OMRON

Limit Switches

realizing

CONTENTS

Warranty and Application Considerations

Read and Understand this Catalog
Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

■ Warranty and Limitations of Liability

Warranty and Limitations of Liability
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■ Application Considerations

Application Considerations
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Disclaimers
PERFORMANCE DATA Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON *Warranty and Limitations of Liability.*
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Safety Precautions

■ Symbol Guide

The following symbols are used to ensure proper product operation.

Meaning of Common Symbols

Symbol		Meaning
International Standards		UL
		UL(CSA)
		CSA
		TÜV
		SUVA
		BIA
		CCC
NEW		Indicates new products released in April 2004 or later

Warning Indications

Warnings in *Precautions and Safety Precautions* are indicated as shown in the following table.

Classification		Symbol	Meaning
Items for product safety	Precautionary information	⚠ DANGER	Indicates an imminently hazardous situation which, if not avoided, is likely to result in serious injury or may result in death. Additionally there may be severe property damage.
		⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
		⚠ Caution	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.
	Points to note	**Precautions for Correct Use**	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.
Other items		**Precautions for Safe Use**	Supplementary comments on what to do or avoid doing, to use the product safely.

Meaning of Product Safety Symbols

Symbol		Meaning	Symbol		Meaning
Precautionary information		**General Caution** Indicates general cautionary, warning, or danger level information	Prohibitions		**General Prohibition** Indicates a general prohibition
		Explosion Caution Indicates the possibility of explosion under specific conditions			**Contact Prohibition** Indicates prohibition of coming into contact with a specific part of a specific device under specific condition because of the possibility of injury.
		Electrical Shock Caution Indicates possibility of electric shock under specific conditions			**Disassembly Prohibition** Indicates that disassembly is prohibited to prevent electric shock.
		High Temperature Caution Indicates the possibility of injury by high temperature under specific conditions	Mandatory actions		**General Mandatory Action** Indicates a general action that must be performed by the user.
		Laser Caution Indicates information related to laser safety			**Mandatory Ground** Indicates that a ground that must be connected by the user for a device equipped with a ground terminal.
				Ni-Cd	**Nickel-Cadmium Battery Collection** Indicates a nickel-cadmium battery that must be collected and recycled.

SI Units

In line with international standards, this catalog uses SI units. Some conversions from units that have been used in our previous catalogs to SI units are given in the following table.

SI unit Conversions (Units in shaded boxes are SI units.)

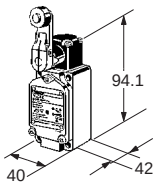
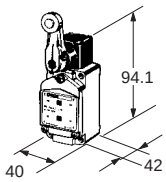
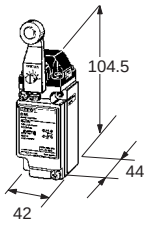
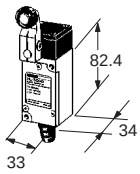
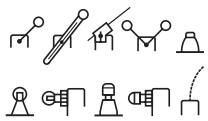
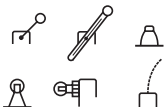
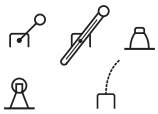
	m/s^2	G
Acceleration	1	1.01972×10^{-1}
	9.80665	1

	N	kgf
Force	1	1.01972×10^{-1}
	9.80665	1

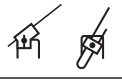
	N•m	**kgf•cm**	**kgf•m**
Torque	1	1.01972x10	1.01972×10^{-1}
	9.80665×10^{-2}	1	1×10^{-2}
	9.80665	1×10^{2}	1

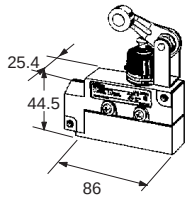
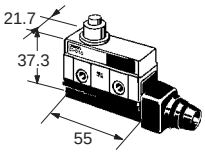
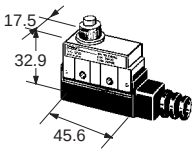
	Pa	**kPa**	**kgf/cm²**	**mmHg(Torr)**	**mmH₂O**
Pressure	1	1×10^{-3}	1.01972×10^{-5}	7.50062×10^{-3}	1.01972×10^{-1}
	1×10^{3}	1	1.01972×10^{-2}	7.50062	1.01972×10^{2}
	9.80665×10^{4}	9.80665x10	1	7.35559×10^{2}	1×10^{4}
	1.33322×10^{2}	1.33322×10^{-1}	1.35951×10^{-3}	1	1.35951x10

Selection Guide

Classification		General-purpose limit switches			
Model		WL	WLM	D4A-□N	HL-5000
Appearance					
Features		Wide selection of two-circuit double break	Double seal fitted to rotating parts. Improved resistance to abrasion and smoother movement. Improved visibility when setting stroke zones.	A new version with better seal, shock resistance, and strength	Economical miniature limit switch boasting rigid construction
Degree of protection	**IEC**	IP67	IP67	IP67	IP65
Rated current (A) (UL or general rating)	20 15 10 5	500 VAC	115 VAC	Two circuits 480 VAC Four circuits 125 VAC	250 VAC
Microload type		Available	---	---	---
Mechanical durability* (x 1,000 operations min.)	50,000 40,000 30,000 20,000 10,000			Two circuits Four circuits	
Electrical durability* (x 1,000 operations min.)	1,000 800 600 400 200	(750)	(30,000) at 24 VDC and 10 mA	Two circuits Four circuits (750)	
Operation indicator		Available	Available	Available	---
Mounting pitch		58.7 x 30.2 mm (other sizes available)	58.7 x 30.2 mm	59.5 x 29.4 mm	50 x 24 mm
Actuators* **					
Approved standards		UL, CSA, EN (IEC) (approval with conditions)**, CCC	UL, CSA, EN (IEC) (approval with conditions)**, CCC	UL, CSA, CCC	CCC
Page		34	34	74	96

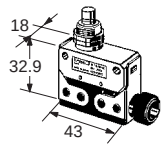
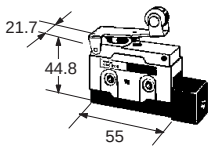
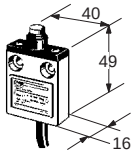
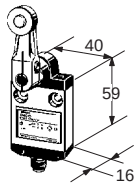
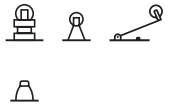
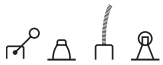
Note *For mechanical durability and electrical durability that depend on operation conditions, contact our sales representative.
**Refer to the sections on individual products for details.
***Actuator types are shown below.

Roller lever	Adjustable roller lever	Adjustable rod lever	Hemispherical plunger	Plunger	Roller plunger	Ball plunger	Bevel plunger	Coil spring	Hinge lever	Hinge roller lever	One-way roller arm lever (horizontal)
											

Classification		Enclosed switches		
Model		ZE/ZV/XE/XV	ZC-□55	SHL
Appearance				
Features		Long-durability and large breaking capacity	Small, high-precision enclosed switch	Subminiature limit switch with high sealing property
Degree of protection	**IEC**	IP65 (-N type)/IP60 (-Q type)	IP67	IP67
Rated current (A) (UL or general rating)	20 15 10 5	ZE/ZV/ZV2: 250 VAC XE/XV/XV2: 125 VDC	250 VAC	250 VAC
Microload type		---	---	Available
Mechanical durability* (x 1,000 operations min.)	50,000 40,000 30,000 20,000 10,000	ZE/ZV/ZV2 XE/XV/XV2 (1,000)		
Electrical durability* (x 1,000 operations min.)	1,000 800 600 400 200	ZE/ZV/ZV2 XE/XV/XV2	(500)	(500)
Operation indicator		---	Available	Available
Mounting pitch		ZE: 25.4 mm, ZV: 41.3 mm ZV2: 31 x 75 mm	25.4 mm	16.5 mm
Actuators**				
Approved standards		UL, CSA, CCC	UL, CSA, EN (IEC), CCC	UL, CSA, EN (IEC), CCC
Page		105	117	128

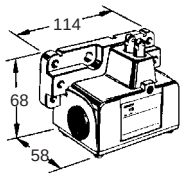
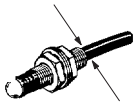
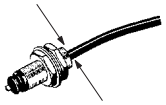
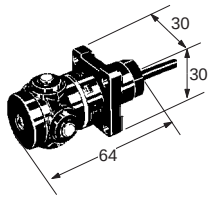
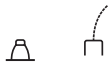
Note *For mechanical durability and electrical durability that depend on operation conditions, contact our sales representative.
**Actuator types are shown below.

Roller lever	Adjustable roller lever	Adjustable rod lever	Hemispherical plunger	Plunger	Roller plunger	Ball plunger	Bevel plunger	Coil spring	Hinge lever	Hinge roller lever	One-way roller arm lever (horizontal)
											

Classification		Small sealed switches	Enclosed switches		Miniature limit switch
Model		D4E-□N	D4MC	D4C	D4CC
Appearance					
Features		Slim and compact switch with better seal and ensuring longer durability than D4E	Economical, high utility enclosed switch	Small, slim-bodied high-precision enclosed switch	Many models including roller lever switches only 16-mm thick with connector
Degree of protection	**IEC**	IP67	IP67	IP67	IP67
Rated current (A) (UL or general rating)	20 15 10 5	250 VAC	250 VAC	250 VAC	125 VAC 30 VDC
Microload type		Available	---	Available	---
Mechanical durability* (x 1,000 operations min.)	50,000 40,000 30,000 20,000 10,000				
Electrical durability* (x 1,000 operations min.)	1,000 800 600 400 200	(500)	(500)	(200)	(200)
Operation indicator		Available	---	Available	Available
Mounting pitch		33 mm	25.4 mm	25 mm	25 mm
Actuators* **					
Approved standards		UL, CSA, EN (IEC), CCC	UL, CSA, CCC	UL, CSA, EN (IEC) (approval with conditions)**, CCC	UL, CSA
Page		138	151	160	181

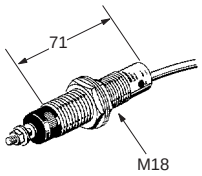
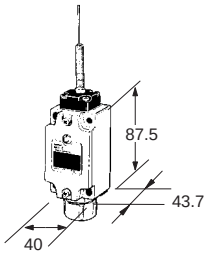
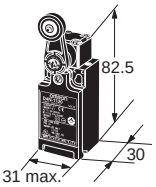
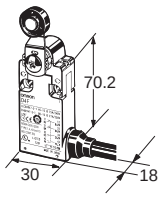
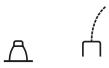
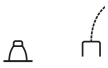
Note *For mechanical durability and electrical durability that depend on operation conditions, contact our sales representative.
**Refer to the sections on individual products for details.
***Actuator types are shown below.

Roller lever	Adjustable roller lever	Adjustable rod lever	Hemispherical plunger	Plunger	Roller plunger	Ball plunger	Bevel plunger	Coil spring	Hinge lever	Hinge roller lever	One-way roller arm lever (horizontal)
											

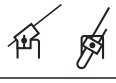
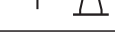
Classification		Multiple limit switches	Mechanical touch switch	High-precision switches	
Model		VB	D5B	D5A	D5F
Appearance			 **Note:** M8 and M10 are also available.		
Features		12-mm pitch between poles	Detects object in multiple directions	High-precision switch for detecting Micro-unit Displacement	Optical system achieves 1-µm operating position repeatability in this 4-way switch
Degree of protection	**IEC**	IP67	IP67	IP40 (M5 type), IP67	IP67
Rated current (A) (UL or general rating)	20 15 10 5	250 VAC	30 VDC	24 VAC 12 VDC	Supply voltage 12 to 24 VDC
Microload type		Available	Available	Available	---
Mechanical durability* (x 1,000 operations min.)	50,000 40,000 30,000 20,000 10,000	5,000			(5,000)
Electrical durability* (x 1,000 operations min.)	1,000 800 600 400 200	(300)	5,000	1,000	5,000
Operation indicator		---	---	Available	Available
Mounting pitch		50 mm	M5, M8, M10 (screw mounting)	M5, M8, etc.	23 x 23 mm
Actuators**					---
Approved standards		EN (IEC) (only for models with ground terminals), CCC	---	---	---
Page		192	199	205	213

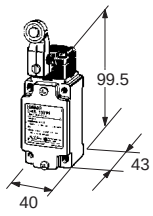
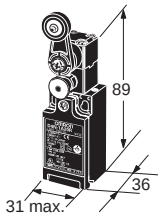
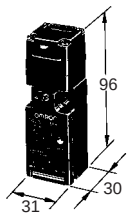
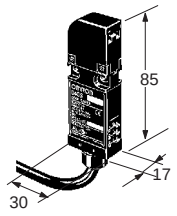
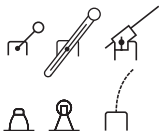
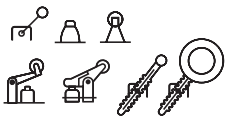
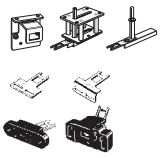
Note *For mechanical durability and electrical durability that depend on operation conditions, contact our sales representative.
**Actuator types are shown below.

Roller lever	Adjustable roller lever	Adjustable rod lever	Hemispherical plunger	Plunger	Roller plunger	Ball plunger	Bevel plunger	Coil spring	Hinge lever	Hinge roller lever	One-way roller arm lever (horizontal)
											

Classification		Touch switches		Safety limit switches	
Model		D5C	NL	D4N	D4F
Appearance					
Features		Unique touch switch with very light physical contact	Operates with light physical contact. Offers control functions that cannot be performed with other switches.	Self-holding head added to the limit switch with positive opening mechanism. Approval obtained for various safety standards. 2-conduit models also available.	The smallest limit switch in the world with a positive opening mechanism (4 contacts). High-sensitivity safety limit switch. Switches with either 2 or 4 contacts.
Degree of protection	**IEC**	IP67 (equivalent)	IP60	IP67	IP67
Rated current (A) (UL or general rating)	20 15 10 5	200 mA at 24 VDC 200 mA at 240 VAC	30 mA at 12 VDC 170 mA at 24 VDC 300 mA at 200 VAC	240 VAC	240 VAC
Microload type		---	---	Applicable to both standard loads and microloads.	Applicable to both standard loads and microloads.
Mechanical durability* (x 1,000 operations min.)	50,000 40,000 30,000 20,000 10,000				10,000
Electrical durability* (x 1,000 operations min.)	1,000 800 600 400 200			500	Four circuits Two circuits
Operation indicator		Available	Available	---	---
Mounting pitch		M18 (screw mounting)	60 x 30 mm	47 × 22 mm, 39 × 42 mm	20 mm
Actuators**					
Approved standards		---		UL, CSA, EN (IEC), CCC	UL, CSA, EN (IEC), CCC
Page		218	226	250	274

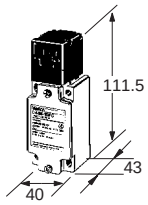
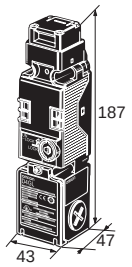
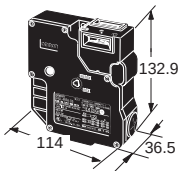
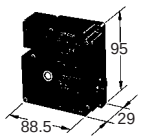
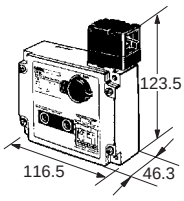
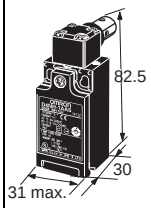
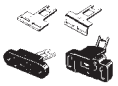
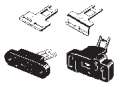
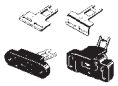
Note *For mechanical durability and electrical durability that depend on operation conditions, contact our sales representative.
**Actuator types are shown below.

Roller lever	Adjustable roller lever	Adjustable rod lever	Hemispherical plunger	Plunger	Roller plunger	Ball plunger	Bevel plunger	Coil spring	Hinge lever	Hinge roller lever	One-way roller arm lever (horizontal)
											

Classification		Safety limit switches		Safety-door switch	
Model		D4B-□N	D4N-□R	D4NS	D4GS-N
Appearance					
Features		Positive opening mechanism to open fused contacts. Mechanism that indicates applicable operating zone, as well as pushbutton switching to control left and right motion.	Self-holding head added to the limit switch with positive opening mechanism. Approval obtained for various safety standards. 2-conduit models also available.	Three contact models with 2NC/1NC and 3NC contact forms in addition to the previous contact forms 1NC/1NO, and 2NC. M12-connector models to save on labor and simplifying replacement. Standardized gold-clad contacts for high contact reliability for both standard loads and microloads. Free of lead, cadmium, and hexavalent chrome, reducing the burden on the environment.	Slim construction only 17 mm wide. Washable construction (IP67). Reversible design with either front or rear mounting. Built-in switches with two- or three-terminal contact construction.
Degree of protection	**IEC**	IP67	IP67	IP67 (Body only, Operation key hole is IP00.)	IP67 (Body only, Operation key hole is IP00.)
Rated current (A) (UL or general rating)	20 15 10 5	400 VAC	240 VAC	240 VAC	240 VAC
Microload type		Available	Applicable to both standard loads and microloads.	Applicable to both standard loads and microloads.	---
Mechanical durability* (x 1,000 operations min.)	50,000 40,000 30,000 20,000 10,000	Snap action Slow action	1,000	1,000	1,000
Electrical durability* (x 1,000 operations min.)	1,000 800 600 400 200	500	500	500	100
Operation indicator		Available	---	---	---
Mounting pitch		60 x 30 mm	47 × 22 mm, 39 × 42 mm	47 × 22 mm, 39 × 42 mm	20 mm, 22 mm
Actuators* **					
Approved standards		UL, CSA, EN (IEC), SUVA (slow-action)**, CCC	UL, CSA, EN (IEC), CCC	UL, CSA, EN (IEC), CCC	UL, CSA, EN (IEC), CCC
Page		282	301	319	331

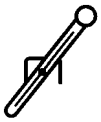
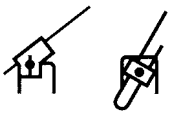
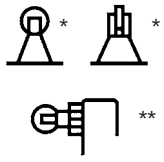
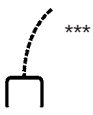
Note *For mechanical durability and electrical durability that depend on operation conditions, contact our sales representative.
**Approval for slow-action models only, with the exception of adjustable lever and wobble lever.
***Actuator types are shown below.

Roller lever	Adjustable roller lever	Adjustable rod lever	Hemispherical plunger	Plunger	Roller plunger	Ball plunger	Bevel plunger	Coil spring	Hinge lever	Hinge roller lever	One-way roller arm lever (horizontal)
											

Classification		Safety-door switches					
Model		D4BS	D4GL	D4JL	D4NL	D4BL	D4NH
Appearance							
Features		Positive opening mechanism to open fused contacts. Wide operating temperature range: –40 to 80°C.	Contains no harmful substances, such as lead or cadmium, reducing the burden on the environment. Slim safety-door switch with an electromagnetic lock or unlock mechanism. Models with 4-contact and 5-contact built-in switches. Holding force of 1,000 N min. Can be used for either standard loads or microloads. Models with a conduit size of M20.	World's Top* Holding Force of 3,000 N min. *For plastic models Two safety circuits and two monitor contacts provide an array of monitoring patterns. Suitable for general loads or micro loads. Models with trapped keys/rear release button prevent workers from being locked in hazardous work areas. Degree of protection: IP67	Contains no harmful substances, such as lead or cadmium, reducing the burden on the environment. Models with 4-contact and 5-contact built-in switches are available. Key holding force of 1,300 N min. Can be used for either standard loads or microloads. Lineup includes models with a conduit size of M20.	Automatically locks mechanically when special key is inserted. Lock released when pressure is applied to solenoid. Special release lock to enable maintenance when power is off (e.g., for power failures).	Hinge-type door switch. Shaft and arm lever type available.
Degree of protection	**IEC**	IP67	IP67 (Body only, Operation key hole is IP00.)	IP67 (Body only, Operation key hole is IP00.)	IP67 (Body only, Operation key hole is IP00.)	IP67	IP67
Rated current (A) (UL or general rating)	20 15 10 5	600 VAC	240 VAC	240 VAC	240 VAC	With indicator: 115 VAC Without indicator: 240 VAC	240 VAC
Microload type		Applicable to both standard loads and microloads.	Applicable to both standard loads and microloads.	Applicable to both standard loads and microloads.	Applicable to both standard loads and microloads.	---	Applicable to both standard loads and microloads.
Mechanical durability* (x 1,000 operations min.)	50,000 40,000 30,000 20,000 10,000	1,000	1,000	1,000	1,000	1,000	1,000
Electrical durability* (x 1,000 operations min.)	1,000 800 600 400 200	500	500	500	500	500	500
Operation indicator		---	Available	Available	Available	Available	---
Mounting pitch		60 x 30 mm	84 × 30 mm	---	55 × 79 mm	74 x 100 mm	47 × 22 mm, 39 × 42 mm
Actuators**							
Approved standards		UL, CSA, EN (IEC), BIA, SUVA, CCC	UL, CSA, EN (IEC), CCC	UL, CSA, EN (IEC), CCC	UL, CSA, EN (IEC), CCC	UL, CSA, EN (IEC), BIA, SUVA, CCC	UL, CSA, EN (IEC), CCC
Page		341	349	365	387	405	420

Note *For mechanical durability and electrical durability that depend on operation conditions, contact our sales representative.
**Actuator types are shown below.

Types and Characteristics of Limit Switch Actuators

Appearance	Classification	Pretravel (PT)	Overtravel (OT)	Operating force (OF)	Repeat accuracy	Shock and vibration resistance	Description
	Roller lever type	Small to large	Large	Medium	Good to excellent	Excellent	The stroke in the operating direction is as large as 45° to 90°, the actual angle of which varies with the model. The lever can be set in any angle. Highly sensitive models with small PT values and wide-angle models with large OT values are available. These models are applied to a wide range of applications including object positioning and detection.
	Adjustable roller lever	Small to large	Large	Medium	Good to excellent	Good	Dogs are detected roughly by making use of the characteristics of the roller lever. The length of the lever is adjustable. If the adjustable roller lever is long, take necessary countermeasures against lever shaking. (see note ****)
	Adjustable rod lever	Large	Large	Medium	Good	Good	This lever is convenient when the dogs are wide or not uniform in size. The OF required by this lever is smaller than that of any other rotating actuator used for Limit Switches. The length of the rod is adjustable and the rod itself can be bent with ease. If the adjustable rod lever is long, take necessary countermeasures against lever shaking. (see note ****)
	Fork lever lock	Large	Medium	Medium	Good	Excellent	The lever turns by itself when it is operated to an angle of 55° and the lever keeps its position at an angle of 90°. A single dog in reciprocating operation can actuate the Limit Switch. Two dogs can be used actuate two Limit Switches positioned slightly different from each other.
	Plunger	Small	Medium	Large	Excellent	Excellent	The plunger operated by hydraulic pressure or air cylinder power detects positions highly accurately. The plunger must be installed according to the movement of the dog so that incorrect load will not be imposed on the plunger.
	Roller plunger	Small	Medium	Large	Excellent	Excellent	The roller plunger can be operated in a wide range by employing a cam, dog, cylinder, or auxiliary actuator and detects positions highly accurately.
	Ball plunger	Small	Medium	Large	Good	Excellent	The tip of the plunger is made of a steel ball, which can be operated in any direction with no limitations. The ball plunger is convenient when the mounting side is different from the movement direction of the dog or the Limit Switch is actuated by two dogs in X and Y directions respectively.
	Bevel plunger	Small	Medium	Large	Excellent	Excellent	Unlike roller-type plungers, the bevel plunger protects the actuator from abrasion. The bevel plunger is a hardened plunger with an angle of 120° and ensures high accuracy and a long life. The bevel plunger is mainly applied to multiple Limit Switches for multi-level control of machining equipment.
	Coil spring	Medium	Large	Small	OK	OK	The coil spring can be operated in any direction except the axis direction. The OF required by the coil spring is smaller than any other actuator used for Limit Switches. The use of the coil spring is ideal for the detection of dogs that are not uniform in size or direction. The OT is absorbed by the actuator, thus permitting variations in the dog positions
	Hinge lever	Large	Medium	Small	OK	OK	The hinge lever is used with low-speed, low-torque cams. The lever can be varied in a variety of shapes according to the dog.
	Hinge roller lever	Large	Medium	Small	OK	OK	This lever consists of a hinge lever with a roller and suitable for a high-speed cam if the operating speed is within the permissible rate.
	One-way roller arm lever (horizontal)	Medium	Medium	Medium	OK	OK	The roller position is changeable.

Appearance	Classification	Pretravel (PT)	Overtravel (OT)	Operating force (OF)	Repeat accuracy	Shock and vibration resistance	Description
	One-way roller arm lever (vertical)	Medium	Medium	Medium	OK	OK	This lever operates only in the vertical direction.

Note *Panel-mounting models are available (i.e., the D4E-N, SHL, ZC, and D4MC).
**Horizontal roller model is available (i.e., the D4A-N).
***Steel wire model is available (i.e., the WL). Plastic rod or wire rod models are available as well (i.e., D4A-N, D4B-N, HL-5000, D4C, or D4CC).
****Lever shaking may cause the actuator to bounce after being actuated and move to the operating position on the opposite side, which may result in a failure of the Limit Switch.

Switch Terminology

General Terms

Limit Switch

A basic switch enclosed in a metal or resin case to protect it from external forces, water, oil, dust, dirt, etc. Also abbreviated to merely "Switch."

Ratings

Generally, the ratings of the Switch refer to values that ensures the characteristics and performance of the Switch, such as rated current and rated voltage under specific conditions.

Contacts

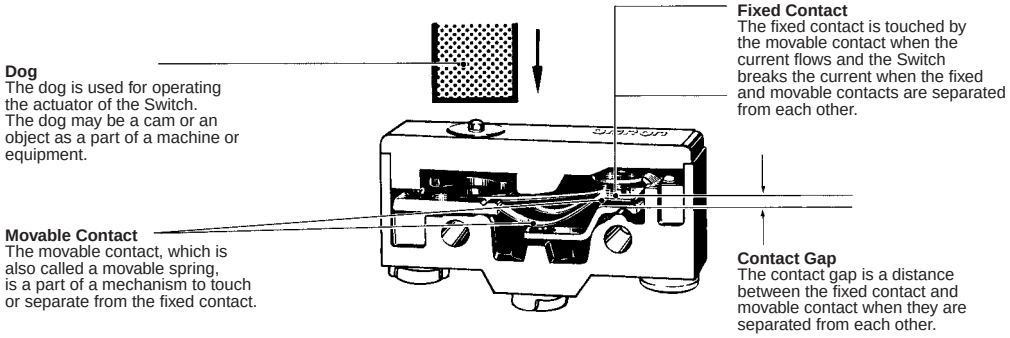
Contacts are mechanically opened and closed for current switching.

Contact Configuration

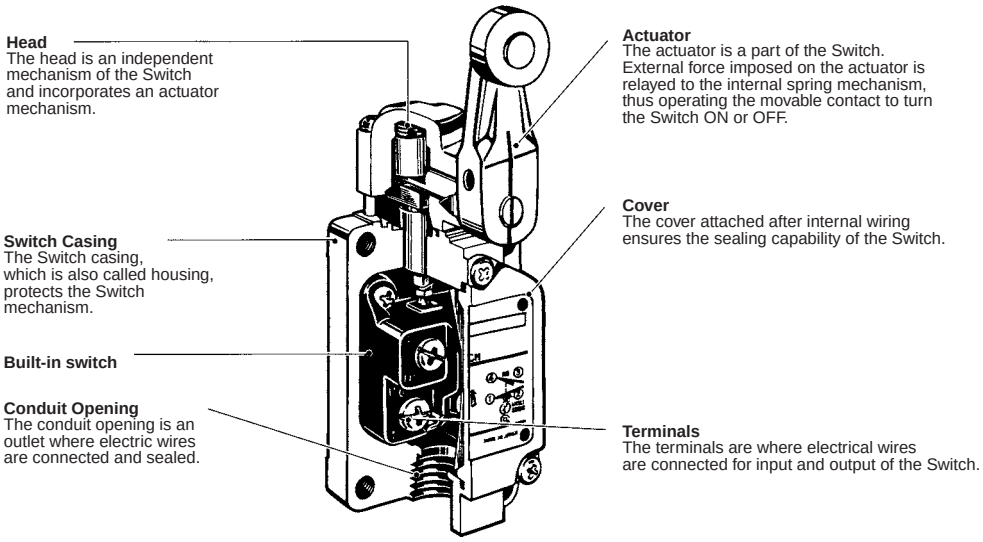
The electrical input/output circuit configuration of contacts which depends on the application.

Resin Molding (Molded Terminals)

Terminals that are hardened by applying resin after lead wires have been connected in order to eliminate any exposed current-carrying parts and to improve sealing performance.



Terms Related to Configuration and Structure



Terms Related to Switch Durability

Mechanical Durability

The mechanical durability refers to the number of available switching operations on condition that the Switch is actuated to the OT position per operation.

Electrical Durability

The electrical durability refers to the number of available switching operations on condition that the Switch is actuated to the OT position per operation to turn the rated resistive load ON or OFF.

Terms Related to Characteristics

FP (Free Position)

The initial position of the actuator when no external force is applied.

OP (Operating Position)

The position of the actuator at which the contacts snap to the operated contact position.

TTP (Total Travel Position)

The position of the actuator when it reaches the stopper.

RP (Releasing Position)

The position of the actuator at which the contacts snap from the operated contact position to their normal position.

OF (Operating Force)

The force applied to the actuator required to operate the switch contacts.

RF (Releasing Force)

The value to which the force on the actuator must be reduced to allow the contacts to return to the normal position.

PT (Pretravel)

The distance or angle through which the actuator moves from the free position to the operating position.

OT (Overtravel)

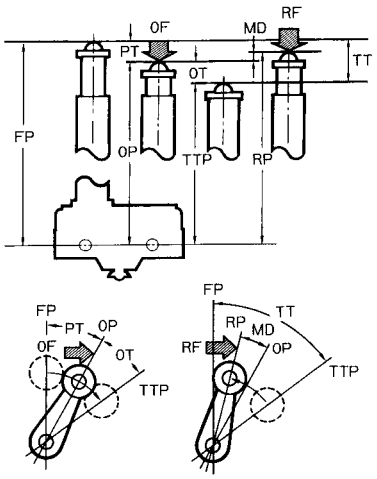
The distance or angle of the actuator movement beyond the operating position.

MD (Movement Differential)

The distance or angle from the operating position to the releasing position.

TT (Total Travel)

The sum of the pretravel and total overtravel expressed as a distance or angle.



Terms Used in EN60947-5-1 Standards

The following provides information on the following terms used in this catalog.

EN60947-5-1

EN standards applicable to electronic machine control circuitry, the contents of which are the same as those of IEC947-5-1.

Application Category

Refer to the following examples.

Type of current	Category	Typical application
AC	AC-15	Control of electromagnetic loads exceeding 72 VA
	AC-14	Control of electromagnetic loads not exceeding 72 VA
DC	DC-12	Control of resistive loads and semiconductor loads

Rated Operating Current (I_e)

The rated switch operating current.

Rated Operating Voltage (U_e)

The rated switch operating voltage, which must not exceed the rated insulation voltage (U_i).

Rated Insulation Voltage (U_i)

The maximum rated voltage at which the insulation voltage of the Switch is maintained. This value is used as the parameter of the dielectric strength and creepage distance of the Switch.

Conventional Enclosed Thermal Current (I_{the})

The normal carry current that does not increase the permissible upper-limit temperature of the Switch if it is a model with its charged part sealed. The rated permissible upper-limit temperature is 65° if the terminals are made of brass.

Rated Impulse Dielectric Strength (U_{imp})

The peak impulse voltage that the Switch can withstand with no insulation breakage.

Conditional Short-circuit Current

The current that the Switch can withstand until the circuit breaker operates.

Short-circuit Protective Device (SCPD)

The device, such as a breaker or fuse, which breaks the current to protect the Switch from short-circuiting.

Pollution Degree

The environment in which the Switch is used.
The pollution degree is divided into four levels as shown below. The Switch falls under pollution degree 3.

Level	Description
Pollution degree 1	No pollution or only dry, non-conductive pollutants exist.
Pollution degree 2	Normally only non-conductive pollutants exist, which are expected to be temporarily conductive due to condensation.
Pollution degree 3	Conductive pollutants exist or existing non-conductive pollutants will be temporarily conductive due to expected condensation.
Pollution degree 4	Conductive pollutants exist or existing non-conductive pollutants will be conductive continuously due to rain or snow.

Protection Against Electric Shock

Electric Shock Preventive Levels

Level	Description
Class 0	Electric shocks are prevented by basic insulation only.
Class I	Electric shock are prevented by basic insulation and grounding.
Class II	Electric shocks are prevented by double insulation or reinforced insulation with no grounding required.
Class III	No countermeasures against electric shocks are required because the electric circuits in use operate in a low-enough voltage range.

Closed-circuit Counter Electromotive Voltage

Instantaneous overvoltage generated from the closed circuit, which must not exceed the U_{imp} value.

Direct Opening

The act of mechanically separating the contacts directly by the actuator without using the spring. The Switch incorporating a force-separation mechanism bears the mark on the right.

Direct Opening Travel (DOT)

Distance of the actuator traveling between the FP and the position to separate the contacts forcibly.

Direct Opening Force (DOF)

Necessary force imposed on the actuator to separate the contacts forcibly.

Space Distance

The minimum space distance between two charged parts.

Creepage Distance

The minimum distance on the surface of the insulator between two charged parts.

Distance through Insulation

The minimum direct distance between the charged part and the non-metal switch housing through air or any other insulator.

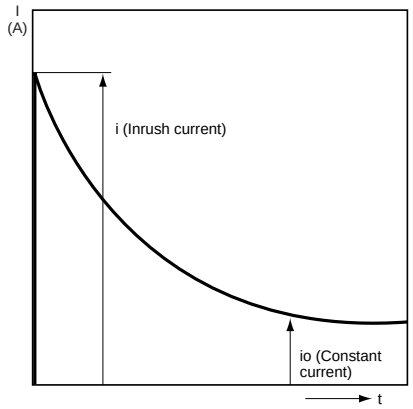
Precautions for General-purpose Limit Switches

(Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)

Note: Refer to the Precautions section for each Switch for specific precautions applicable to each Switch.

Precautions for Safe Use

- If the Switch is to be used as a switch in an emergency stop circuit or in a safety circuit for preventing accidents resulting in injuries or deaths, use a Switch with a direct opening mechanism, use the NC contacts with a forced release mechanism, and set the Switch so that it will operate in direct opening mode.
  For safety, install the Switch using one-way rotational screws or other similar means to prevent it from easily being removed. Protect the Switch with an appropriate cover and post a warning sign near the Switch in order to ensure the safety.
- Do not supply electric power when wiring. Otherwise electric shock may result.
- Keep the electrical load below the rated value.
- Be sure to evaluate the Switch under actual working conditions after installation.
- Do not touch the charged switch terminals while the Switch has carry current, otherwise electric shock may result.
- If the Switch has a ground terminal, be sure to connect the ground terminal to a ground wire.
- Do not disassemble the Switch while electric power is being supply. Otherwise electric shock may result.
- The durability of the Switch greatly varies with switching conditions. Before using the Switch, be sure to test the Switch under actual conditions. Make sure that the number of switching operations is within the permissible range.
  If a deteriorated Switch is used continuously, insulation failures, contact weld, contact failures, switch damage, or switch burnout may result.
- Maintain an appropriate insulation distance between wires connected to the Switch.
- Some types of load have a great difference between normal current and inrush current. Make sure that the inrush current is within the permissible value. The greater the inrush current in the closed circuit is, the greater the contact abrasion or shift will be. Consequently, contact weld, contact separation failures, or insulation failures may result. Furthermore, the Switch may become broken or damaged.



Wiring

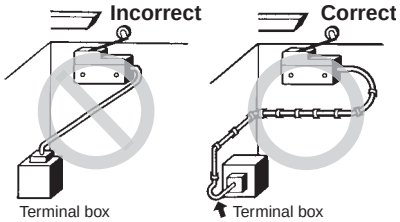
Pay the utmost attention so that each terminal is wired correctly. If the terminal is wired incorrectly, the Switch will not function. Furthermore, not only will the Switch have a bad influence on the external circuit, the Switch itself may become damaged or burnt.

Mounting

- Do not modify the actuator, otherwise the operating characteristics and performance of the actuator will change.
- Do not enlarge the mounting holes of the Switch or modify the Switch, otherwise insulation failures or housing damage may result.
- Be sure to evaluate the Switch under actual working conditions after installation.
- Do not apply oil, grease, or other lubricants to the moving parts of the actuator, otherwise the actuator may not operate correctly. Furthermore, intrusion of oil, grease, or other lubricants inside the Switch may reduce sliding characteristic or cause failures in the Switch.
- Mount the Switch and secure it with the specified screws tightened to the specified torque along with flat washers and springs.
  The actuator of a Pushbutton Limit Switch mounted to a panel with excessive tightening torque may not operate correctly.
- Be sure to wire the Switch so that the conduit opening is free of metal powder or any other impurities.
- If glue or bonding agent is applied, make sure that it does not adhere to the movable parts or intrude inside the Switch, otherwise the Switch may not work correctly or cause contact failure. Some types of glue or bonding agent may generate a gas that may have a bad influence on the Switch. Pay the utmost attention when selecting the glue or locking agent.
- Do not drop or disassemble the Switch, otherwise the Switch will not be capable of full performance. Furthermore, the Switch may become broken or burnt.
- Some models allow changes in head directions. When changing the head of such a model, make sure that the head is free of any foreign substance. Tighten each screw of the head to the rated torque.
- Be sure to take measures so that no foreign material, oil, or water will penetrate into the Switch through the conduit opening. Be sure to attach a connector suited to the cable thickness and tighten the connector securely to the rated torque.
- Do not impose shock or vibration on the actuator while it is fully pressed. Otherwise, the actuator will partially abrade and an actuation failure may result.

Wiring

- If the wiring method is incorrect, the wires may get caught on objects or the lead wires may be pulled excessively. Make sure that the lead wires are sufficiently long and secure them along the wiring path.



Pay the utmost attention so that each terminal is wired correctly. If a terminal is wired incorrectly, the Limit Switch will not function properly. Furthermore, not only will the Limit Switch have an adverse influence on external circuits, the Limit Switch itself may become damaged or burnt.

Precautions for Correct Use

Switch Operation

- The Switch in actual operation may cause accidents that cannot be foreseen from the design stage. Therefore, the Switch must be practically tested before actual use.
- When testing the Switch, be sure to apply the actual load condition together with the actual operating environment.
- All the performance ratings in this catalog are provided under the following conditions unless otherwise specified.

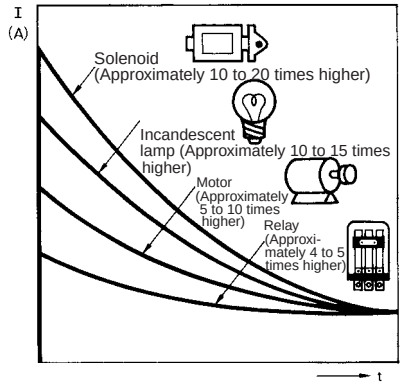
Inductive load: A minimum power factor of 0.4 (AC) or a maximum time constant of 7 ms (DC)

Lamp load: An inrush current 10 times higher than the normal current

Motor load: An inrush current 6 times higher than the normal current

1. Ambient temperature: +5°C to 35°C
2. Ambient humidity: 40% to 70%.

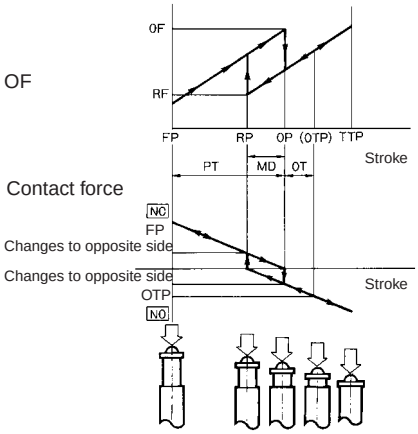
Note: An inductive load causes a problem especially in DC circuitry. Therefore, it is essential to know the time constants (L/R) of the load.



Mechanical Characteristics

Operating Force, Stroke, and Contact Characteristics

- The following graph indicates the relationship between operating force and stroke or stroke and contact force. In order to operate the Limit Switch with high reliability, it is necessary to use the Limit Switch within an appropriate contact force range. If the Limit Switch is used in a normally closed condition, the dog must be installed so that the actuator will return to the FP when the actuator is actuated by the dog. If the Limit Switch is used in a normally open condition, the actuator must be pressed to 70% to 100% of the OT (i.e., 60% to 80% of the TT) and any slight fluctuation must be absorbed by the actuator.
- If the full stroke is set close to the OP or RP, contact instability may result. If the full stroke is set to the TTP, the actuator or switch may become damaged due to the inertia of the dog. In that case, adjust the stroke with the mounting panel or the dog. Refer to page 22, *Dog Design*, page 23, *Stroke Settings vs. Dog Movement Distance*, and page 24, *Dog Surface* for details.
- The following graph shows an example of changes in contact force according to the stroke. The contact force near the OP or RP is unstable, and the Limit Switch cannot maintain high reliability. Furthermore, the Limit Switch cannot withstand strong vibration or shock.



If the Limit Switch is used so that the actuator is constantly pressed, it will fail quickly and reset faults may occur. Inspect the Limit Switch periodically and replace it as required.

Mechanical Conditions for Switch Selection

- The actuator must be selected according to the operating method.
- Check the operating speed and switching frequency.
  1. If the operating speed is extremely low, the switching of the movable contact will become unstable, thus resulting in incorrect contact or contact weld.
  2. If the operating speed is extremely high, the Switch may break due to shock. If the switching frequency is high, the switching of the contacts cannot catch up with the switching frequency. Make sure that the switching frequency is within the rated switching frequency.
- Do not impose excessive force on the actuator, otherwise the actuator may become damaged or not operate correctly.
- Make sure that the stroke is set within the suitable range specified for the model, or otherwise the Switch may break.

Electrical Characteristics

Electrical Characteristics for Switch Selection

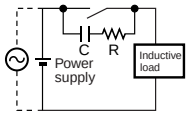
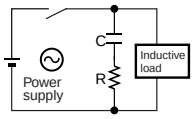
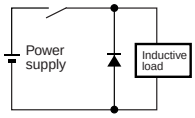
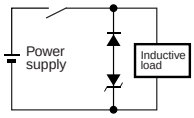
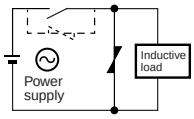
- The switching load capacity of the Switch greatly varies between AC and DC. Always be sure to apply the rated load. The control capacity will drastically drop if it is a DC load. This is because a DC load has no current zero-cross point, unlike an AC load. Therefore, if an arc is generated, it may continue comparatively for a long time. Furthermore, the current direction is always the same, which results in a contact relocation phenomena whereby the contacts easily stick to each other and do not separate when the surfaces of the contacts are uneven.
- If the load is inductive, counter-electromotive voltage will be generated. The higher the voltage is, the higher the generated energy will be, which will increase the abrasion of the contacts and contact relocation phenomena. Be sure to use the Switch within the rated conditions.
- If the load is a minute voltage or current load, use a dedicated Switch for minute loads. The reliability of silver-plated contacts, which are used by standard Switches, will be insufficient if the load is a minute voltage or current load.

Contact Protective Circuit

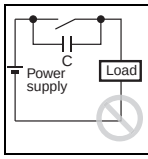
Apply a contact protective circuit to increase the contact durability, prevent noise, and suppress the generation of carbide or nitric acid. Be sure to apply the contact protective circuit correctly, otherwise an adverse effect may occur.

The following provides typical examples of contact protective circuits. If the Switch is used in an excessively humid location for switching a load that easily generates arcs, such as an inductive load, the arcs may generate NOx, which will change into HNO_3 if it reacts with moisture. Consequently, the internal metal parts may corrode and the Switch may fail. Be sure to select the ideal contact preventive circuit from the following. Also, load operating times may be delayed somewhat if a contact protective circuit (a surge killer) is used.

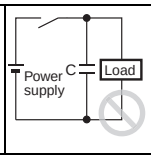
Typical Examples of Contact Protective Circuits

Circuit example		Applicable current		Feature	Element selection
		AC	DC		
CR circuit		*	Yes	*When AC is switched, the load impedance must be lower than the CR impedance.	C: 1 to 0.5 μF x switching current (A) R: 0.5 to 1 Ω x switching voltage (V) The values may change according to the characteristics of the load. The capacitor suppresses the spark discharge of current when the contacts are open. The resistor limits the inrush current when the contacts are closed again. Consider the roles of the capacitor and resistor and determine ideal capacitance and resistance values through testing. Generally, use a capacitor that with a dielectric strength of between 200 and 300 V. Use an AC capacitor for an AC circuit i.e., a capacitor that has no polarity. If, however, the arc shutoff capacity between the contacts is a problem at high DC voltages, it may be more effective to connect a capacitor and resistor across the contacts rather than the load. Performing testing to determine the most suitable method.
		Yes	Yes	The operating time will be greater if the load is a relay or solenoid. Connecting the CR circuit in parallel to the load is effective when the power supply voltage is 24 or 48 V and in parallel to the contacts when the power supply voltage is 100 to 200 V.	
Diode method		No	Yes	Energy stored in the coil is changed into current by the diode connected in parallel to the load. Then the current flowing to the coil is consumed and Joule heat is generated by the resistance of the inductive load. The reset time delay with this method is longer than that in the CR method.	The diode must withstand a peak inverse voltage 10 times higher than the circuit voltage and a forward current as high or higher than the load current.
Diode and Zener diode method		No	Yes	This method will be effective if the reset time delay caused by the diode method is too long.	If a suitable Zener voltage is not used, the load may fail to operate depending on the environment. Use a Zener diode with a Zener voltage that is about 1.2 times the power supply voltage.
Varistor method		Yes	Yes	This method makes use of constant-voltage characteristic of the varistor so that no high-voltage is imposed on the contacts. This method causes a reset time delay. Connecting a varistor in parallel to the load is effective when the supply voltage is 24 to 48 V and in parallel to the contacts when the supply voltage is 100 to 200 V.	Select a varistor with a cut voltage Vc that satisfies the following formula. For AC, the voltage must me multiplied by the square root of 2. Vc > Power supply voltage x 1.5 If Vc is set too high, effectiveness will be reduced because high voltages will not be cut.

Do not apply contact protective circuits (surge killers) as shown below.



This circuit effectively suppresses arcs when the contacts are OFF. The capacitor contacts are OFF. Consequently, when the contacts are ON again, short-circuited current from the capacitance may cause contact weld.

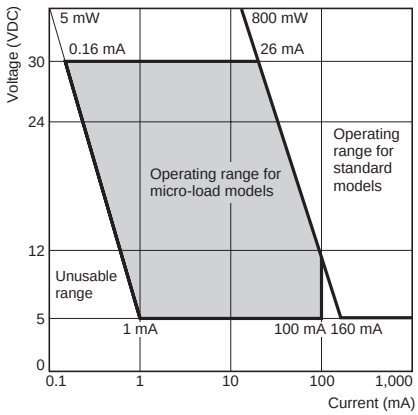


This circuit effectively suppresses arcs when the contacts are OFF. When the contacts are ON again, however, charge current will flow to the capacitor, which may result in contact weld.

Switching a DC inductive load is usually more difficult than switching a resistive load. By using an appropriate contact protective circuit, however, switching a DC inductive load will be as easy as switching a resistive load.

Using Switches for Micro Loads

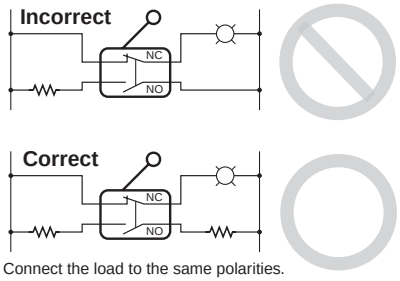
Contact faults may occur if a Switch for a general-load is used to switch a micro load circuit. Use switches in the ranges shown in the diagram on the right. However, even when using micro load models within the operating range shown here, if inrush current occurs when the contact is opened or closed, it may increase contact wear and so decrease durability. Therefore, insert a contact protection circuit where necessary. The minimum applicable load is the N-level reference value. This value indicates the malfunction reference level for the reliability level of 60% (λ60). The equation, $\lambda 60 = 0.5 \times 10^{-6}$/ operations indicates that the estimated malfunction rate is less than 1/2,000,000 operations with a reliability level of 60%.



Connections

- Do not connect a Single Limit Switch to two power supplies that are different in polarity or type.

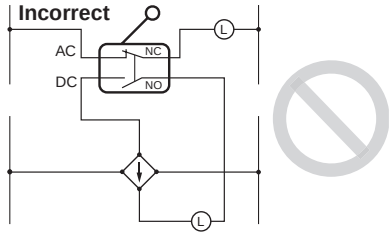
Power Connection Examples
(Connection of Different Polarities)



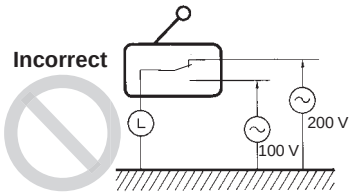
Connect the load to the same polarities.

Incorrect Power Connection Example

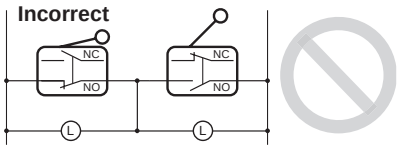
(Connection of Different Power Supplies)
There is a risk of AC and DC mixing.



- Do not design a circuit where voltage is imposed between contacts, otherwise contact welding may result.



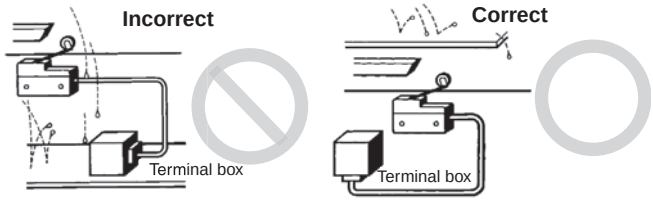
- Do not use a circuit that will short-circuit if an error occurs, otherwise the charged part may melt and break off.



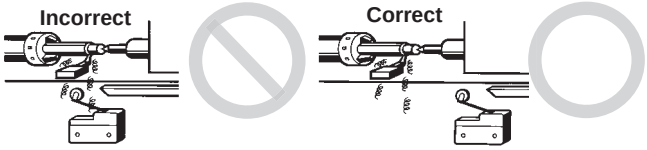
- Application of Switch to a Low-voltage, Low-current Electronic Circuit.
  1. If bouncing or chattering of the contacts results and causes problems, take the following countermeasures.
     (a) Insert an integral circuit.
     (b) Suppress the generation of pulse from the contact bouncing or chattering of the contacts so that it is less than the noise margin of the load.
  2. Conventional silver-plated contacts are not suited to this application. Use gold-plated contacts, which are ideal for handling minute voltage or current loads.
  3. The contacts of the Switch used for an emergency stop must be normally closed with a positive opening mechanism.
- In order to protect the Switch from damage due to short-circuits, be sure to connect a quick-response fuse with a breaking current 1.5 to 2 times larger than the rated current to the Switch in series. When complying with EN approved ratings, use a 10-A IEC 60269-compliant gI or gG fuse.

Operating Environment

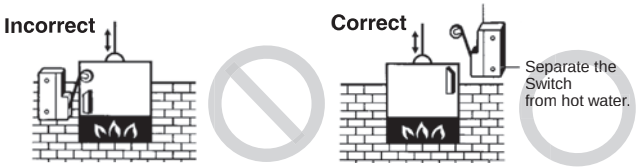
- Do not use the Switch by itself in atmospheres containing flammable or explosive gases. Arcs and heating resulting from switching may cause fire or explosion.
- Use protective covers to protect Switches that are not specified as waterproof or airtight whenever they are used in locations subject to splattering or spraying oil or water, or to accumulation of dust or dirt.



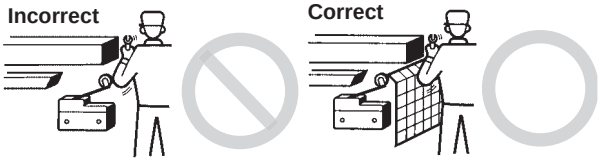
- The materials of Limit Switch may change in quality or deteriorate if the Limit Switch is used outdoors or any other location where the Limit Switch is exposed to special machining oil. Consult your OMRON representative before selecting the model.
- Be sure to install the Switch so that the Switch is free from dust or metal powder. The actuator and the switch casing must be protected from the accumulation of dust or metal powder.



- Do not use the Switch in locations where the Switch is exposed to hot water at a temperature greater than 60°C or steam.
- Do not use the Switch under temperatures or other environmental conditions not within the specified ranges. The rated permissible ambient temperature range varies with the model. Refer to the specifications in this catalog.
  If the Switch is exposed to radical temperature changes, the thermal shock may deform the Switch and the Switch may malfunction.



- Be sure to protect the Switch with a cover if the Switch is in a location where the Switch may be actuated by mistake or where the Switch is likely cause an accident.

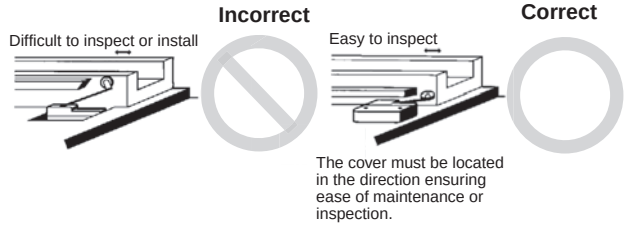


- Make sure to install the Switch in locations free of vibration, shock, or resonance. If vibration or shock is continuously imposed on the Switch, contact failure, malfunction, or decrease in service life may be caused by abrasive powder generated from the internal parts. If excessive vibration or shock is imposed on the Switch, the contacts may malfunction or become damaged.
- Do not use the Switch with silver-plated contacts for long periods if the switching frequency of the Switch is comparatively low or the load is minute. Otherwise, sulfuric film will be generated on the contacts and contact failures may result. Use the Switch with gold-plated contacts or use a dedicated Switch for minute loads instead.
- Do not use the Switch in locations with corrosive gas, such as sulfuric gas (H_2S or SO_2), ammonium gas (NH_3), nitric gas (HNO_3), or chlorine gas (Cl_2), or high temperature and humidity. Otherwise, contact failure or corrosion damage may result.

- If the Switch is used in locations with silicone gas, arc energy may create silicon dioxide (SiO_2) on the contacts and a contact failure may result. If there is silicone oil, silicone sealant, or wire covered with silicone close to the Switch, attach a contact protective circuit to suppress the arcing of the Switch or eliminate the source of silicone gas generation.

Regular Inspection and Replacement

- If the Switch is normally closed with low switching frequency (e.g., once or less than once a day), a reset failure may result due to the deterioration of the parts of the Switch. Regularly inspect the Switch and make sure that the Switch is in good working order.
- In addition to the mechanical durability or electrical durability of the Switch described previously, the durability of the Switch may decrease due to the deterioration of each part, especially rubber, resin, and metal. Regularly inspect the Switch and replace any part that has deteriorated in order to prevent accidents from occurring.
- Be sure to mount the Switch securely in a clean location to ensure ease of inspection and replacement. The Switch with operation indicator is available, which is ideal if the location is dark or does not allow easy inspection or replacement.



Storage of Switch

- When storing the Switch, make sure that the location is free of corrosive gas, such as H_2S, SO_2, NH_3, HNO_3, or Cl_2, or dust and does not have a high temperature or humidity.
- Be sure to inspect the Switch before use if it has been stored for three months or more.

Weather Resistance, Cold Resistance, and Heat Resistance

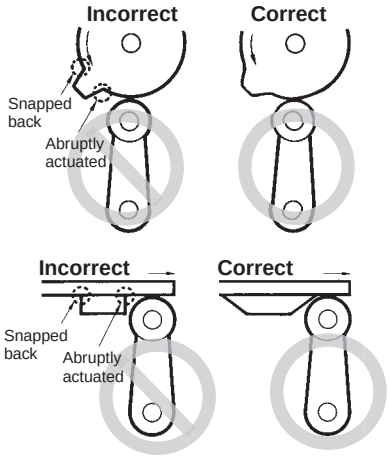
Silicon rubber is used to increase resistance to weather, cold, and heat. Silicon rubber, however, can generate silicon gas. (This can occur at room temperature, but the amount of silicon gas generated increases at higher temperatures.) Silicon gas will react as a result of arc energy and form silicon oxide (SiO_2). If silicon oxide accumulates on the contacts, contact interference can occur and can interfere with the device. Before using a Switch, test it under actual application conditions (including the environment and operating frequency) to confirm that no problems will occur in actual.

Outdoor Use

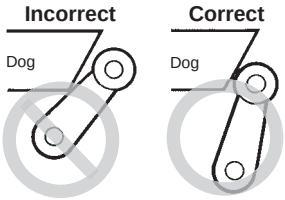
- If the Limit Switch is used in places with sludge or dust powder spray, make sure that the mechanical parts are sealed with a rubber cap.
- The rubber materials exposed to ozone may deteriorate. Check that the rubber parts are made of environment-resistive materials, such as chloroprene, silicone, or fluorine rubber.
- Due to capillary attraction, rainwater may enter the Limit Switch through the lead wires or sheath. Be sure to cover the wire connections in a terminal box so that they are not directly exposed to rainwater.
- If the Limit Switch is used outdoors, the steel parts of the Limit Switch (such as the screws and plunger parts) may corrode. Consider the use of outdoor models, such as WL-□P1 or D4C-□P.
- “Limit Switch is used outdoors” refers to an environment where the Limit Switch is exposed directly to rainwater or sunlight (e.g., multi-story parking facilities) excluding locations with corrosive gas or salty breezes. A Limit Switch used outdoors may not release due to icing and may not satisfy specified standards.

Operation

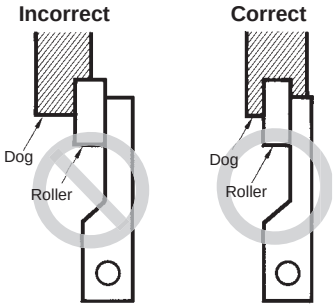
- Carefully determine the position and shape of the dog or cam so that the actuator will not abruptly snap back, thus causing shock. In order to operate the Limit Switch at a comparatively high speed, use a dog or cam that keeps the Limit Switch turned ON for a sufficient time so that the relay or valve will be sufficiently energized.
- The method of operation, the shape of the cam or dog, the operating frequency, and the travel after operation have a large influence on the durability and operating accuracy of the Limit Switch. The cam or dog must be smooth in shape.



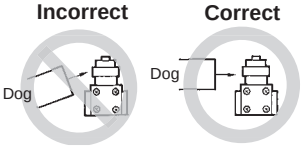
- Appropriate force must be imposed on the actuator by the cam or dog in both rotary operation and linear operation. If the dog touches the lever as shown below, the operating position will not be stable.



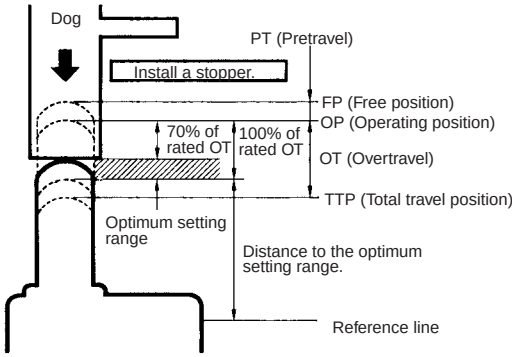
- Unbalanced force must not be imposed on the actuator. Otherwise, wear and tear on the actuator may result.



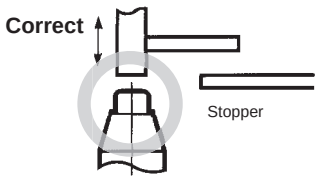
- With a roller actuator, the dog must touch the actuator at a right angle. The actuator or shaft may deform or break if the dog touches the actuator (roller) at an oblique angle.



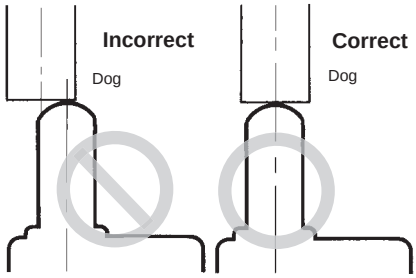
- Make sure that the actuator does not exceed the OT (overtravel) range, otherwise the Limit Switch may malfunction. When mounting the Limit Switch, be sure to adjust the Limit Switch carefully while considering the whole movement of the actuator.



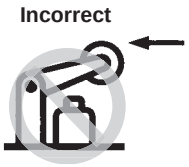
- The Limit Switch may soon malfunction if the OT is excessive. Therefore, adjustments and careful consideration of the position of the Limit Switch and the expected OT of the actuator are necessary when mounting the Limit Switch.



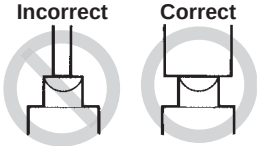
- When using a pin-plunger actuator, make sure that the stroke of the actuator and the movement of the dog are located along a single straight line.



- Be sure to use the Limit Switch according to the characteristics of the actuator. If a roller arm lever actuator is used, do not attempt to actuate the Limit Switch in the direction shown below.



- Do not modify the actuator to change the OP.
- With the long actuator of an Adjustable Roller Lever Switch, the following countermeasures against lever shaking are recommended.
  1. Make the rear edge of the dog smooth with an angle of 15° to 30° or make it in the shape of a quadratic curve.
  2. Design the circuit so that no error signal will be generated.
  3. Use or set a switch that is actuated in one direction only.
- With a bevel plunger actuator, make sure that the width of the dog is wider than that of the plunger.



Dog Design

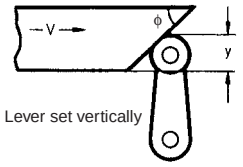
Operating Speed, Dog Angle, and Relationship with Actuator

Before designing a dog, carefully consider the operating speed and angle of the dog (ϕ) and their relationship with the shape of the actuator. The optimum operating speed (V) of a standard dog at an angle of 30° to 45° is 0.5 m/s maximum.

Roller Lever Switches

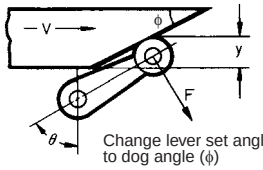
1. Non-overtravel Dog

Dog speed: 0.5 m/s max. (standard speed)



ϕ	V max. (m/s)	y
30° 45° 60° 60° to 90°	0.4 0.25 0.1 0.05 (low speed)	0.8 (TT) 80% of total travel

Dog speed: 0.5 m/s ≤ V ≤ 2 m/s (high speed)

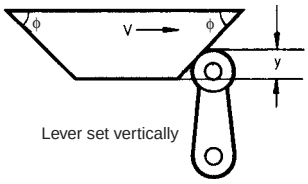


θ	ϕ	V max. (m/s)	y
45°	45°	0.5	0.5 to 0.8 (TT)
50°	40°	0.6	0.5 to 0.8 (TT)
60° to 55°	30° to 35°	1.3	0.5 to 0.7 (TT)
75° to 65°	15° to 25°	2	0.5 to 0.7 (TT)

Note: The above y values indicate the ratio ranges based on TT (total travel). Therefore, the optimum pressing distance of the dog is between 50% and 80% (or 50% and 70%).

2. Overtravel Dog

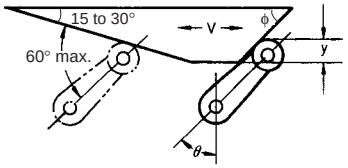
Dog speed: 0.5 m/s max.



ϕ	V max. (m/s)	y
30° 45° 60° 60° to 90°	0.4 0.25 0.1 0.05 (low speed)	0.8 (TT) 80% of total travel

Dog speed: 0.5 m/s min.

If the speed of the overtravel dog is comparatively high, make the rear edge of the dog smooth at an angle of 15° to 30° or make it in the shape of a quadratic curve. Then lever shaking will be reduced.



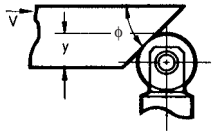
θ	ϕ	V max. (m/s)	y
45°	45°	0.5	0.5 to 0.8 (TT)
50°	40°	0.6	0.5 to 0.8 (TT)
60° to 55°	30° to 35°	1.3	0.5 to 0.7 (TT)
75° to 65°	15° to 25°	2	0.5 to 0.7 (TT)

Note: The above y values indicate the ratio ranges based on TT (total travel). Therefore, the optimum pressing distance of the dog is between 50% and 80% (or 50% and 70%).

Plunger Switches

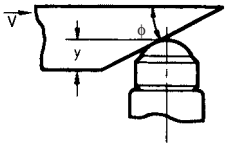
If the dog overrides the actuator, the front and rear of the dog may be the same in shape, provided that the dog is not designed to be separated from the actuator abruptly.

Roller Plunger



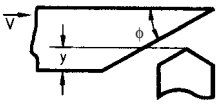
ϕ	V max. (m/s)	y
30° 20°	0.25 0.5	0.6 to 0.8 (TT) 0.5 to 0.7 (TT)

Ball Plunger



ϕ	V max. (m/s)	y
30° 20°	0.25 0.5	0.6 to 0.8 (TT) 0.5 to 0.7 (TT)

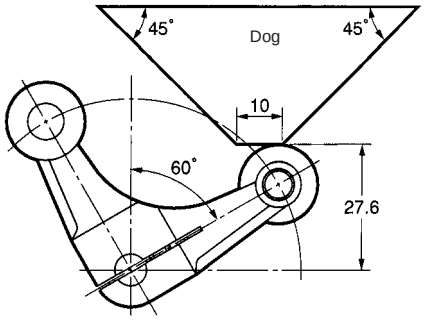
Bevel Plunger



ϕ	V max. (m/s)	y
30° 20°	0.25 0.5	0.6 to 0.8 (TT) 0.5 to 0.7 (TT)

Note: The above y values indicate the ratio ranges based on TT (total travel). Therefore, the optimum pressing distance of the dog is between 60% and 80% (or 50% and 70%).

Fork Lever Lock Models

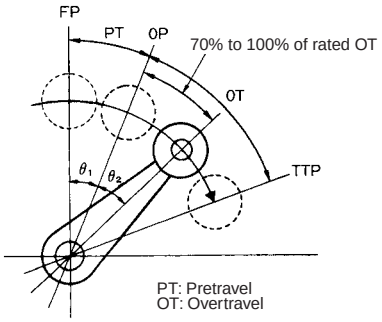


Note: Design the shape of the dog so that it does not come in contact with the other roller lever when the actuator is inverted.

Stroke Settings vs. Dog Movement Distance

- The following information on stroke settings is based on the movement distance of the dog instead of the actuator angle. The following is the optimum stroke of the Limit Switch.

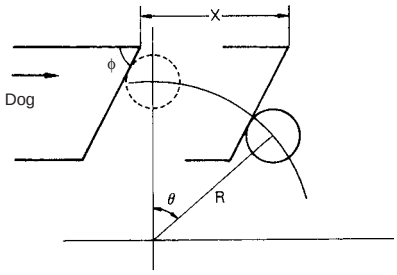
  Optimum stroke: PT + {Rated OT x (0.7 to 1.0)}
  In terms of angles, the optimum stroke is expressed as $\theta_1 + \theta_2$.



- The movement distance of the dog based on the optimum stroke is expressed by the following formula.

  Movement distance of dog

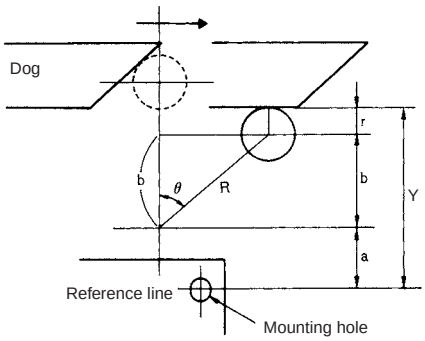
$$X = R\sin\theta + \frac{R(1-\cos\theta)}{\tan\phi} \text{ (mm)}$$



ϕ: Dog angle
θ: Optimum stroke angle
R: Actuator length
X: Dog movement distance

- The distance between the reference line and the bottom of the dog based on the optimum stroke is expressed by the following formula.

$$Y = a + b + r\,(mm)$$



a: Distance between reference line and actuator fulcrum
b: R cosθ
r: Roller radius
Y: Distance between reference line and bottom of dog

Dog Surface

- The surface of dog touching the actuator should be 6.3 S in quality and a hardness of approximately HV450.
- For smooth operation of the actuator, apply molybdenum disulfide grease to the actuator and the dog touching the actuator. This is ideal for Limit Switches of drip-proof construction and Multiple Limit Switches.

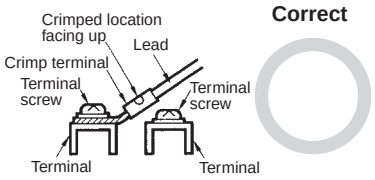
Maintenance and Repairs

- The user of the system must not attempt to perform maintenance and repairs. Contact the manufacturer of the system concerning maintenance and repairs.

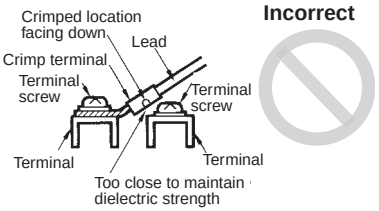
Other

- The standard material for the switch seal is nitrile rubber (NBR), which has superior resistance to oil. Depending on the type of oil or chemicals in the application environment, however, NBR may deteriorate, e.g., swell or shrink. Confirm performance in advance.
- The correct Switch must be selected for the load to ensure contact reliability. Refer to precautions for micro loads in individual product information for details.
- When using a Limit Switch with a long lever or long rod lever, make sure that the lever is in the downward direction.
- Wire the leads as shown in the following diagram.

Correct Wiring



Incorrect Wiring



Typical Problems, Probable Causes, and Remedies

Problem		Probable cause	Remedy
Mechanical failure	1. The actuator does not operate. 2. The actuator does not return. 3. The actuator has been deformed. 4. The actuator is worn. 5. The actuator has been damaged.	The shape of the dog or cam is incorrect.	• Change the design of the dog or cam and smooth the contacting surface of the cam. • Scrutinize the suitability of the actuator. Make sure that the actuator does not bounce.
		The contacting surface of the dog or cam is rough.	
		The actuator in use is not suitable.	
		The operating direction of the actuator is not correct.	
		The operation speed is excessively high.	• Attach a decelerating device or change the mounting position of the Switch.
		Excessive stroke.	• Change the stroke.
		The rubber or grease hardened due to low temperature.	• Use a cold-resistive switch.
		The accumulation of sludge, dust, or cuttings.	• Use a drip-proof model or one with high degree of protection. • Use a protection cover and change the solvent and materials.
		Dissolution, expansion, or swelling damage to the rubber parts of the driving mechanism.	
	There is a large deviation in operating position (with malfunctioning involved).	Damage to and wear and tear of the internal movable spring.	• Regularly inspect the Switch. • Use a better quality switch. • Tighten the mounting screws securely. Use a mounting board.
		Wear and tear of the internal mechanism.	
		The loosening of the mounting screws causing the position to be unstable.	
	The terminal part wobbles. (The mold part has been deformed.)	Overheating due to a long soldering time.	• Solder the Switch quickly. • Change the lead wire according to the carry current and ratings.
		The Switch has been connected to and pulled by thick lead wires with excessive force.	
		High temperature or thermal shock resulted.	• Use a temperature-resistive switch or change mounting positions.
Failures related to chemical or physical characteristics	Contact chattering	Vibration or shock is beyond the rated value.	• Attach an anti-vibration mechanism. • Attach a rubber circuit to the solenoid. • Increase the operating speed (with an accelerating mechanism).
		Shock has been generated from a device other than the Switch.	
		Too-slow operating speed.	
	Oil or water penetration	The sealing part has not been tightened sufficiently.	• Use a drip-proof or waterproof switch. • Use the correct connector and cable. (Use a sealed connector for sealed switches.)
		The wrong connector has been selected and does not conform to the cable.	
		The wrong switch has been selected.	
		The terminal part is not molded.	
		The Switch has been burnt or carbonated due to the penetration of dust or oil.	
	Deterioration of the rubber part	The expansion and dissolution of the rubber caused by solvent or lubricating oil.	• Use an oil-resistant rubber or fluororesin bellows. • Use a weather-resistant rubber or protective cover. • Use a switch with a metal bellows protective cover.
		Cracks due to direct sunlight or ozone.	
		Damage to the rubber caused by scattered or heated cuttings.	
	Corrosion (rusting or cracks)	The oxidation of metal parts resulted due to corrosive solvent or lubricating oil.	• Change the lubricating oil. • Change mounting positions. • Use a crack-resistant material.
		The Switch has been operated in a corrosive environment, near the sea, or on board a ship.	
		The electrical deterioration of metal parts of the Switch resulted due to the ionization of cooling water or lubricating oil.	
		The cracking of alloyed copper due to rapid changes in temperature.	
Failures related to electric characteristics	No actuation. No current breakage. Contact welding	Inductive interference in the DC circuit.	• Add an erasing circuit.
		Carbon generated on the surface of the contacts due to switching operations.	• Use a switch with a special alloy contact or use a sealed switch.
		A short-circuit or contact weld due to contact migration.	• Reduce the switching frequency or use a switch with a large switching capacity.
		Contact weld due to an incorrectly connected power source.	• Change the circuit design.
		Foreign materials or oil penetrated into the contact area.	• Use a protective box.

Degree of Protection for Limit Switches

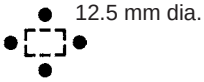
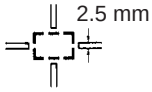
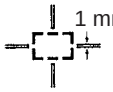
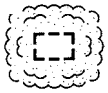
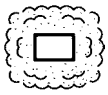
Note: International protection degrees are determined by the following tests. Be sure to check the sealing capability under the actual operating environment and conditions before actual use.

■ IEC (International Electrotechnical Commission) Standards (IEC 60529 January 1997)

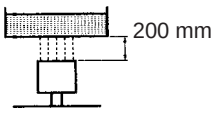
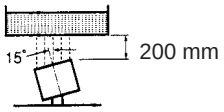
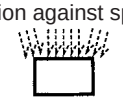
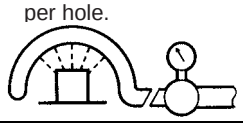
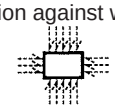
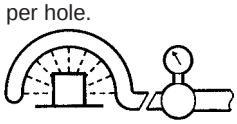
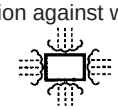
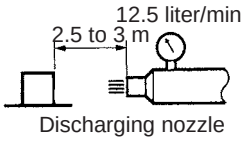
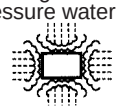
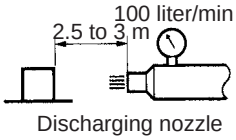
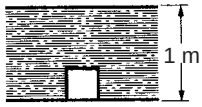
IP-□□

- Degree of protection against water
- Degree of protection against solid materials
- International protection mark

Degree of Protection from Solid Materials

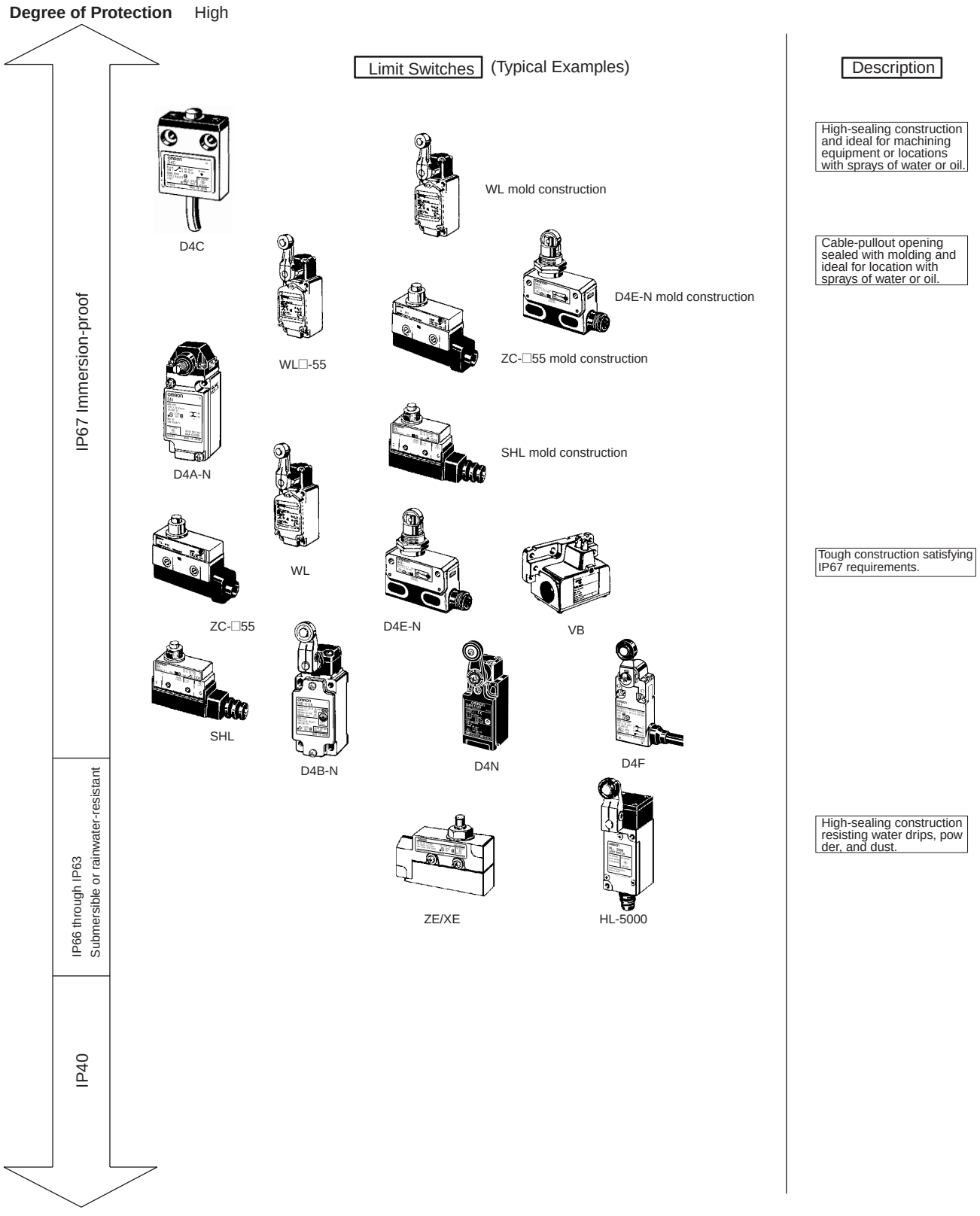
Degree	Protection	
0		No protection
1		Protects against penetration of any solid object such as a hand that is 50 mm or more in diameter.
2		Protects against penetration of any solid object such as a finger that is 12.5 mm or more in diameter.
3		Protects against penetration of any solid object such as a wire that is 2.5 mm or more is diameter.
4		Protects against penetration of any solid object such as a wire that is 1 mm or more in diameter.
5		Protects against penetration of dust of a quantity that may malfunction the protect or obstruct the safety operation of the product.
6		Protects against penetration of all dust.

Degree of Protection Against Water

Degree	Protection		Test method (with fresh water)
0	No protection	Not protected against water.	No test
1	Protection against water drops 	Protects against vertical drops of water towards the product.	Water is dropped vertically towards the product from the test machine for 10 min. 
2	Protection against water drops 	Protects against drops of water approaching at a maximum angle of 15° to the left, right, back, and front of vertical towards the product.	Water is dropped for 2.5 min each (i.e., 10 min in total) towards the product inclined 15° to the left, right, back, and front from the test machine. 
3	Protection against sprinkled water 	Protects against sprinkled water approaching at a maximum angle of 60° from vertical towards the product.	Water is sprinkled at a maximum angle of 60° to the left and right from vertical for 10 min from the test machine 
4	Protection against water spray 	Protects against water spray approaching at any angle towards the product.	Water is sprayed at any angle towards the product for 10 min from the test machine. 
5	Protection against water jet spray 	Protects against water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
6	Protection against high-pressure water jet spray 	Protects against high-pressure water jet spray approaching at any angle towards the product.	Water is jet sprayed at any angle towards the product for 1 min per square meter for at least 3 min in total from the test machine. 
7	Protection underwater (see note 1) 	Resists the penetration of water when the product is placed underwater at specified pressure for a specified time.	The product is placed 1 m deep in water (if the product is 850 mm max. in height) for 30 min. 
8	Protection underwater (see note 2) 	Can be used continuously underwater.	The test method is determined by the manufacturer and user.

■ Degree of Protection

The following shows the degree of protection as an initial characteristic of each Limit Switch model. The degree of protection may change upon deterioration. For more details, refer to the information on degree of protection under *Characteristics* in the relevant section.



Overview of Connectors

Connectors (SC Series)

Cabtire cables and flexible tubes with various diameters are used to connect factory machines and controllers with Limit Switches. To ensure the watertightness of the edges of the conduits, use the SC connector according to the kind of Limit Switch.

Connector for Cabtire Cable/Flexible Tube

Conduit	Applicable cable	Inner diameter (D) of seal rubber	External diameter of cable		Model	Applicable model
			Min.	Max.		
G1/2 (JIS B 0202)	Cabtire cable (general-purpose)	7 dia. mm	5.5 dia. mm	7.5 dia. mm	SC-1M	WL, D4A-N, D4B-N, ZE, ZV, ZV2, VB
		9 dia. mm	7.5 dia. mm	9.5 dia. mm	SC-2M	
		12.5 dia. mm	11 dia. mm	13 dia. mm	SC-3M	
		14 dia. mm	12 dia. mm	14 dia. mm	SC-4M	
		11 dia. mm	9 dia. mm	11 dia. mm	SC-5M	
	Cabtire cable (anti-corrosive)	7 dia. mm	5.5 dia. mm	7.5 dia. mm	SC-21	
		9 dia. mm	7.5 dia. mm	9.5 dia. mm	SC-22	
		12.5 dia. mm	11 dia. mm	13 dia. mm	SC-23	
		14 dia. mm	12 dia. mm	14 dia. mm	SC-24	
		11 dia. mm	9 dia. mm	11 dia. mm	SC-25	
1/2-14NPT	Cabtire cable	7 dia. mm	5.5 dia. mm	7.5 dia. mm	SC-1PT	D4A-N
		9 dia. mm	7.5 dia. mm	9.5 dia. mm	SC-2PT	
		12.5 dia. mm	11 dia. mm	13 dia. mm	SC-3PT	
		14 dia. mm	12 dia. mm	14 dia. mm	SC-4PT	
		11 dia. mm	9 dia. mm	11 dia. mm	SC-5PT	

Note: **1.** Use SC-21 to SC-25 together with the rubber ring and conduit washer for the SC-P2.

2. It is necessary to use sealing tape with SC Connectors. However, SC-1M to SC-5M are provided with an O-ring and therefore the sealing is ensured without sealing tape.

Simple Connector

Conduit	Applicable cable	Inner diameter (D) of seal rubber	External diameter of cable		Model	Applicable model
			Min.	Max.		
G1/2 (JIS B 0202)	Cabtire cable	10.6 dia. mm	8.5 dia. mm	10.5 dia. mm	SC-P2	WL, D4A-N, D4B-N, ZE, ZV, ZV2, VB
Pg13.5		9.6 dia. mm	7.5 dia. mm	9.5 dia. mm	SC-P3	WL□-G, D4B-N
G1/2 (JIS B 0202)		9 dia. mm	7.5 dia. mm	9 dia. mm	SC-6	D4A-N, D4B-N, D4N*, D4N-R*, WL, ZE, ZE, ZV, ZV2, VB

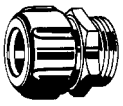
Note: The casings for SC-P2, -P3 and -6 are made of resin. If more sealing capability is required, use one of SC-1M to SC-5M, which have metal casings. Models marked with an asterisk (*) however, can only be used with resin connectors.

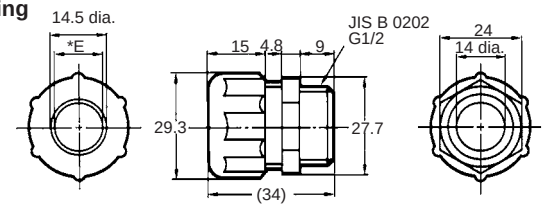
■ Dimensions and Structure

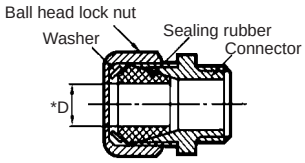
Connectors for Cabtire Cable/Flexible Tube

SC-P2 accessories and sealing tape must be used together with models without an O-ring in order to prevent ingress of oil or water. Follow the instructions given under *Conduits* on page 33.

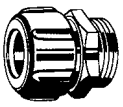
Metal Models without O-ring
G1/2
SC-21 to 25

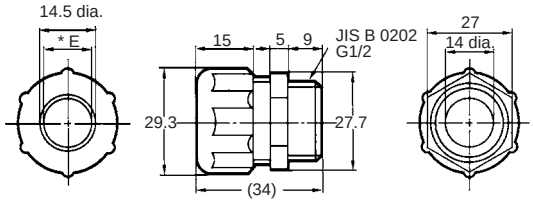


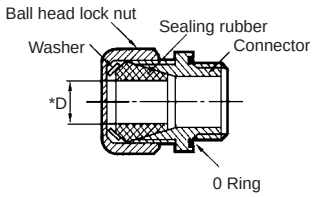




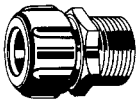
Metal Models with O-ring
G1/2
SC-1M to 5M

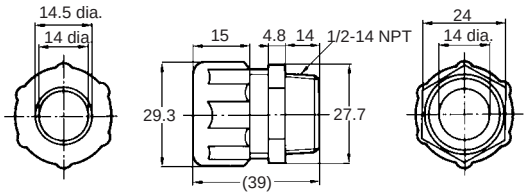


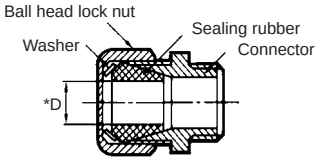




Metal Models without O-ring
1/2-14NPT
(U.S.-standard screws)
SC-1PT to 5PT



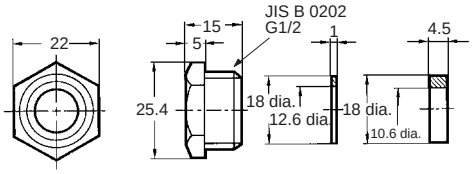


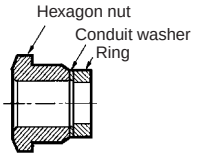


Note: Dimensions not shown in the above diagrams have a variation of ±0.4 mm.

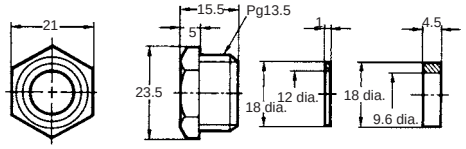
Simple Connectors (Not Suitable for Locations Subject to Oil or Water)

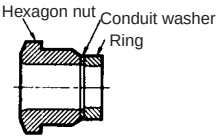
Resin Models
G1/2
SC-P2



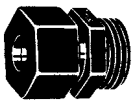


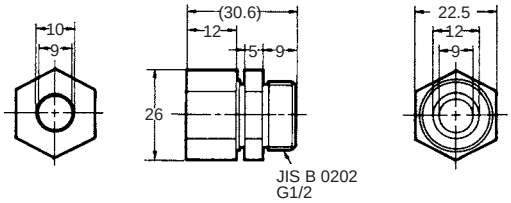
Resin Models
Pg13.5
SC-P3

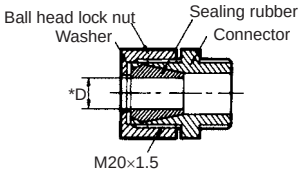




Resin Models
G1/2
SC-6 (for D4N)







Note: Dimensions not shown in the above diagrams have a variation of ±0.4 mm.

Diameter of Part Marked with Asterisk

Model	Inner diameter (D) of sealed rubber	Internal diameter (E) of washer	Applicable cable
SC-21, 1M, 1PT	7 dia. mm	10.4 dia. mm	5.5 to 7.5 dia. mm
SC-22, 2M, 2PT	9 dia. mm	13.2 dia. mm	7.5 to 9.5 dia. mm
SC-23, 3M, 3PT	12.5 dia. mm	14.6 dia. mm	11 to 13 dia. mm
SC-24, 4M, 4PT	14 dia. mm	14.6 dia. mm	12 to 14 dia. mm
SC-25, 5M, 5PT	11 dia. mm	13.2 dia. mm	9 to 11 dia. mm
SC-6	9 dia. mm	10 dia. mm	7.5 to 9 dia. mm

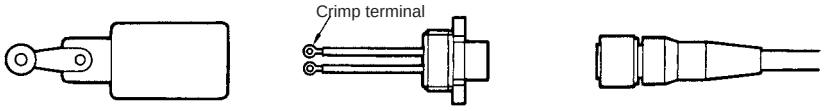
■SC-□F□ FA Connectors

The SC-□F□ is a snap-on connecting model that greatly reduces the time-consuming effort for wiring the Limit Switch. The SC-□F□ is easily and quickly connected or disconnected and its degree of protection is IP67.

Ordering Information

FA Connector

Limit Switch **FA Connector** **Connecting Cable**



FA Connectors

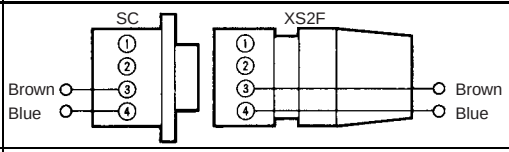
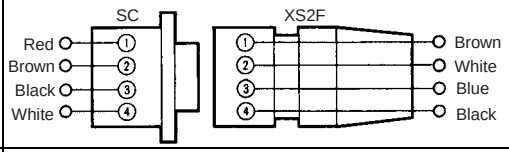
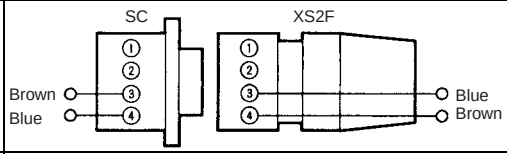
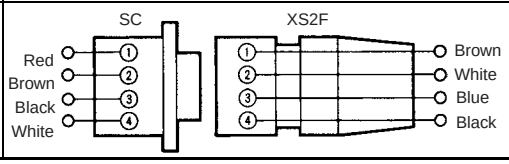
Model	Number of conductors	Rated voltage	Size of conduit	Size of crimp terminal	Applicable model
SC-2F	2	125 VDC	JIS B 0202 G1/2	M4	WL
SC-2FAD	2	250 VAC			
SC-4F4D	4	125 VDC			
SC-4F4AD	4	250 VAC			

Connecting Cables

Straight Cable 

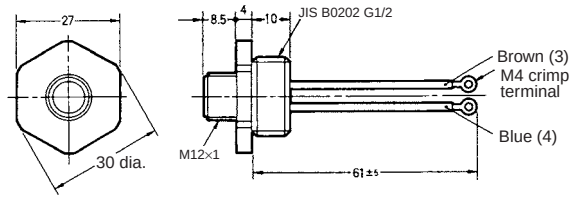
Voltage specification	Number of conductors	Cable length	Model
AC	2	2 m	XS2F-A421-DB0-A
		5 m	XS2F-A421-GB0-A
	4	2 m	XS2F-A421-D90-A
		5 m	XS2F-A421-G90-A
DC	2	2 m	XS2F-D421-DD0
		5 m	XS2F-D421-GD0
	4	2 m	XS2F-D421-D80-A
		5 m	XS2F-D421-G80-A

■Connections to Sensor I/O Connectors

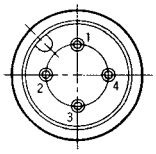
Voltage specification	Number of conductors	FA Connector	Sensor I/O Connector	Connection
AC	2	SC-2FAD	XS2F-A421-□B0-A D: 2-m cord G: 5-m cord	
	4	SC-4F4AD	XS2F-A421-□90-A D: 2 m G: 5 m	
DC	2	SC-2F	XS2F-D421-□D0 D: 2 m G: 5 m	
	4	SC-4F4D	XS2F-D421-□80-A D: 2 m G: 5 m	

■ Dimensions

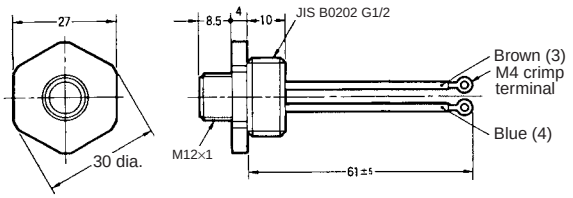
SC-2F



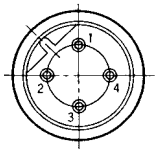
Built-in DC connector



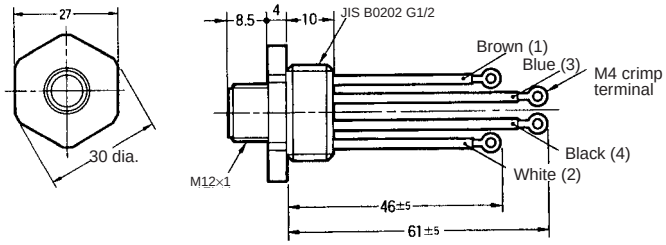
SC-2FAD



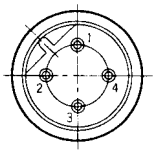
Built-in AC connector



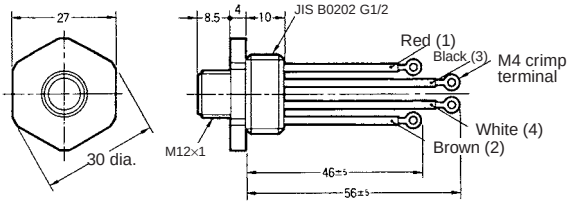
SC-4F4AF



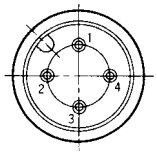
Built-in AC connector



SC-4F4D



Built-in DC connector



Note: **1.** Each dimension has a tolerance of ±0.4 mm unless otherwise specified.

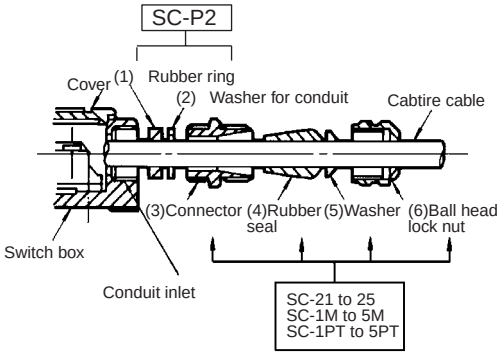
2. Figures in parentheses are connector pin numbers.

■ Conduits

Connector for Cabtire Cable/Flexible Tube

G1/2, 1/2-14NPT

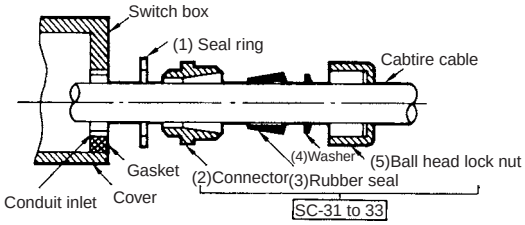
To connect a Limit Switch with a connector, insert a rubber ring first and then a washer into the conduit inlet of the switch body, put a rubber seal, washer, and nut in this order onto the tapered part of the connector and tighten the nut securely. Then tighten the conduit inlet with the connector to maintain high sealing capability. Apply sealing tape to the edge of the connector on the conduit inlet side to increase sealing capability.



Note: The hexagonal nut of the SC-P2 can be removed if necessary before inserting the rubber ring and washer into the conduit inlet.

G3/4

Insert the seal ring into the conduit opening of the switch box and tighten the seal ring securely with the connector. Next, insert the seal rubber into the tapered portion of the connector and then the washer. Tighten the seal rubber and washer securely with the lock nut so that so that the proper sealing performance of the connector will be maintained. Finally, apply a sealing tape to the connector conduit.



Two-circuit Limit Switch/Long-life Two-circuit Limit Switch
WL/WLM

Wide Range of Two-circuit Switches; Select One for the Operating Environment/ Application

- A wide selection of models are available, including the overtravel models with greater OT, indicator-equipped models for checking operation, low-temperature models, heat-resistant models, and corrosion-proof models.
- Microload models are added to the product lineup.
- Meets EN/IEC standards (only Switches with ground terminals and prewired connectors with DC specifications).
- Switches with ground terminals and prewired connectors with DC specifications have the CE marking.

Features

Standard Models

Many Variations in Standard Limit Switches

A Wide Range of Models

The WL Series provides a complete range of Limit Switches with a long history of meeting user needs. Select environment-resistant specifications, actuators for essentially any workpiece, operating sensitivity matched to the workpiece, operation indicators to aid operation and maintenance, and various wiring specifications.

Environment-resistant Models

Select from Six Types of Environment Resistance

The series includes Airtight Switches, Hermetic Switches, Heat-resistant Switches, Low-temperature Switches, Corrosion-proof switches, and Weather-proof Switches. Select the one required by the onsite environment.

Spatter-prevention Models

Excellent Performance on Arc Welding Lines or Sites with Spattering Cutting Powder

Ideal for Welding Sites

Stainless steel and resins that resist adhesion of spatters are used to prevent troubles caused by zinc powder generated during welding.

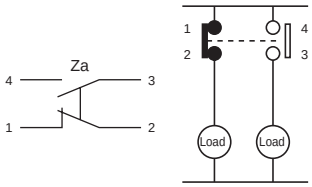
Long-life Models

Mechanical Endurance of 30 Million Operations

Long-life Models for High-frequency Applications

Long life has been achieved by increasing the resistance to friction and creating better sliding properties in the head mechanism. Greater visibility is provided when setting with a fluorescent display for setting the stroke.

Features Common to All Models



DPDB Operation

The double-pole, double-break structure ensures circuit braking.

Waterproof to IP67

O-rings, cover seals, and other measures provide a waterproof, drip-proof structure (IP67).

Approved Standards to Aid Export Machines

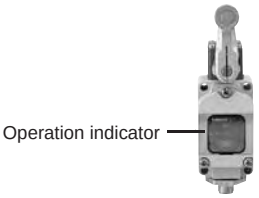
Various WL/WLM switches are approved by UL, CSA, TÜV, EN/IEC, and CCC making them ideal for export machines.

High-precision Models Available in All Switch Types; Ideal for Position Control

High-precision models achieve a very small movement to operation (approx. 5°) and a repeat accuracy that is twice that of basic models.

Operation Indicators for Easier Daily Inspections (See note.)

Confirm operation with a neon lamp or LED for easier startup confirmations and maintenance.



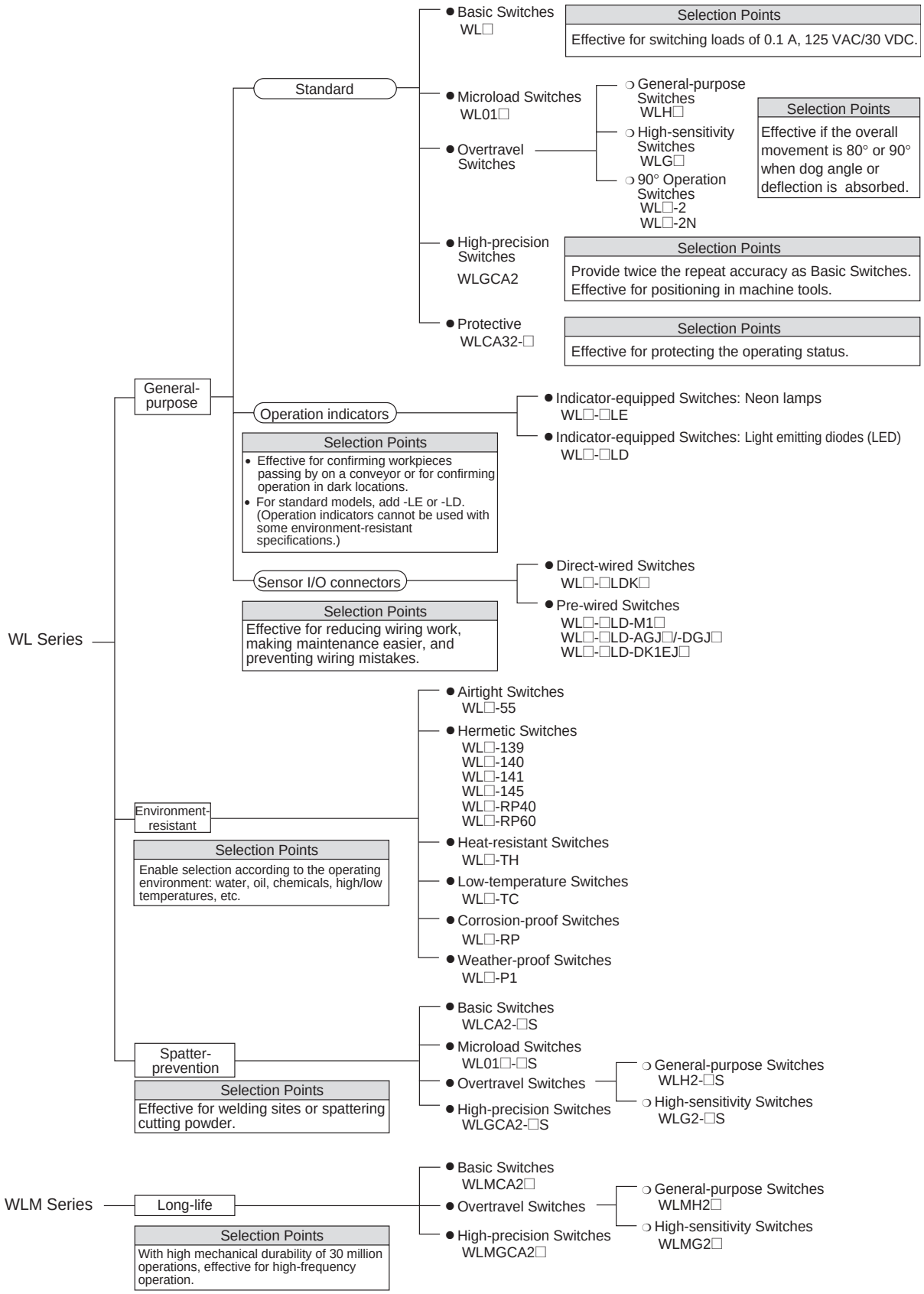
Note: Specify the type of operation indicator for general-purpose models. Provided on standard models for spatter-prevention and long-life models.

Models with Connectors Provided with All Switch Types

Reduced wiring with one-touch connection. Connectors that also make Switch replacement easier are provided with direct-wired and prewired models).

Product Configuration

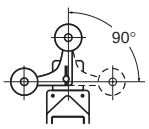
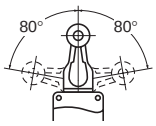
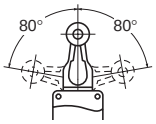
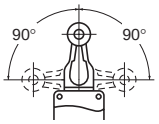
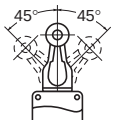
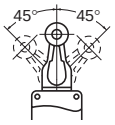
■ Selection by Purpose



■ Tables of Models

General-purpose, Spatter-prevention, and Long-life Switches

Actuators/Heads

Type	General-purpose	Actuators			Features	Head specifications		Spatter-prevention	Long-life
	Model	Roller lever	Plunger	Flexible rod	Total travel (TT)	One-side operation	Head mounting	Model	Model
Basic	WL□	Possible	Possible	Possible	• With a Roller Lever 	Possible (See note 1.) (Except for long-life models.)	Any of 4 directions	WLCA2-□S	WLMCA2□
General-purpose Overtravel	WLH□	Possible	---	---	• Overtravel is large, making setting the dog easier. • Mounting is compatible with WLH2. 	Not possible (See note 2.)	Any of 4 directions	WLH2-□S	WLH2□
High-sensitivity Overtravel	WLG□	Possible	---	---	• Operation is highly sensitive with only 10° pretravel. • Overtravel is large, making setting the dog easier. • Mounting is compatible with WLG2. 	Not possible (See note 2.)	Any of 4 directions	WLG2-□S	WLMG2□
Overtravel, 90° operation	WL□-2	Possible	---	---	• Overtravel is large, making setting the dog easier. • Mounting is compatible with WLCA2-2. 	Not possible (See note 2.)	Any of 4 directions	---	---
	WL□-2N	Possible	---	---		Possible (See note 1.)	Either of 2 directions		
High-precision	WLGCA2	Possible	---	---	• Repeat accuracy is twice that of basic models. • Operation is highly sensitive with only 5° pretravel. • Ideal for positioning, e.g., with machine tools. 	Not possible (See note 2.)	Any of 4 directions	WLGCA2-□S	WLMGCA2□
Protective	WLCA32-□	Possible	---	---	• When the dog throws the lever, the output is reversed and the reversed output is held even after the dog passed. The original status is returned to only after the dog passed. 	---	Any of 4 directions	---	---

Note 1. One-side operation means that three operational directions can be selected electrically, according to the change in direction of the operating plunger. The operating plunger is set for operation on both sides before delivery.

2. Those models for which one-side operation is impossible can only operate on both sides.

Connectors and Conduits

Wiring type	General-purpose	Connector/conduit specifications	Spatter-prevention	Long-life
	Model		Model	Model
Direct-wired connector	WL□-□LDK□	• SC-2F/-4F Connector built-in	---	WLM□-LDK□
Pre-wired connector	WL□-□LD-M1□ WL□-□LD-□GJ□ WL□-□LD-DK1EJ□	• XS2H-series Pre-wired Connector built-in	WL□-□S-M1□J-1 WL□-□S-DGJS03	WLM□-LD-M1J WLM□-LD-□GJ□
Conduit (screw terminal)	WL□-□ WL□-□G1□ WL□-□G□ WL□-□Y□ WL□-□TS□	• G1/2 with no ground terminal • G1/2 with ground terminal • Pg13.5 with ground terminal • M20 with ground terminal • 1/2 14NPT with ground terminal	---	WLM□-LD --- --- --- ---

Environment-resistant Switches

Type / Item / Model		Environment-resistant		
		Application	Environment-resistant construction	Applicable models
Airtight seal	WL□-55	For uses in locations subject to cutting oil or water	Uses the W-10FB3-55 Airtight Built-in Switch. **Note:** Use the SC Connector for the conduit opening.	All models except the low-temperature and heat-resistant models **Note:** Models can be produced using standard actuators.
Hermetic seal (Molded terminals/ Anti-coolant)	WL□-139 WL□-140 WL□-141 WL□-145 WL□-RP40 WL□-RP60		Refer to page 55 for information on the environment-resistant construction of Switches with Hermetic Seals.	All models except the low-temperature and heat-resistant models **Note:** Models can be produced using standard actuators. Only the WLCA2, WLGCA2, or WLH2 can be produced for the WL□-141 and WL□-145.
Low-temperature (See note.)	WL□-TC	Can be used at a temperature of –40°C (operating temperature range: –40 to 40°C), but cannot withstand icing.	Uses a general-purpose built-in switch. Silicone rubber is used for rubber parts such as the O-ring, gasket, etc.	All models except airtight seal, hermetic seal, heat-resistant, corrosion-proof, and indicator-equipped models
Heat-resistant (See note.)	WL□-TH	Can be used in temperatures of 120°C (operating temperature range: 5 to 120°C).	Uses a special built-in switch made from heat-resistant resin. Silicone rubber is used for rubber parts such as the O-ring, gasket etc.	All models except airtight seal, hermetic seal, heat-resistant, corrosion-proof, and indicator-equipped, nylon roller (WLCA2-26N), seal roller models, and resin rod (WLNJ-2) models
Corrosion-proof	WL□-RP	For use in locations subject to corrosive gases and chemicals.	Diecast parts, such as the switch box, are made of corrosion-proof aluminum. Rubber sealing parts are made of fluorine rubber which aids in resisting oil, chemicals and adverse weather conditions. Exposed nuts and screws (except the actuator section) are made of stainless steel. Moving and rotary parts such as rollers are made of sintered stainless steel or stainless steel.	All models except overtravel (90° operation), fork lever lock (WLCA32-41 to -43), low-temperature, heat-resistant, and indicator-equipped models
Weather-proof	WL□-P1	For use in parking lots and other outdoor locations.	Rubber parts are made from silicone rubber, which has a high-tolerance to deterioration over time and changes in temperature. Rollers are made of stainless steel to improve corrosion resistance. Exposed nuts and screws are made of stainless steel.	Only general-purpose overtravel (WLH2/12) and high-sensitivity overtravel (WLG2/12) models (excluding heat-resistant models).

Note: Weather Resistance, Cold Resistance, and Heat Resistance
Silicon rubber is used to increase resistance to weather, cold, and heat. Silicon rubber, however, can generate silicon gas. (This can occur at room temperature, but the amount of silicon gas generated increases at higher temperatures.) Silicon gas will react as a result of arc energy and form silicon oxide (SiO_2). If silicon oxide accumulates on the contacts, contact interference can occur and can interfere with the device. Before using a Switch, test it under actual application conditions (including the environment and operating frequency) to confirm that no problems will occur in actual.

■ Selection Guide

With the WL Series, OMRON will combine the switch, Actuator, and wiring method required to build the ideal switch for your application.

The WL Series consists of four basic types: General-purpose, Environment-resistant, Spatter-prevention, and Long-life Switches. WLCA2 Switches can be used for the most common applications.

According to Operating Environment

	Environment	Key specifications	Models	
Ambient operating temperature	Normal	–10°C 80°C Water-resistant to IP67.	WL□ WLM□	General-purpose Switches Long-life Switches
	High-temperature	5°C 120°C To increase heat resistance, the rubber material (silicon rubber) and the material of the built-in switch have been changed.	WL□-TH	Heat-resistant Switches (See note.)
	Low-temperature	–40°C 40°C To increase resistance to cold, silicon rubber and other measures are used.	WL□-TC	Low-temperature Switches (See note.)
Operating environment	Outdoors	Rubber parts are made from silicone rubber, which has a high-tolerance to deterioration over time and changes in temperature. Rollers are made of stainless steel to improve corrosion resistance. Exposed nuts and screws are made of stainless steel.	WL□-P1	Weather-proof Switches (See note.)
	Chemicals and oil	Corrosion-proof aluminum diecast has been used for the housing, fluorine rubber has been used for rubber parts, and stainless steel has been used for screws and nuts (except for actuator) to increase resistance to oils, chemicals, and weather.	WL□-RP	Corrosion-proof Switches (See note.)
	Water drops and mist	Uses an airtight built-in switch.	WL□-55	Airtight Switches (See note.)
	Constant water drops and mist	Cables attached. Uses a general-purpose built-in switch. The case cover and conduit opening are molded from epoxy resin to increase the seal. The cover cannot be removed.	WL□-139	Hermetic, Molded-terminal Switches (See note.)
		Cables attached. Uses an airtight built-in switch. The case cover and box interior are molded from epoxy resin to increase the seal. The cover cannot be removed. The SC connector can be removed, so it is possible to use flexible conduits for the cable.	WL□-RP40	Hermetic, Molded-terminal Switches (See note.)
		Cables attached. Uses an airtight built-in switch. The cover screws, case cover, box interior, and conduit opening are molded from epoxy resin to increase the seal. (The cover cannot be removed.)	WL□-140	Hermetic, Molded-terminal Switches (See note.)
	Constant water drops or splattering cutting powder	Cables attached. Uses an airtight built-in switch. The cover screws, case cover, box interior, conduit opening, box head, and head screws are molded from epoxy resin to increase the seal. (The cover cannot be removed.) The Head opening is protected from cutting powder. -141: The Head section is molded from epoxy resin; Head direction cannot be changed. -145: The Head section is molded from epoxy resin; Head can be in any of 4 directions.	WL□-141, -145	Hermetic, Molded-terminal Switches (See note.) (Only the WLCA2, WLG2, WLGCA2, and WLH2 can be produced.)
	Coolant	Cables attached. Uses an airtight built-in switch. The case cover, box interior, conduit opening, and head screws are molded from epoxy resin to increase the seal. (The cover cannot be removed.) Rubber parts are made from fluorine rubber to increase resistance to coolant.	WL□-RP60	Hermetic, Anti-coolant Switches (See note.)
	Spattering from welding	To prevent spatter during welding, a heat-resistant resin is used for the indicator cover and screws and rollers are all made from stainless steel.	WL□-S	Spatter-prevention Switches

Note: Not all functions can be combined with environment-resistant switches. Refer to the applicable models on the previous page.

According to Application Conditions

	Conditions	Key specifications	Models
Load	Switching standard loads	10 A at 125,250, or 500 VAC 0.8 A at 125 VDC 0.4 A at 250 VDC	WL□ General-purpose Switches WL□-S Spatter-prevention Switches WLM□ Long-life Switches
Load	Switching microloads	0.1 A at 125 VAC, resistive load 0.1 A at 30 VDC, resistive load	WL01□ General-purpose Microload Switches WL01□-S Spatter-prevention Microload Switches
Durability	Normal durability	Mechanical: 15 million operation min. (10 million operation min. for overtravel general-purpose or high-sensitivity models or flexible rod models)	WL□ General-purpose Switches WL□-S Spatter-prevention Switches
Durability	Long-life	Mechanical: 30 million operation min.	WLM□ Long-life Switches

According to Ease of Installation and Maintenance

	Conditions	Key specifications	Models
Operation indicator	Daily inspections and maintenance checks	Switching light-ON between operating/not operating. (Switching not possible for models with molded terminals.) Neon lamp 125 VAC, 250 VAC	WL□-LE General-purpose, Indicator-equipped (Neon Lamp) Switches WL□-LES Spatter-prevention, Indicator-equipped (Neon Lamp) Switches
Operation indicator		Switching light-ON between operating/not operating. (Switching not possible for models with molded terminals.) LED 10 to 115 VAC/DC	WL□-LD General-purpose, Indicator-equipped (LED) Switches WL□-LDS Spatter-prevention, Indicator-equipped (LED) Switches
Wiring specification	Screw tightening and installation	Screw terminals. No ground terminal. Conduit size: G½	WL□ General-purpose Switches WLM□ Long-life Switches
Wiring specification		Screw terminals. Ground terminal. Conduit size: 4 sizes	WL□ General-purpose Switches
Wiring specification	One-touch connector attachment	Direct-wired connector, 2-core. Greatly reduces wiring work. Waterproof to IP67.	WL□-□LDK13 General-purpose, Direct-wired Connector Switches WLM□-LDK13 Long-life, Direct-wired Connector Switches
Wiring specification		Direct-wired connector, 4-core. Greatly reduces wiring work. Waterproof to IP67.	WL□-□LDK43 General-purpose, Direct-wired Connector Switches WLM□-LDK43 Long-life, Direct-wired Connector Switches
Wiring specification	Connector attachment in control and relay boxes	Pre-wired connector, 2-core. Greatly reduces wiring work. Waterproof to IP67.	WL□-□LD-M1J General-purpose, Pre-wired Connector Switches WL□-□S-M1J-1 Spatter-prevention, Pre-wired Connector Switches WLM□-LD-M1J Long-life, Pre-wired Connector Switches
Wiring specification		Pre-wired connector, 4-core. Greatly reduces wiring work. Waterproof to IP67.	WL□-□LD-□GJO3 General-purpose, Pre-wired Connector Switches WL□-□S-□GJSO3 Spatter-prevention, Pre-wired Connector Switches WLM□-LD-□GJO3 Long-life, Pre-wired Connector Switches

According to Form of Operation

	Detection object	Key specifications	Models	
Operation angles	General	TT (total travel) 45° 45°; PT (pretravel) 15°	WLCA2 WLCA2-□S WLMCA2	General-purpose Switches Spatter-prevention Switches Long-life Switches
	Passing dogs	80° 80°; 15°	WLH2 WLH2-□S WLMH2	General-purpose Switches Spatter-prevention Switches Long-life Switches
	Passing dogs, high sensitivity	80° 80°; 10°	WLG2 WLG2-□S WLMG2	General-purpose Switches Spatter-prevention Switches Long-life Switches
	Passing dogs	90° 90°; WLCA2-2 25°; WLCA2-2N 20°	WLCA2-2 WLCA2-2N	General-purpose Switches General-purpose Switches
	High precision	45° 45°; 5°	WLGCA2 WLGCA2-□S WLMGCA2	General-purpose Switches Spatter-prevention Switches Long-life Switches
Actuators	Dogs and workpieces (Mounts in any of 4 directions)	R38	• Short lever • One-Horizontal operation possible. (WLCA□ only) • Head mounts in any of 4 directions.	WL□2 WL□2-□S WLM□2	Roller Lever Actuators Roller Lever Actuators Roller Lever Actuators
		R50	• Medium lever • One-Horizontal operation possible. (WLCA□ only) • Head mounts in any of 4 directions.	WL□2-7	Roller Lever Actuators
		R63	• Long lever • One-Horizontal operation possible. (WLCA□ only) • Head mounts in any of 4 directions.	WL□2-8	Roller Lever Actuators
	Adjustable between dog and lever	R25 to 89	• One-Horizontal operation possible. (WLCA□ only) • Head mounts in any of 4 directions.	WL□12	Adjustable Roller Lever Actuators
	Dogs or workpieces with large deflection	25 to 140	• One-Horizontal operation possible. (WLCL only) • Head mounts in any of 4 directions.	WL□L	Adjustable Rod Lever Actuators
		350 to 380	• One-Horizontal operation not possible. • Head mounts in any of 4 directions.	WLHAL4	Adjustable Rod Lever Actuator
		427.5	• One-Horizontal operation not possible. • Head mounts in any of 4 directions.	WLHAL5	Rod Spring Lever Actuator
	Round-trip operation of passing dogs		• Head mounts in any of 4 directions.	WLCA32-41	Fork Lever Lock Actuator
			• Head mounts in any of 4 directions.	WLCA32-42	Fork Lever Lock Actuator
			• Head mounts in any of 4 directions.	WLCA32-43	Fork Lever Lock Actuator
			• Head mounts in any of 4 directions.	WLCA32-44	Fork Lever Lock Actuator
	Cams or workpieces with vertical movement			WLD	Top Plunger Actuator
			• Head mounts in any of 4 directions.	WLSD	Horizontal Plunger Actuator
				WLD3	Top-ball Plunger Actuator
			• Head mounts in any of 4 directions.	WLSD3	Horizontal-ball Plunger Actuator
			• Available in sealed models. (WLD28□)	WLD2 WLD28	Top-roller Plunger Actuator Sealed Top-roller Plunger Actuator
				WLSD2	Horizontal-roller Plunger Actuator

Model Number Structure

■ Model Number Legend

General-purpose and Environment-resistant Switches

WL□□-□□□□□□□□

1 2 3 4 5 6 7 8 9 10

1. Electrical Rating

Blank	Standard
01	Microload

Note: Dimensions are the same as the standard models.

3. Environment-resistant Model Specifications

Blank	Standard
RP	Corrosion-proof (See note 2.)
P1	Weather-proof (See note 2.)

Note 1: Dimensions are the same as the standard environment-resistance models.
2. Refer to page 37 for applicable models.

4. Built-in Switch Type

Blank	Standard
55	Hermetically sealed

Note: Dimensions are the same as the standard built-in switch models.

5. Temperature Specifications

Blank	Standard: –10°C to 80°C
TH	Heat-resistant: 5°C to 120°C (See note 2.)
TC	Low-temperature: –40°C to 40°C (See note 2.)

Note 1: Dimensions are the same as the standard models.
2. Refer to page 37 for applicable models.

7. Conduit Size, Ground Terminal Specifications (See note 1.)

Blank	G$^{1}/_{2}$ without ground terminal
G1	G$^{1}/_{2}$ with ground terminal
G	Pg13.5 with ground terminal
Y	M20 with ground terminal
TS	$^{1}/_{2}$-14NPT with ground terminal

Note 1: Models with ground terminals are approved by EN/IEC (CE marking).
2. Dimensions are the same as the standard models.

2. Actuator and Head Specifications

Symbol	Actuator type	Switch without lever
CA	Roller lever: Standard model R38	WLRCA2
CA2-7	Roller lever: Standard model R50	WLRCA2
CA2-8	Roller lever: Standard model R63	WLRCA2
H2	Roller lever: General-purpose overtravel model, 80°	WLRH2
G2	Roller lever: High-sensitivity overtravel, 80°	WLRG2
CA2-2	Roller lever: Overtravel, 90°	WLRCA-2-2
CA2-2N	Roller lever: Overtravel, 90°	WLRCA2-2N
GCA2	Roller lever: High-precision R38	WLRGCA2
CA12	Adjustable roller lever: Standard	WLRCA2
H12	Adjustable roller lever: General-purpose overtravel model, 80°	WLRH2
G12	Adjustable roller lever: High-sensitivity overtravel, 80°	WLRG2
CA12-2	Adjustable roller lever: Overtravel, 90°	WLRCA-2-2
CA12-2N	Adjustable roller lever: Overtravel, 90°	WLRCA2-2N
CL	Adjustable rod lever: Standard, 25 to 140	WLRCL
HL	Adjustable rod lever: General-purpose overtravel model, 80°, 25 to 140 mm	WLRH2
HAL4	Adjustable rod lever: General-purpose overtravel model, 80°, 350 to 380 mm	WLRH2
GL	Adjustable rod lever: High-sensitivity overtravel, 80°, 25 to 140 mm	WLRG2
CL-2	Adjustable rod lever: Overtravel, 90°, 25 to 140 mm	WLRCA-2-2
CL-2N	Adjustable rod lever: Overtravel, 90°, 25 to 140 mm	WLRCA2-2N
HAL5	Rod spring lever: General-purpose overtravel model, 80°	WLRH2
CA32-41	Fork lever lock: Protective, WL-5A100	WLRCA32
CA32-42	Fork lever lock: Protective, WL-5A102	WLRCA32
CA32-43	Fork lever lock: Protective, WL-5A104	WLRCA32
D	Plunger: Top plunger	---
D2	Plunger: Top-roller plunger	---
D28	Plunger: Sealed top-roller plunger	---
D3	Plunger: Top-ball plunger	---
SD	Plunger: Horizontal plunger	---
SD2	Plunger: Horizontal-roller plunger	---
SD3	Plunger: Horizontal-ball plunger	---
NJ	Flexible rod: Coil spring	---
NJ-30	Flexible rod: Coil spring, multi-wire	---
NJ-2	Flexible rod: Coil spring, resin rod	---
NJ-S2	Flexible rod: Steel wire	---

6. Hermetic Model Specifications

Blank	No cables or molding
139	General-purpose built-in switch with cables attached and molded conduit opening and cover (cover cannot be removed). (See note.)
140	Airtight built-in switch with cables attached and molded conduit opening, cover, and box interior cover screws (cover cannot be removed). (See note.)
141	Airtight built-in switch with cables attached and molded conduit opening, cover, head, box interior, cover screws, and head screws (cover cannot be removed, Head direction cannot be changed). The Head opening is created to protect it from cutting powder. (See note.)
145	Airtight built-in switch with cables attached and molded conduit opening, cover, box interior, and cover screws (cover cannot be removed, Head can be mounted in any of 4 directions). The Head opening is created to protect it from cutting powder. (See note.)
RP40	Airtight built-in switch with cables attached and molded cover and box interior (cover cannot be removed, Head direction can be changed). SC Connector can be removed, so it is possible to use flexible conduits for the cable. (See note.)
RP60	Airtight built-in switch with cables attached, fluorine rubber used, and molded conduit opening, cover, and box interior (cover cannot be removed, Head direction cannot be changed). (See note.)

Note: Refer to page 37 for applicable models.

8. Indicator Type

Symbol	Element	Voltage	Leakage current
Blank	No indicator		
LE	Neon lamp	125 to 250 VAC	Approx. 0.6 to 1.9 mA
LD	LED	10 to 115 VAC/DC	Approx. 0.5 mA

Note: Dimensions are the same for both LE and LD models.

9. Indicator Wiring

2	NC connection: Light-ON when operating
3	NO connection: Light-ON when not operating

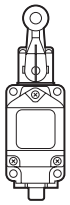
Note: Include the indicator wiring specification only when a (6) hermetic seal and (8) operation indicator have been selected.

10. Lever Type

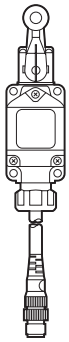
Blank	Standard lever
A	Double nut lever

General-purpose Sensor I/O Connector Switches

Direct-wired Connector



Pre-wired Connector



WL□□-□LD□
1 2 3 4 5

1. Electrical Rating

Blank	Standard
01	Microload

Note: Dimensions are the same as the standard models.

2. Actuator Type

CA2	Roller lever: Standard model
GCA2	Roller lever: High-precision model
H2	Roller lever: General-purpose overtravel model
G2	Roller-lever: High-sensitivity overtravel
D2	Top-roller plunger
D28	Sealed top-roller plunger

3. Built-in Switch Type

Blank	Standard
55	Hermetically sealed

Note: Dimensions are the same as the standard models.

4. Indicator Type

LD	LED, AC/DC (10 to 115 V)

5. Wiring Specifications

K13A	Direct-wired Connector (2-core: AC, NO wiring, connector pins No. 3, 4)
K13	Direct-wired Connector (2-core: DC, NO wiring, connector pins No. 3, 4)
K43A	Direct-wired Connector (4-core: AC)
K43	Direct-wired Connector (4-core: DC)
-M1J (See note 1.)	Pre-wired Connector (See note 2.) (2-core: DC, NO wiring, connector pins No. 3, 4)
-M1GJ (See note 1.)	Pre-wired Connector (See note 2.) (2-core: DC, NO wiring, connector pins No. 1, 4)
-M1JB	Pre-wired Connector (See note 2.) (2-core: DC, NC wiring, connector pins No. 3, 2)
-AGJ03	Pre-wired Connector (See note 2.) (4-core, AC)
-DGJ03 (See note 1.)	Pre-wired Connector (See note 2.) (4-core, DC)
-DK1EJ03 (See note 1.)	Pre-wired Connector (See note 2.) (3-core: DC, NO wiring, connector pins No. 2, 3, 4)

Note 1: Models with pre-wired connectors and DC specifications have EN/IEC approval (CE marking).
2. With 0.3-m cable attached.

Spatter-prevention Switches

WL□□-□□S□
1 2 3 4 5

1. Electrical Rating

Blank	Standard
01	Microload

Note: Dimensions are the same as the standard models.

2. Actuator Type

CA2	Roller lever: Standard model
GCA2	Roller lever: High-precision model
H2	Roller lever: General-purpose Overtravel model
G2	Roller lever: High-sensitivity Overtravel model
D28	Sealed top-roller plunger

3. Built-in Switch Type

Blank	Standard
55	Hermetically sealed

Note: Dimensions are the same as the standard built-in switch models.

4. Indicator Type

LD	LED, AC/DC
LE	Neon lamp

Note: Dimensions are the same for both LE and LD models.

5. Wiring Specifications

-M1J-1 (See note 1.)	Pre-wired Connector (See note 2.) (2-core: DC, NO wiring, connector pins No. 3, 4)
-M1GJ-1 (See note 1.)	Pre-wired Connector (See note 2.) (2-core: DC, NO wiring, connector pins No. 1, 4)
-DGJS03 (See note 1.)	Pre-wired Connector (See note 2.) (4-core: DC)

Note 1: Models with pre-wired connectors and DC specifications are approved by EN/IEC (CE marking) except for LE Models (Neon Lamp Models).
2. With 0.3-m cable attached.

Long-life Switches

WLM□-LD□
1 2 3

1. Actuator

CA2	Roller lever: Standard model
GCA2	Roller lever: High-precision model
H2	Roller lever: General-purpose overtravel model
G2	Roller lever: High-sensitivity overtravel model

2. indicator Type

LD	LED, AC/DC (10 to 115 V)

3. Wiring Specifications

Blank	Screw terminal: G1/2 conduit
K13A	Direct-wired Connector: 2-core, AC
K13	Direct-wired Connector: 2-core, DC
K43A	Direct-wired Connector: 4-core, AC
K43	Direct-wired Connector: 4-core, DC
-M1J	Pre-wired Connector: 2-core, DC (See note.)
-AGJ03	Pre-wired Connector: 4-core, AC (See note.)
-DGJ03	Pre-wired Connector: 4-core, DC (See note.)

Note: With 0.3-m cable attached.

Ordering Information

■ List of Models

General-purpose Switches

Standard Switches

Note: Models are also available with ground terminals.

Item			Lever type: Roller lever R38	Roller lever R50	Roller lever R63
			Model	Model	Model
Basic		Standard load	WLCA2	WLCA2-7	WLCA2-8
		Microload	WL01CA2	WL01CA2-7	WL01CA2-8
Overtravel	General-purpose	Standard load	WLH2	---	---
		Microload	WL01H2	---	---
	High-sensitivity	Standard load	WLG2	---	---
		Microload	WL01G2	---	---
	90° operation	Standard load	WLCA2-2	---	---
		Microload	WL01CA2-2	---	---
		Standard load	WLCA2-2N	---	---
		Microload	WL01CA2-2N	---	---
High-precision		Standard load	WLGCA2	---	---
		Microload	WL01GCA2	---	---

Item			Lever type: Adjustable roller lever	Adjustable rod lever 25 to 140mm	Adjustable rod lever 350 to 380mm	Rod spring lever
			Model	Model	Model	Model
Basic		Standard load	WLCA12	WLCL	---	---
		Microload	WL01CA12	WL01CL	---	---
Overtravel	General-purpose	Standard load	WLH12	WLHL	WLHAL4	WLHAL5
		Microload	WL01H12	WL01HL	---	---
	High-sensitivity	Standard load	WLG12	WLGL	---	---
		Microload	WL01G12	WL01GL	---	---
	90° operation	Standard load	WLCA12-2	WLCL-2	---	---
		Microload	WL01CA12-2	---	---	---
		Standard load	WLCA12-2N	WLCL-2N	---	---
		Microload	WL01CA12-2N	WL01CL-2N	---	---

Item			Lever type: Fork lever lock (with WL-5A100 Plastic Roller Lever)	Fork lever lock (with WL-5A102 Plastic Roller Lever)	Fork lever lock (with WL-5A104 Plastic Roller Lever)
			Model	Model	Model
Protective		Standard load	WLCA32-41	WLCA32-42	WLCA32-43
		Microload	WL01CA32-41	WL01CA32-42	WL01CA32-43

Item			Lever type: Top plunger	Top-roller plunger	Sealed top-roller plunger	Top-ball plunger
			Model	Model	Model	Model
Basic		Standard load	WLD	WLD2	WLD28	WLD3
		Microload	WL01D	WL01D2	WL01D28	WL01D3

Item			Lever type: Horizontal plunger	Horizontal-roller plunger	Horizontal-ball plunger
			Model	Model	Model
Basic		Standard load	WLSD	WLSD2	WLSD3
		Microload	WL01SD	WL01SD2	WL01SD3

Item			Lever type: Coil spring (spring diameter: 6.5)	Coil spring (spring diameter: 4.8)	Coil spring (spring diameter: 8)	Steel wire (wire diameter: 1)
			Model	Model	Model	Model
Basic		Standard load	WLNJ	WLNJ-30	WLNJ-2	WLNJ-S2
		Microload	WL01NJ	WL01NJ-30	WL01NJ-2	WL01NJ-S2

General-purpose Switches

Indicator-equipped Switches

Item			Lever type: Roller lever R38  Model	Roller lever R50  Model	Roller lever R63  Model	Adjustable roller lever  Model
Basic		Neon lamp	WLCA2-LE	WLCA2-7LE	WLCA2-8LE	WLCA12-LE
		LED	WLCA2-LD	WLCA2-7LD	WLCA2-8LD	WLCA12-LD
Overtravel	General-purpose	Neon lamp	WLH2-LE	---	---	WLH12-LE
		LED	WLH2-LD	---	---	WLH12-LD
	High-sensitivity	Neon lamp	WLG2-LE	---	---	WLG12-LE
		LED	WLG2-LD	---	---	WLG12-LD
	90° operation	Neon lamp	WLCA2-2LE	---	---	WLCA12-2LE
		LED	WLCA2-2LD	---	---	WLCA12-2LD
		Neon lamp	WLCA2-2NLE	---	---	WLCA12-2NLE
		LED	WLCA2-2NLD	---	---	WLCA12-2NLD
High-precision		Neon lamp	WLGCA2-LE	---	---	---
		LED	WLGCA2-LD	---	---	---

Item			Lever type: Adjustable rod lever 25 to 140 mm  Model	Adjustable rod lever 350 to 380 mm  Model	Rod spring lever  Model
Basic		Neon lamp	WLCL-LE	---	---
		LED	WLCL-LD	---	---
Overtravel	General-purpose	Neon lamp	WLHL-LE	WLHAL4-LE	WLHAL5-LE
		LED	WLHL-LD	WLHAL4-LD	WLHAL5-LD
	High-sensitivity	Neon lamp	WLGL-LE	---	---
		LED	WLGL-LD	---	---
	90° operation	Neon lamp	WLCL-2LE	---	---
		LED	WLCL-2LD	---	---
		Neon lamp	WLCL-2NLE	---	---
		LED	WLCL-2NLD	---	---

Item		Lever type: Fork lever lock (with WL-5A100 Plastic Roller Lever)  Model	Fork lever lock (with WL-5A102 Plastic Roller Lever)  Model	Fork lever lock (with WL-5A104 Plastic Roller Lever)  Model
Protective	Neon lamp	WLCA32-41LE	WLCA32-42LE	WLCA32-43LE
	LED	WLCA32-41LD	WLCA32-42LD	WLCA32-43LD

Item		Lever type: Top plunger  Model	Top-roller plunger  Model	Sealed top-roller plunger  Model	Top-ball plunger  Model
Basic	Neon lamp	WLD-LE	WLD2-LE	WLD28-LE	WLD3-LE
	LED	WLD-LD	WLD2-LD	WLD28-LD	WLD3-LD

Item		Lever type: Horizontal plunger  Model	Horizontal-roller plunger  Model	Horizontal-ball Plunger  Model	Coil spring (spring diameter: 6.5)  Model
Basic	Neon lamp	WLSD-LE	WLSD2-LE	WLSD3-LE	WLNJ-LE
	LED	WLSD-LD	WLSD2-LD	WLSD3-LD	WLNJ-LD

Item		Lever type: Coil spring (spring diameter: 4.8)  Model	Coil spring (spring diameter: 8)  Model	Steel wire (wire diameter: 1)  Model
Basic	Neon lamp	WLNJ-30LE	WLNJ-2LE	WLNJ-S2LE
	LED	WLNJ-30LD	WLNJ-2LD	WLNJ-S2LD

Covers with Operation Indicators

Item	Lever type: Cover only with indicator  Model
Neon lamp	WL-LE
LED	WL-LD

Note: The default setting is “light-ON when not operating.” Turn the lamp holder by 180° to change the setting to “light-ON when operating.”

General-purpose Switches

Sensor I/O Connector Switches

● Direct-wired Connectors

Lever type	Wiring		Built-in switch specification	Basic	Overtravel		High-precision
					General-purpose	High-sensitivity	
			Item	Model	Model	Model	Model
Roller lever 	2-core	DC	Standard	WLCA2-LDK13	WLH2-LDK13	WLG2-LDK13	WLGCA2-LDK13
			Airtight seal	WLCA2-55LDK13	WLH2-55LDK13	WLG2-55LDK13	WLGCA2-55LDK13
	4-core	DC	Standard	WLCA2-LDK43	WLH2-LDK43	WLG2-LDK43	WLGCA2-LDK43
			Airtight seal	WLCA2-55LDK43	WLH2-55LDK43	WLG2-55LDK43	WLGCA2-55LDK43
Top-roller plunger 	2-core	DC	Standard	WLD2-LDK13	---	---	---
			Airtight seal	WLD2-55LDK13	---	---	---
	4-core	DC	Standard	WLD2-LDK43	---	---	---
			Airtight seal	WLD2-55LDK43	---	---	---

● Pre-wired Connectors

Lever type	Wiring				Built-in switch specification	Basic	Overtravel		High-precision
							General-purpose	High-sensitivity	
					Item	Model	Model	Model	Model
Roller lever 	2-core	DC	NO	No. 3, 4	Standard	WLCA2-LD-M1J	WLH2-LD-M1J	WLG2-LD-M1J	WLGCA2-LD-M1J
					Airtight seal	WLCA2-55LD-M1J	---	---	WLGCA2-55LD-M1J
				No. 1, 4	Standard	WLCA2-LD-M1GJ	WLH2-LD-M1GJ	WLG2-LD-M1GJ	WLGCA2-LD-M1GJ
					Airtight seal	WLCA2-55LD-M1GJ	---	WLG2-55LD-M1GJ	---
			NC	No. 3, 2	Standard	---	---	WLG2-LD-M1JB	---
					Airtight seal	WLCA2-55LD-M1JB	---	WLG2-55LD-M1JB	WLGCA2-55LD-M1JB
	4-core	DC	---	---	Standard	WLCA2-LD-DGJ03	WLH2-LD-DGJ03	WLG2-LD-DGJ03	---
					Airtight seal	WLCA2-55LD-DGJ03	WLH2-55LD-DGJ03	WLG2-55LD-DGJ03	WLGCA2-55LD-DGJ03
	3-core	DC	---	No. 2, 3, 4	Standard	WLCA2-LD-DK1EJ03	WLH2-LD-DK1EJ03	WLG2-LD-DK1EJ03	---
					Airtight seal	WLCA2-55LD-DK1EJ03	WLH2-55LD-DK1EJ03	WLG2-55LD-DK1EJ03	---
Top-roller plunger 	2-core	DC	NO	No. 3, 4	Standard	WLD2-LD-M1J	---	---	---
					Airtight seal	WLD2-55LD-M1J	---	---	---
				No. 1, 4	Standard	WLD2-LD-M1GJ	---	---	---
					Airtight seal	WLD2-55LD-M1GJ	---	---	---
			NC	No. 3, 2	Standard	---	---	---	---
					Airtight seal	WLD2-55LD-M1JB	---	---	---
	4-core	DC	---	---	Standard	WLD2-LD-DGJ03	---	---	---
					Airtight seal	---	---	---	---
	3-core	DC	---	No. 2, 3, 4	Standard	WLD2-LD-DK1EJ03	---	---	---
					Airtight seal	WLD2-55LD-DK1EJ03	---	---	---

Environment-resistant Switches

Note: Models are also available with ground terminals.

Item					Lever type	Roller lever R38		
						Basic	Overtravel	
							General-purpose	High-sensitivity
						Model	Model	Model
Airtight seal			No indicator			WLCA2-55	WLH2-55	WLG2-55
			Indicator	LED		WLCA2-55LD	WLH2-55LD	WLG2-55LD
				Neon		WLCA2-55LE	WLH2-55LE	WLG2-55LE
Hermetic seal	Molded terminals	-139	No indicator			WLCA2-139	WLH2-139	WLG2-139
			Indicator	NC wiring		WLCA2-139LD2	---	---
				NO wiring		WLCA2-139LD3	---	WLG2-139LD3
		-140	No indicator			WLCA2-140	WLH2-140	WLG2-140
			Indicator	NC wiring		WLCA2-140LD2	---	WLG2-140LD2
				NO wiring		WLCA2-140LD3	---	WLG2-140LD3
		-141	No indicator			WLCA2-141	WLH2-141	WLG2-141
			Indicator	NC wiring		WLCA2-141LD2	---	WLG2-141LD2
				NO wiring		WLCA2-141LD3	WLH2-141LD3	WLG2-141LD3
	Anti-coolant		No indicator			WLCA2-RP60	WLH2-RP60	WLG2-RP60
			Indicator	NC wiring		WLCA2-RP60LD2	---	WLG2-RP60LD2
				NO wiring		WLCA2-RP60LD3	WLH2-RP60LD3	WLG2-RP60LD3
Heat-resistant			No indicator			WLCA2-TH	WLH2-TH	WLG2-TH
Low-temperature			No indicator			WLCA2-TC	WLH2-TC	WLG2-TC
Corrosion-proof			No indicator			WLCA2-RP	WLH2-RP	WLG2-RP
Weather-proof			No indicator			---	WLH2-P1	WLG2-P1

Item					Lever type	Adjustable roller lever	Adjustable rod lever 25 to 140 mm
						Basic	Basic
						Model	Model
Airtight seal			No indicator			WLCA12-55	WLCL-55
			Indicator	LED		WLCA12-55LD	WLCL-55LD
				Neon		WLCA12-55LE	---
Hermetic seal	Molded terminals	-139	No indicator			WLCA12-139	WLCL-139
		-140				WLCA12-140	WLCL-140
		-141				WLCA12-141	---
	Anti-coolant					WLCA12-RP60	WLCL-RP60
Heat-resistant			No indicator			WLCA12-TH	WLCL-TH
			Indicator			---	---
Low-temperature			No indicator			WLCA12-TC	WLCL-TC
			Indicator			---	---
Corrosion-proof			No indicator			WLCA12-RP	WLCL-RP
			Indicator			---	---
Weather-proof			No indicator			---	---
			Indicator			---	---

Item					Lever type	Top-roller plunger	Sealed top-roller plunger	Coil spring (spring diameter: 6.5)
						Model	Model	Model
Airtight seal			No indicator			WLD2-55	WLD28-55	WLNJ-55
			Indicator	LED		WLD2-55LD	WLD28-55LD	WLNJ-55LD
				Neon		WLD2-55LE	WLD28-55LE	---
Hermetic seal	Molded terminals	-139	No indicator			WLD2-139	WLD28-139	WLNJ-139
		-140				---	WLD28-140	WLNJ-140
	Anti-coolant					WLD2-RP60	WLD28-RP60	WLNJ-RP60
Heat-resistant			No indicator			WLD2-TH	WLD28-TH	WLNJ-TH
			Indicator			---	---	---
Low-temperature			No indicator			WLD2-TC	---	WLNJ-TC
			Indicator			---	---	---
Corrosion-proof			No indicator			WLD2-RP	WLD28-RP	WLNJ-RP
			Indicator			---	---	---

Spatter-prevention Switches

Item			Lever type: Roller lever — Double nut lever	Roller lever — Allen-head lever	Sealed top-roller plunger
			Model	Model	Model
Neon lamp operation indicator	Basic		WLCA2-LEAS	WLCA2-LES	WLD28-LES
	Overtravel	General-purpose	WLH2-LEAS	WLH2-LES	---
		High-sensitivity	WLG2-LEAS	WLG2-LES	---
	High-precision		---	WLGCA2-LES	---
LED operation indicator	Basic		WLCA2-LDAS	WLCA2-LDS	WLD28-LDS
	Overtravel	General-purpose	WLH2-LDAS	WLH2-LDS	---
		High-sensitivity	WLG2-LDAS	WLG2-LDS	---
	High-precision		---	WLGCA2-LDS	---

Note: Ask your OMRON representative about WL01□-□S Microload Switches.

Long-life Switches

Item / Lever type			LED operation indicator (See note 1.) — Basic	Overtravel — General-purpose	Overtravel — High-sensitivity	High-precision
			Model	Model	Model	Model
 Roller lever, screw terminal			WLMCA2-LD	WLMH2-LD	WLMG2-LD	WLMGCA2-LD
 Roller lever, direct-wired connector	2-core	AC	WLMCA2-LDK13A	WLMH2-LDK13A	WLMG2-LDK13A	WLMGCA2-LDK13A
		DC	WLMCA2-LDK13	WLMH2-LDK13	WLMG2-LDK13	WLMGCA2-LDK13
	4-core	AC	WLMCA2-LDK43A	WLMH2-LDK43A	WLMG2-LDK43A	WLMGCA2-LDK43A
		DC	WLMCA2-LDK43	WLMH2-LDK43	WLMG2-LDK43	WLMGCA2-LDK43
 Roller lever, pre-wired connector (See note 2.)	2-core	DC	WLMCA2-LD-M1J	WLMH2-LD-M1J	WLMG2-LD-M1J	WLMGCA2-LD-M1J
	4-core	AC	WLMCA2-LD-AGJ03	WLMH2-LD-AGJ03	WLMG2-LD-AGJ03	WLMGCA2-LD-AGJ03
		DC	WLMCA2-LD-DGJ03	WLMH2-LD-DGJ03	WLMG2-LD-DGJ03	WLMGCA2-LD-DGJ03

Note 1. The default setting is “light-ON when not operating.” Turn the lamp holder by 180° to change the setting to “light-ON when operating”. (Ask your OMRON representative about 2-core models.)

2. With 0.3-m cable attached.

Individual Parts

Heads

Actuator type	Set model	Head model (with Actuator)
Roller lever 	WLCA2	WL-1H1100
	WLG2	WL-2H1100
	WLH2	WL-2H1100-1 (See note.)
	WLCA2-2	WL-3H1100
	WLCA2-2N	WL-6H1100
Adjustable roller lever 	WLCA12	WL-1H2100
	WLG12	WL-2H2100
	WLH12	WL-2H2100-1 (See note.)
	WLCA12-2	WL-3H2100
	WLCA12-2N	WL-6H2100
Adjustable rod lever 	WLCL	WL-4H4100
	WLGL	WL-2H4100
	WLCL-2	WL-3H4100
	WLCL-2N	WL-6H4100

Actuator type	Set model	Head model (with Actuator)
Top plunger 	WLD	WL-7H100
	WLD2	WL-7H200
	WLD3	WL-7H300
	WLD28	WL-7H400
Horizontal plunger 	WLSD	WL-8H100
	WLSD2	WL-8H200
	WLSD3	WL-8H300
Fork lever lock 	WLCA32-41	WL-5H5100
	WLCA32-42	WL-5H5102
	WLCA32-43	WL-5H5104
	WLCA32-44	WL-5H5104
Coil spring 	WLNJ	WL-9H100
	WLNJ-30	WL-9H200
	WLNJ-2	WL-9H300
	WLNJ-S2	WL-9H400

Note: The model number of Heads without levers are same as those of Heads with levers without the numbers at the end.
Example: WL-1H1100 becomes WL-1H without the lever.
However, the WLH2 and WLH12 become WL-2H-1 and the WLGCA2 becomes WL-1H-1 for the Heads without levers.
Other Heads are also available. Ask your OMRON representative.

Switches without Levers

Switches without levers 		
Actuator type		**Switch model**
Switches for roller levers 	Basic R38	WLRCA2
	High-precision R38	WLRGCA2
	High-sensitivity overtravel, 80°	WLRG2
	General-purpose overtravel, 80°	WLRH2
	Overtravel, 90° operation	WLRCA2-2
	Overtravel, 90° operation	WLRCA2-2N
Switches for adjustable roller levers 	Basic	WLRCA2
	High-sensitivity overtravel, 80°	WLRG2
	General-purpose overtravel, 80°	WLRH2
	Overtravel, 90° operation	WLRCA2-2
	Overtravel, 90° operation	WLRCA2-2N
Switches for adjustable rod lever 	Basic, 25 to 140 mm	WLRCL
	High-sensitivity overtravel, 80°, 25 to 140 mm	WLRG2
	Overtravel, 90° operation, 25 to 140 mm	WLRCA2-2
	Overtravel, 90° operation, 25 to 140 mm	WLRCA2-2N
Switches for top plungers 	---	---
Switches for horizontal plungers 	---	---
Switches for fork lever locks 	Protective, WL-5A100 Protective, WL-5A102 Protective, WL-5A104	WLRCA32
Switches for coil springs 	---	---

Spatter-prevention Products

● Levers and Covers with Indicators

Complete Heads with allen-head levers 	Double Nut Lever 	Allen-head Lever 	Cover with Indicator 
WL-1H1100S (for WLCA2-□ or WLGCA2-□)	WL-1A105S Roller Lever (forward and backward lever)	EWL-1A103S Roller lever (forward and backward lever)	Neon lamp WL-LES
WL-2H1100S (for WLH2-□ or WLG2-□)			LED (LED) WL-LDS

● Switches without Levers

Switches without levers 
WLRCA2-LDS
WLRH2-LES WLRH2-LDS WLRG2-LES
WLRG2-LDS
WLRGCA2-LES

Specifications, Ratings, and Characteristics

General-purpose Switches

■ Approved Standards

Agency	Standard	File No.	Approved models
UL	UL508	E76675	All modes with direct-wired connectors or pre-wired connectors except for hermetically sealed models
CSA	CSA C22.2 No. 14	LR45746	
TÜV Rheinland	EN60947-5-1	J50022353	Only models with ground terminals
		J9950023	Models with direct-wired connectors and no ground terminal
		J9950959	Only models with pre-wired connectors and DC specifications
CCC (CQC)	GB14048.5	2003010305032365	Contact your OMRON representative for information on approved models.

Note: Contact your OMRON representative for more information on approved models.

■ Approved Standard Ratings

UL/CSA

Standard-load Switches: A600, NEMA

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC 240 VAC 480 VAC 600 VAC	10 A	60 30 15 12	6 3 1.5 1.2	7,200	720

Switches without Indicators

LE Switches (Neon lamp): A300

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC 240 VAC	10 A	60 30	6 3	7,200	720

LD Switches (LED)

Rated voltage	Carry current
115 VAC	10 A
115 VDC	0.8 A

Microload Switches

0.1 A at 125 VAC, 0.1 A at 30 VDC

TÜV (EN60947-5-1) (Only models with ground terminals are approved.), CCC (GB14048.5)

Model	Application category and ratings	Thermal current (I_{the})	Indicator
WL□	AC-15: 2 A/250 V DC-12: 2 A/48 V	10 A	---
WL01□	AC-14: 0.1 A/125V DC-12: 0.1 A/48 V	0.5 A	---
WL□-LE	AC-15: 2 A/250 V	10 A	Neon lamp
WL01□-LE	AC-14: 0.1 A/125 V	0.5 A	Neon lamp
WL□-LD	AC-15: 2 A/115 V DC-12: 2 A/48 V	10 A	LED
WL01□-LD	AC-14: 0.1 A/115 V DC-12: 0.1 A/48 V	0.5 A	LED

Note: As an example, AC-15: 2 A/250 V means the following:

Application category	AC-15
Rated operating current (Ie)	2 A
Rated operating voltage (Ue)	250 V

■ General Ratings

Standard-load Switches

Item / Model	Rated voltage (V)	Non-inductive load (A)				Inductive load (A)			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
Basic models, overtravel models (except for high-sensitivity models), and high-precision models	AC 125 250 500	10 10 10		3 2 1.5	1.5 1 0.8	10 10 3		5 3 1.5	2.5 1.5 0.8
	DC 8 14 30 125 250	10 10 6 0.8 0.4		6 6 4 0.2 0.1	3 3 3 0.2 0.1	10 10 6 0.8 0.4		6 6 4 0.2 0.1	
High-sensitivity overtravel models	AC 125 250	5 5		---		---		---	
	DC 125 250	0.4 0.2		---		---		---	

Inrush current	**NC**	30 A max. (15 A max. (See note.))
	NO	20 A max. (10 A max. (See note.))

Note: For high-sensitivity overtravel models.

Note
1. The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. A lamp load has an inrush current of 10 times the steady-state current.
4. A motor load has an inrush current of 6 times the steady-state current.
5. For PC loads, use the microload models.

Indicator-equipped Switches

Model	Item	Max. rated voltage (V)	Leakage current (mA)
WL-LE	Neon lamp	125 AC	Approx. 0.6
		250 AC	Approx. 1.9
WL-LD	LED	10 to 115 AC/DC	Approx. 0.5
		10 to 24 AC/DC	Approx. 0.4

■ Characteristics

Degree of protection	IP67
Durability (See note 3.)	Mechanical: 15,000,000 operations min. (See note 4.) Electrical: 750,000 operations min. (See note 5.)
Operating speed	1 mm to 1 m/s (for WLCA2)
Operating frequency	Mechanical: 120 operations/minute min. Electrical: 30 operations/minute min.
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	25 mΩ max. (initial value)
Dielectric strength	1,000 VAC (600 VAC), 50/60 Hz for 1 min between terminals of the same polarity 2,200 VAC (1,500 VAC), 50/60 Hz for 1 min/ Uimp 2.5 kV between current-carrying metal part and ground 2,200 VAC (1,500 VAC), 50/60 Hz for 1 min Uimp 2.5 kV between each terminal and non-current-carrying metal part
Rated insulation voltage (U_i)	250 V (EN60947-5-1)
Switching overvoltage	1,000 V max. (EN60947-5-1)
Pollution degree (operating environment)	Level 3 (EN60947-5-1)
Short-circuit protective device (SCPD)	10 A, fuse type gG or gI (IEC269)
Conditional short-circuit current	100 A (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	10 A, 0.5 A (EN60947-5-1)
Protection against electric shock	Class I
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (See note 6.)
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min. (See note 6.)
Ambient temperature	Operating: –10°C to 80°C (with no icing) (See note 7.)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 275 g (in the case of WLCA2)

Note 1: The above figures are initial values.

2. The figures in parentheses for dielectric strength are those for the high-sensitivity overtravel models.

3. The values are calculated at an operating temperature of 5°C to 35°C and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

4. Durability is 10,000,000 operations min. for general-purpose or high-sensitivity overtravel models, and for flexible rod models.

5. Durability is 500,000 operations min. for high-sensitivity models. All microload models however, are 1,000,000 operations min.

6. Except flexible rod models. The shock resistance (malfunction) for microload models is 200 m/s^2 min.

7. For low-temperature models this is –40°C to 40°C (no icing). For heat-resistant models the range is 5°C to 120°C.

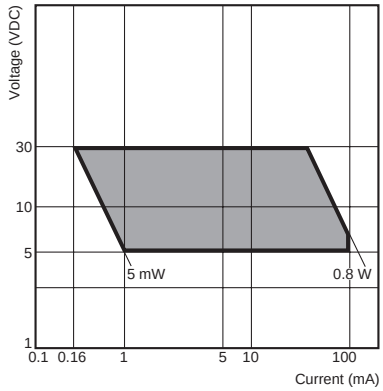
Microload Switches

Refer to these ratings before using the product.

Rated voltage (V)	Resistive load (A)
AC 125	0.1
DC 30	

Operation in the following ranges will produce optimum performance.

Recommended load range	5 to 30 VDC 0.5 to 100 mA



Spatter-prevention Switches

■ Approved Standards

Agency	Standard	File No.	Approved models
UL	UL508	E76675	All modes with direct-wired connectors or pre-wired connectors except for hermetically sealed models
CSA	CSA C22.2 No. 14	LR45746	
TÜV Rheinland	EN60947-5-1	J50022353	Only models with ground terminals
		J9950023	Models with direct-wired connectors and no ground terminal
		J9950959	Only models with pre-wired connectors and DC specifications
CCC (CQC)	GB14048.5	2003010305032365	Contact your OMRON representative for information on approved models.

Note: Contact your OMRON representative for more information on approved models.

■ Approved Standard Ratings

UL/CSA

LE Switches (Neon lamp): A300

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC 240 VAC	10 A	60 30	6 3	7,200	720

LD Switches (LED)

Rated voltage	Carry current
115 VAC	10 A
115 VDC	0.8 A

TÜV (EN60947-5-1) (Only models with ground terminals are approved.), CCC (GB14048.5)

Model	Application category and ratings
WL□	AC-15: 2 A/250 V DC-12: 2 A/48 V
WL01□	AC-14: 0.1 A/125V DC-12: 0.1 A/48 V
WL□-LE	AC-15: 2 A/250 V
WL01□-LE	AC-14: 0.1 A/125 V
WL□-LD	AC-15: 2 A/115 V DC-12: 2 A/48 V
WL01□-LD	AC-14: 0.1 A/115 V DC-12: 0.1 A/48 V

Note: As an example, AC-15: 2 A/250 V means the following:

Application category	AC-15
Rated operating current (Ie)	2 A
Rated operating voltage (Ue)	250 V

■ General Ratings

Item / Model	Rated voltage (V)	Non-inductive load (A)				Inductive load (A)			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
WL□-LES	AC 125 250	10 10		3 2	1.5 1	10 10		5 3	2.5 1.5
WL□-LDS	AC 115	10		3	1.5	10		5	2.5
	DC 12 24 48	10 6 3		6 4 2	3 3 1.5	10 6 3		6 4 2	

Inrush current	**NC**	30 A max.
	NO	20 A max.
Operating temperature		–10°C to 80°C (with no icing)
Operating humidity		95% max.

Note 1: The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. A lamp load has an inrush current of 10 times the steady-state current.
4. A motor load has an inrush current of 6 times the steady-state current.

■ Characteristics

Degree of protection	IP67
Durability (See note 3.)	Mechanical: 15,000,000 operations min. (See note 4.) Electrical: 750,000 operations min. (See note 5.)
Operating speed	1 mm to 1 m/s (for WLCA2)
Operating frequency	Mechanical: 120 operations/minute min. Electrical: 30 operations/minute min.
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	25 mΩ max. (initial value)
Dielectric strength	1,000 VAC (600 VAC), 50/60 Hz for 1 min between terminals of the same polarity 2,200 VAC (1,500 VAC), 50/60 Hz for 1 min/ Uimp 2.5 kV between current-carrying metal part and ground 2,200 VAC (1,500 VAC), 50/60 Hz for 1 min Uimp 2.5 kV between each terminal and non-current-carrying metal part
Rated insulation voltage (U_i)	250 V (EN60947-5-1)
Switching overvoltage	1,000 V max. (EN60947-5-1)
Pollution degree (operating environment)	Level 3 (EN60947-5-1)
Short-circuit protective device (SCPD)	10 A, fuse type gG or gI (IEC269)
Conditional short-circuit current	100 A (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	10 A, 0.5 A (EN60947-5-1)
Protection against electric shock	Class I
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min.
Ambient temperature	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 275 g (in the case of WLCA2)

Note 1: The above figures are initial values.
2. The figures in parentheses for dielectric strength are those for the high-sensitivity overtravel models.
3. The values are calculated at an operating temperature of 5°C to 35°C and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.
4. Durability is 10,000,000 operations min. for general-purpose or high-sensitivity overtravel models.
5. Durability is 500,000 operations min. for high-precision models. All microload models however, are 1,000,000 operations min.

Long-life Switches

■ Approved Standards

Agency	Standard	File No.	Approved models
UL	UL508	E76675	All modes with direct-wired connectors or pre-wired connectors except for hermetically sealed models
CSA	CSA C22.2 No. 14	LR45746	
TÜV Rheinland	EN60947-5-1	J50022353	Only models with ground terminals
		J9950023	Models with direct-wired connectors and no ground terminal
		J9950959	Only models with pre-wired connectors and DC specifications
CCC (CQC)	GB14048.5	2003010305032365	Contact your OMRON representative for information on approved models.

Note: Contact your OMRON representative for more information on approved models.

■ Approved Standard Ratings

UL/CSA

LE Switches (Neon lamp): A300

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC 240 VAC	10 A	60 30	6 3	7,200	720

LD Switches (LED)

Rated voltage	Carry current
115 VAC	10 A
115 VDC	0.8 A

TÜV (EN60947-5-1) (Only models with ground terminals are approved.), CCC (GB14048.5)

Model	Application category and ratings	Thermal current (I_{the})	Indicator
WL□	AC-15: 2 A/250 V DC-12: 2 A/48 V	10 A	---
WL01□	AC-14: 0.1 A/125 V DC-12: 0.1 A/48 V	0.5 A	---
WL□-LE	AC-15: 2 A/250 V	10 A	Neon lamp
WL01□-LE	AC-14: 0.1 A/125 V	0.5 A	Neon lamp
WL□-LD	AC-15: 2 A/115 V DC-12: 2 A/48 V	10 A	LED
WL01□-LD	AC-14: 0.1 A/115 V DC-12: 0.1 A/48 V	0.5 A	LED

■ General Ratings

Refer to these ratings before using the product.

Screw Terminal Switches

Item / Model	Rated voltage (V)	Non-inductive load (A)				Inductive load (A)			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
Basic models, overtravel models, (except for high-sensitivity models), and high-precision models	115 AC	10		3	1.5	10		5	2.5
	12 DC 24 DC 48 DC 115 DC	10 6 3 0.8		6 4 2 0.2	3 3 1.5 0.2	10 6 3 0.8		6 4 2 0.2	
High-sensitivity overtravel models	115 AC	5		---		---		---	
	115 DC	0.4		---		---		---	

Inrush current	NC	30 A max. (15 A max. (See note.))
	NO	20 A max. (10 A max. (See note.))

Note: For high-sensitivity overtravel models.

Direct-wired Connector and Pre-wired Connector Switches

Model	Rated voltage (V)	Non-inductive load (A)				Inductive load (A)			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
DC	12 DC	3	3	3	3	3	3	3	3
	24 DC	3	3	3	3	3	3	3	3
	48 DC	3	3	3	3	3	3	3	3
	115 DC	0.8	0.8	0.2	0.2	0.8	0.8	0.2	0.2
AC	115 AC	3	3	3	1.5	3	3	3	2.5

Note 1: The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. A lamp load has an inrush current of 10 times the steady-state current.
4. A motor load has an inrush current of 6 times the steady-state current.

■ Characteristics

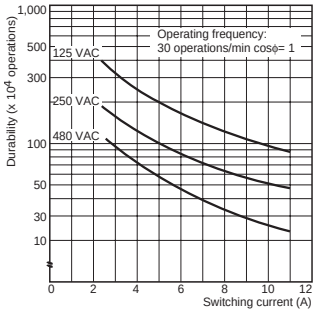
Degree of protection	IP67
Durability (See note 2.)	Mechanical: 30,000,000 operations min. (10 mA at 24 VDC, resistive load) Electrical: 750,000 operations min. (10 A at 115 VAC, resistive load), but for high-precision models: 500,000 operations min. (10 A at 115 VAC, resistive load)
Operating speed	1 mm to 1 m/s (for WLCA2)
Operating frequency	Mechanical: 120 operations/minute Electrical: 30 operations/minute
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	25 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity. (Except connector models.) 2,200 VAC (1,500 V), 50/60 Hz for 1 min between current-carrying metal part and ground. 2,200 VAC (1,500 V), 50/60 Hz for 1 min between each terminal and non-current-carrying metal part.
Vibration resistance	10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min.
Ambient temperature	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 275 g (for WLCA2)

Note 1: The figures in parentheses for dielectric strength, are those for overtravel (high-sensitivity) or connector models.
2. The values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

■ Engineering Data

Electrical Durability: cosϕ= 1

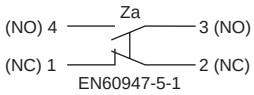
(Operating temperature: 5°C to 35°C,
operating humidity: 40% to 70%)



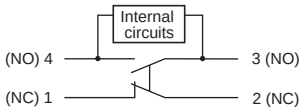
Connections

■ Contact Forms

Screw Terminal Switches



Screw Terminal and Indicator-equipped (Light-ON when Not Operating) Switches (See note 1.)

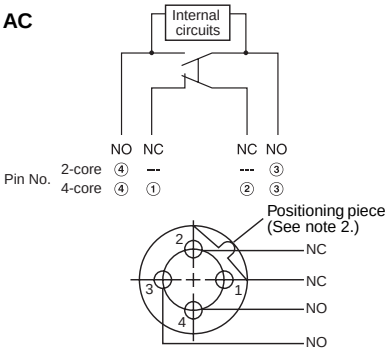


Note 1: Light-ON when not operating means the indicator is lit when the actuator is free and is not light when the Switch contacts (NO) close when the actuator rotates or is pushed down.

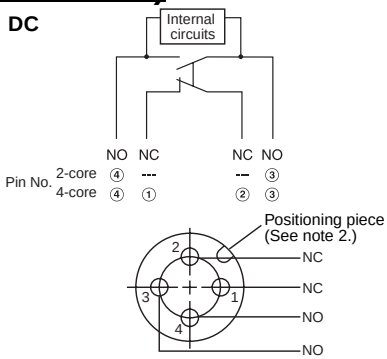
2. The position of the positioning piece is not always the same. If using an L-shaped connector causes problems in application, use a straight connector.

Direct-wired Connector, Pre-wired Connector, and Indicator-equipped (Light-ON when Not Operating) Switches (See note 1.)

AC



DC



■ Indicators

Indicator Covers

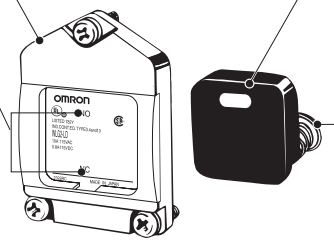
The indicator covered if outsert molded from diecast aluminum and has outstanding sealing properties.

Indicator Windows

Operation (i.e., light-ON when operating or light-ON when not operating) depends on whether a neon lamp or LED is used.

Light-ON when Operating/Not Operating

Indicators can be switched from light-ON when operating and light-ON when not operating, by simply rotating the indicator holder by 180°.
(Molded terminals cannot be switched in this way.)

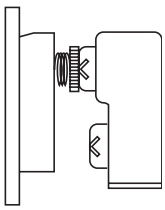


Indicator

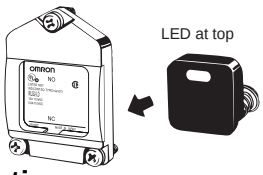
The indicator is either a neon lamp or an LED. Models with LED indicators have a built-in rectifier stack, so it is not necessary to change the polarity.

Contact Spring

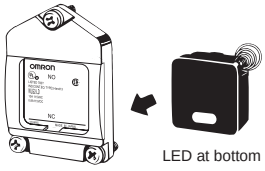
The built-in switch's terminal screws are used to connect the indicator terminal. Since the connection spring (coil spring) is used for this connection, it will not be necessary to connect the indicator terminal. When a ground terminal is provided however, a lead wire must be used.



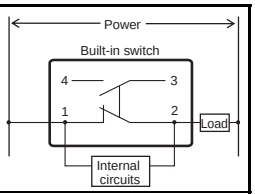
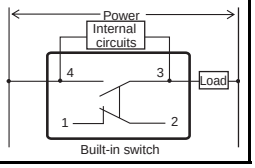
Light-ON when Operating



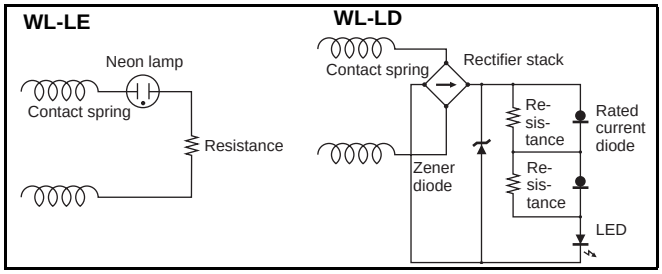
Light-ON when Not Operating



Operation

Light-ON when operating (See note 1.)	**WL-LE WL-LD**	
Light-ON when not operating (See note 2.)	**WL-LE WL-LD**	

Internal Circuits



Note: The indicator cover cannot be replaced on the molded terminals. In all cases the indicator does not light when the load is ON.

Note 1. Light-ON when operating means that the lamp lights when the Limit Switch contacts (NC) release, or when the actuator rotates or is pushed down.

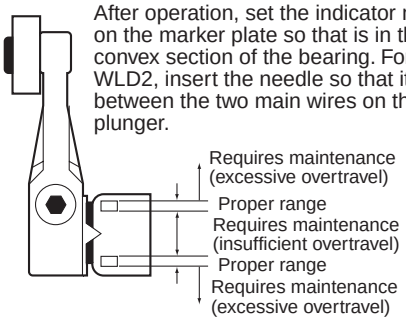
2. Light-ON when not operating means the lamp remains lit when the actuator is free, or when the Limit Switch contacts (NO) close when the actuator rotates or is pushed down.

Nomenclature

General-purpose Switches

Set Position Marker Plate

After operation, set the indicator needle on the marker plate so that is in the convex section of the bearing. For the WLD2, insert the needle so that it is between the two main wires on the plunger.



Actuator

Roller
The roller is made of self-lubricating sintered stainless steel and boasts high resistance to wear.

Lever
The lever forged of anti-corrosive aluminium alloy features high corrosion resistances and outstanding ruggedness. With roller lever, adjustable rod and flexible rod models, the actuator position can be set anywhere within 360°. (The lever cannot be mounted in the opposite direction.)

Head

The Head used in the roller lever type, adjustable rod lever type, or horizontal plunger type (except for 90° operation models) can be mounted in any of the four directions by removing the screws at the four corners of the Head.

Head-mounting Screws

Shaft Section Seal

By fitting an O-ring to the rotary shaft and with an appropriate interference of the screws, high-sealing properties are maintained.

Roller Lever Setscrew

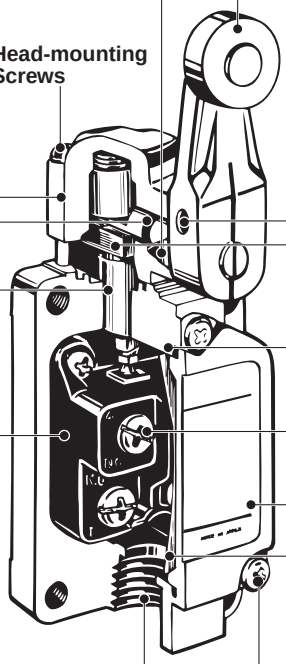
Operational Plunger (See note 2.)

Cover Seal

By using a packing seal as the cover seal, an optimum squeeze can be obtained and high sealing properties are assured as well.

Bearing

The bearing smooths the plunger movement.



Built-in Switch

Built-in switch with SPST-NO+NC contact form.

Terminal Screws

Four, M4 screws

Cover

Separator

The separator has outstanding insulation properties and prevents the generation of any gases which may corrode the internal parts.

Cover Setscrew

Phillips screws are used to ensure ease of use.

Conduit Opening (See note 1.)

The conduit threads are parallel threads for G $^{1}/_{2}$ tube and offer further increased sealing properties when used in conjunction with the SC connector.

Note 1. The display for conduit threads has changed from PF$^{1}/_{2}$ to G$^{1}/_{2}$, according to revisions of JIS B 0202. This is only a change in the display, so the thread size and pitch have not changed. (Conduit threads Pg 13.5 and $^{1}/_{2}$-14NPT are also available.)

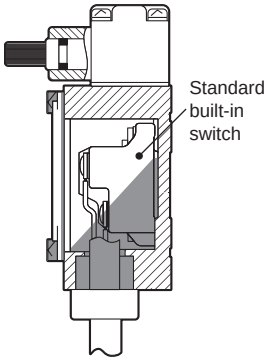
2. By changing the orientation of the operational plunger, three operational directions can be selected electrically. (This is possible only with standard roller lever, adjustable roller lever, and adjustable rod lever models. For the overtravel models, only 90° operation models have this function.)

Environment-resistant Switches

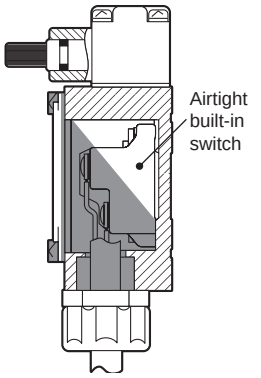
Mold Specifications for Hermetic Seal Switches

: Molded parts

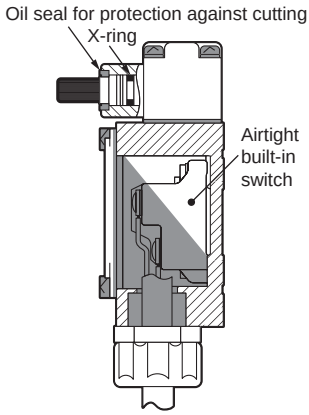
WL□-139



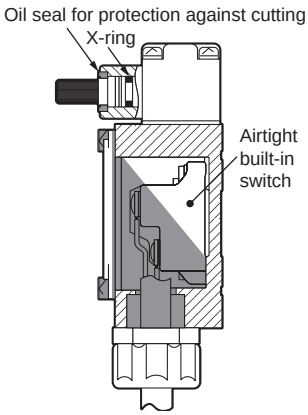
WL□-140



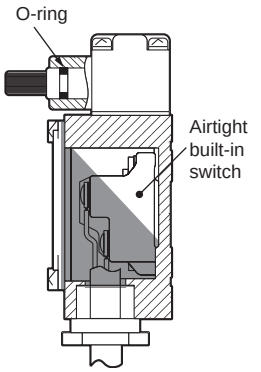
WL□-141



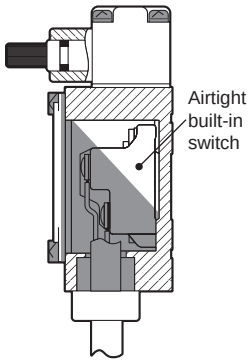
WL□-145



WL□-RP40



WL□-RP60



Note: Florine rubber is used for all rubber parts.

Model	Cable specifications
WL□-139	Standard 5-m VCT (vinyl cabtire cable) cable attached. Finished diameter: 11.5 mm, 4-core.
WL□-140 **WL□-141** **WL□-145** **WL□-RP40** **WL□-RP60**	Standard 5-m VCT cable, with high flexibility and good anti-oil properties attached. Finished diameter: 11.5 mm, 4-core.

Spatter-prevention Switches

Double Nut Lever

SUS304 is used for double nut.

Roller, Roller Axis

Using stainless steel prevents spatter from adhering.

Screws

SUS304 is used, preventing spatter from adhering.

Operating Lever

Melamine sinter-painted, it is easy to peel off the spatter.

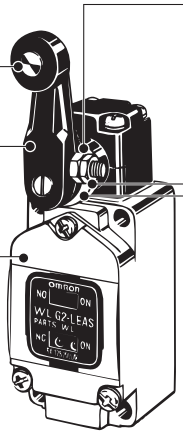
Head Cap

Using fluororesin prevents spatter from adhering.

Note: Spatter means the zinc powder produced when welding.
Adhering spatter to the Limit Switch may cause malfunction of lever or lamp cover.

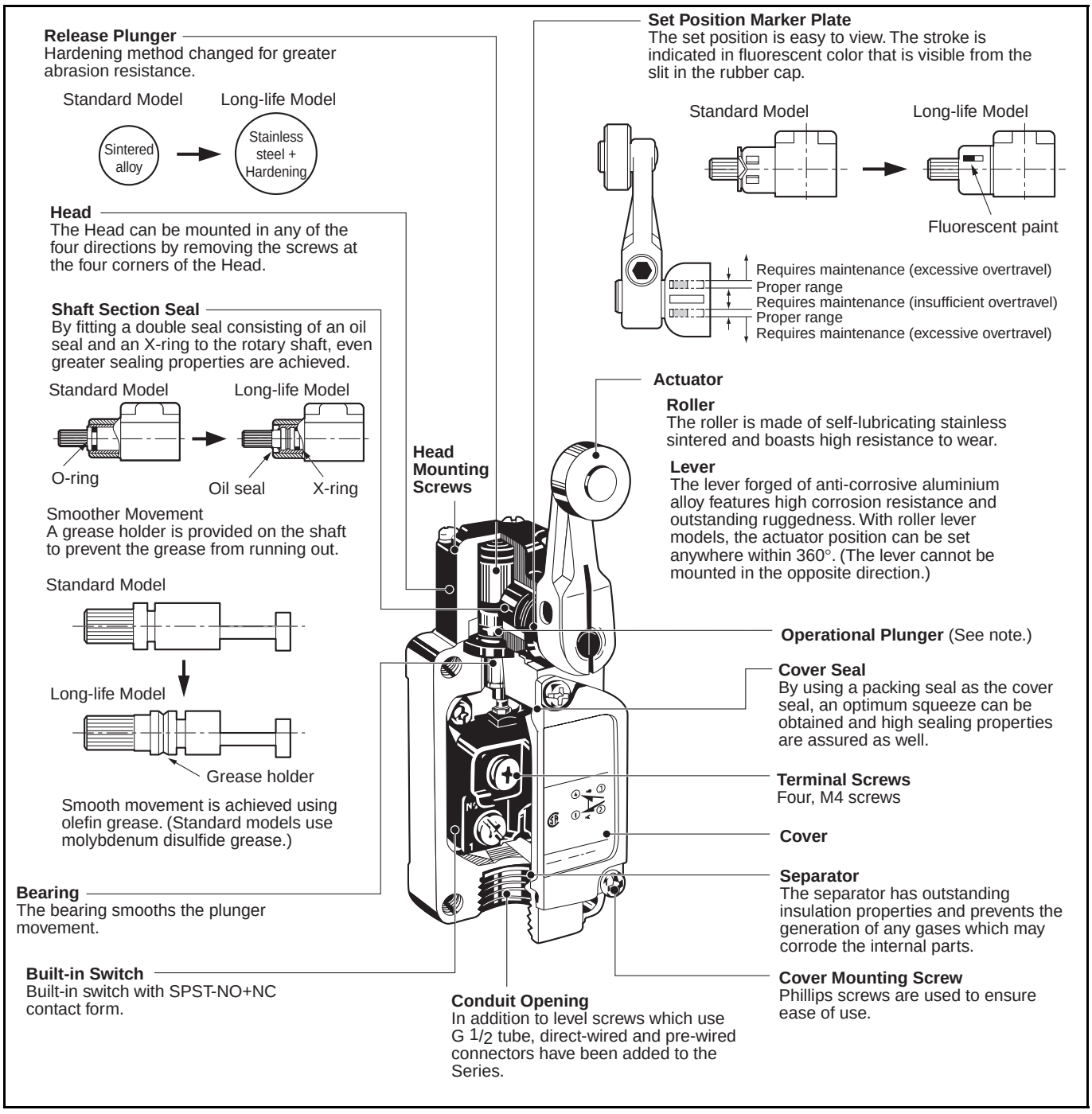
Lamp Cover

Heat-resistant resin is used for the lamp cover.
By using spherical surface for the display part, it disperses the direction of spatter.



The lack of gap prevents spatter powder from clogging.

Long-life Switches



Note: By changing the direction of the operational plunger, any one of the three operational directions (both sides, left, or right) can be selected. (Applicable only to the WLMGCA2-□.)

Dimensions

General-purpose Models

■ Standard Models

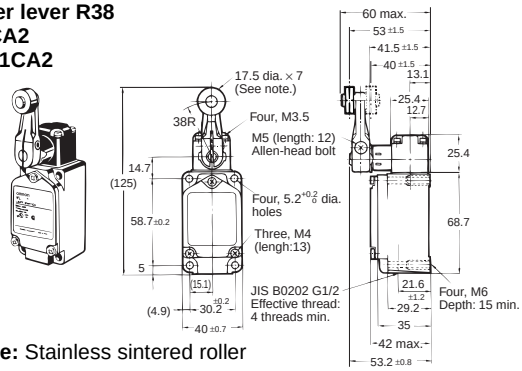
Basic

Rotating Lever

Note 1. Rotating Lever Models: For all models WL□ indicates a standard-load model and WL01□ indicates a microload model.

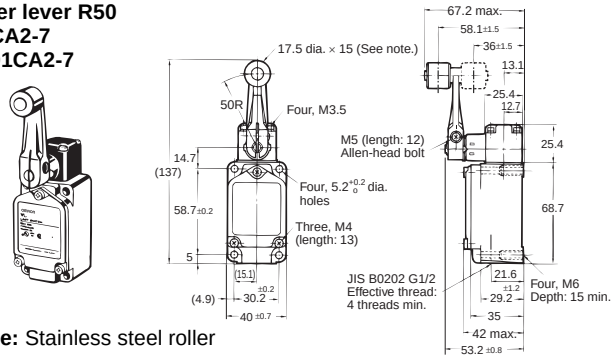
2. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

Roller lever R38
WLCA2
WL01CA2



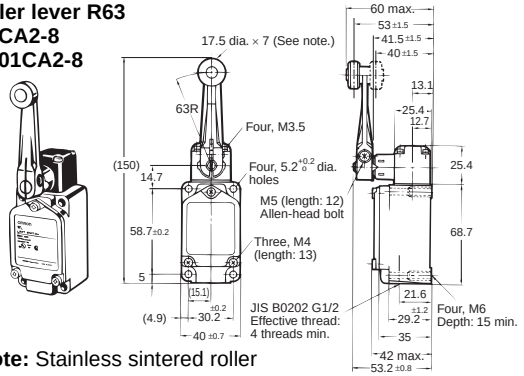
Note: Stainless sintered roller

Roller lever R50
WLCA2-7
WL01CA2-7



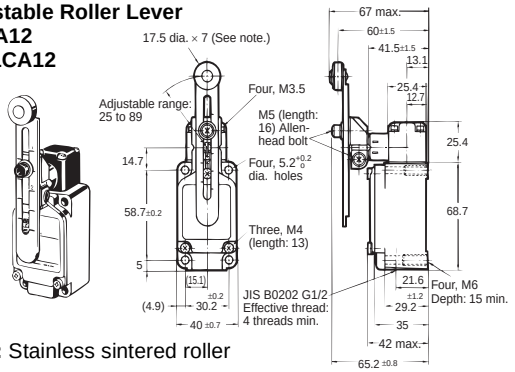
Note: Stainless steel roller

Roller lever R63
WLCA2-8
WL01CA2-8



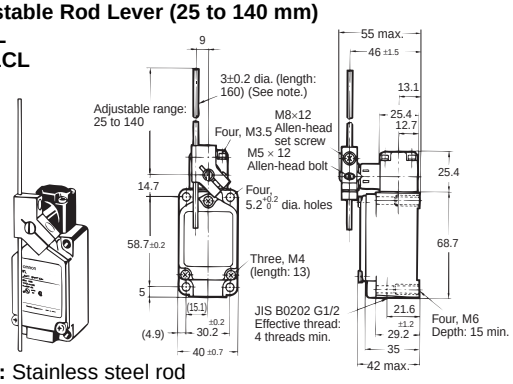
Note: Stainless sintered roller

Adjustable Roller Lever
WLCA12
WL01CA12



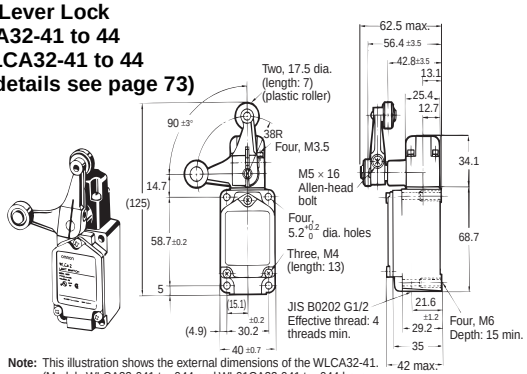
Note: Stainless sintered roller

Adjustable Rod Lever (25 to 140 mm)
WLCL
WL01CL



Note: Stainless steel rod

Fork Lever Lock
WLCA32-41 to 44
WL01CA32-41 to 44
(For details see page 73)



Note: This illustration shows the external dimensions of the WLCA32-41. (Models WLCA32-041 to -044 and WL01CA32-041 to -044 have stainless steel rollers.)

Operating characteristics	WLCA2 WL01CA2	WLCA2-7 WL01CA2-7	WLCA2-8 WL01CA2-8	WLCA12 WL01CA12 (See note 1.)	WLCL, WL01CL (See note 2.)
OF max.	13.34 N	10.2 N	8.04 N	13.34 N	1.39 N
RF min.	2.23 N	1.67 N	1.34 N	2.23 N	0.27 N
PT	15±5°	15±5°	15±5°	15±5°	15±5°
OT min.	30°	30°	30°	30°	30°
MD max.	12°	12°	12°	12°	12°

Operating characteristics	WLCA32-41 to 44, WL01CA32-41 to 44
Force necessary to reverse the direction of the lever: Max.	11.77 N
Movement until the lever reverses	50±5°
Movement until switch operation: Min.	55°
Movement after switch operation: Max.	35°

Note 1: The operating characteristics for WLCA12 and WL01CA12 are measured at the lever length of 38 mm.

2. The operating characteristics for WLCL and WL01CL are measured at the rod length of 140 mm.

OF and RF for WLCA12, with a lever length of 89 mm.

Operating characteristics	WLCA12, WL01CA12
OF	5.68 N
RF	0.95 N

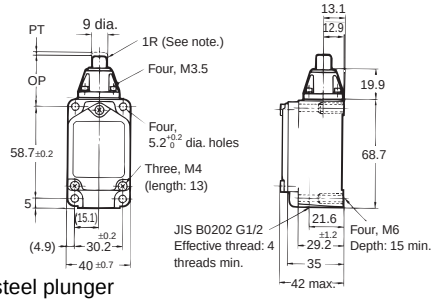
■ Standard Models

Basic

Plunger

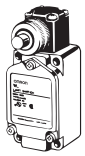
Note 1. For all models WL□ indicates a standard-load model and WL01□ indicates a microload model.
2. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

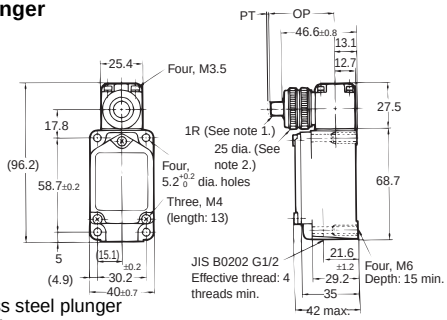
Top Plunger
WLD
WL01D



Note: Stainless steel plunger

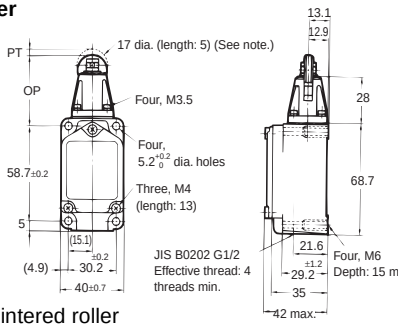
Horizontal Plunger
WLSD
WL01SD





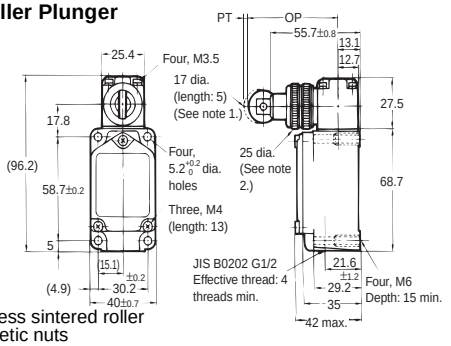
Note 1: Stainless steel plunger
2. Cosmetic nuts

Top-roller Plunger
WLD2
WL01D2



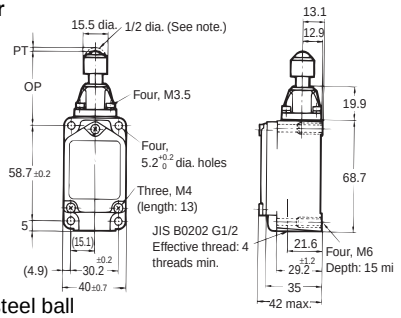
Note: Stainless sintered roller

Horizontal-roller Plunger
WLSD2
WL01SD2



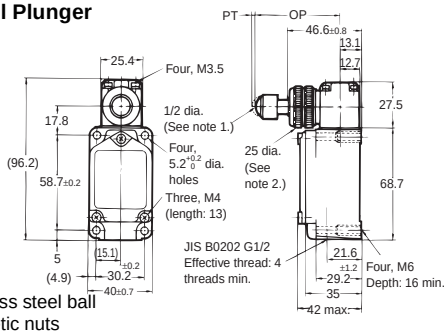
Note 1: Stainless sintered roller
2. Cosmetic nuts
3. The WLSD21 model, which has the roller rotated by 90° is also available.

Top-ball Plunger
WLD3
WL01D3



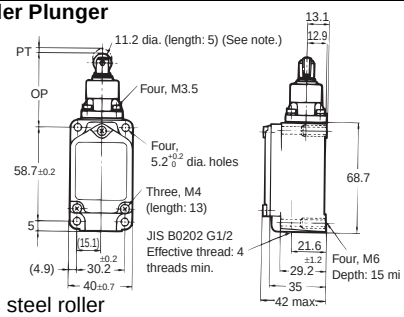
Note: Stainless steel ball

Horizontal-ball Plunger
WLSD3
WL01SD3



Note 1: Stainless steel ball
2. Cosmetic nuts

Sealed Top-roller Plunger
WLD28
WL01D28



Note: Stainless steel roller

Operating characteristics	WLD WL01D	WLD2 WL01D2	WLD3 WL01D3	WLD28 WL01D28	WLSD2 WL01SD2	WLSD3 WL01SD3	WLSD WL01SD
OF max.	26.67 N	26.67 N	26.67 N	16.67 N	40.03 N	40.03 N	40.03 N
RF min.	8.92 N	8.92 N	8.92 N	4.41 N	8.89 N	8.89 N	8.89 N
PT max.	1.7 mm	1.7 mm	1.7 mm	1.7 mm	2.8 mm	2.8 mm	2.8 mm
OT min.	6.4 mm	5.6 mm	4 mm	5.6 mm	5.6 mm	4 mm	6.4 mm
MD max.	1 mm	1 mm	1 mm	1 mm	1 mm	1 mm	1 mm
OP	34±0.8 mm	44±0.8 mm	44.5±0.8 mm	44±0.8 mm	54.2±0.8 mm	54.1±0.8 mm	40.6±0.8 mm
TTP max.	29.5 mm	39.5 mm	41 mm	39.5 mm	---	---	---

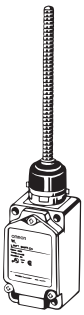
■ Standard Models

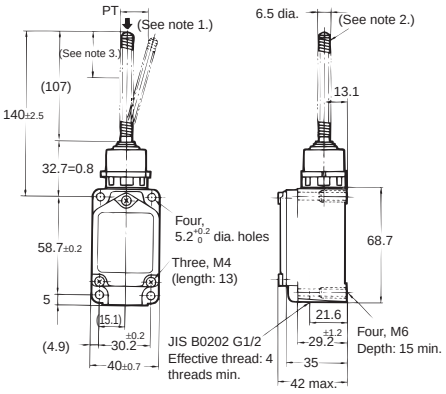
Basic

Flexible Rod

Note 1. For all models WL□ indicates a standard-load model and WL01□ indicates a microload model.
2. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

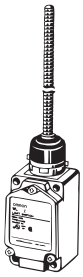
Coil Spring
WLNJ
WL01NJ

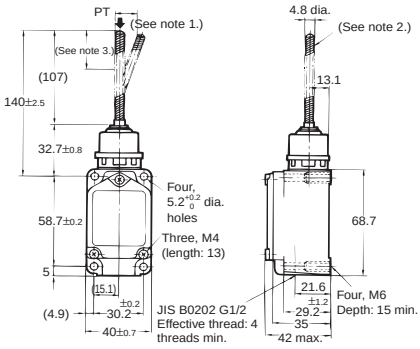




Note: 1. The coil spring may be operated from any direction except the axial direction (↓).
2. Stainless steel coil spring
3. Optimum operating range of the coil spring is within 1/3 of the entire length from the top end.

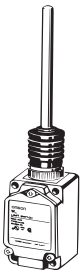
Coil Spring (Multi-wire)
WLNJ-30
WL01NJ-30

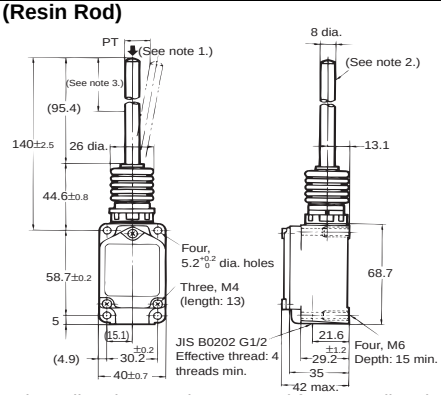




Note: 1. The coil spring may be operated from any direction except the axial direction (↓).
2. Piano wire coil
3. Optimum operating range of the coil spring is within 1/3 of the entire length from the top end.

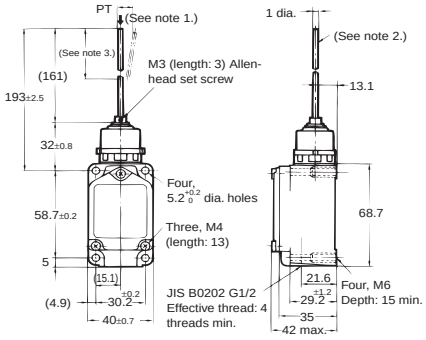
Coil Spring (Resin Rod)
WLNJ-2
WL01NJ-2





Note: 1. The coil spring may be operated from any direction except the axial direction (↓).
2. Polyamide resin rod
3. Optimum operating range of the rod is within 1/3 of the entire length from the top end.

Steel Wire
WLNJ-S2
WL01NJ-S2



Note: 1. The coil spring may be operated from any direction except the axial direction (↓).
2. Stainless steel wire
3. Optimum operating range of the wire is within 1/3 of the entire length from the top end.

Operating characteristics	WLNJ WL01NJ (See note.)	WLNJ30 WL01NJ30 (See note.)	WLNJ-2 WL01NJ-2 (See note.)	WLNJ-S2 WL01NJ-S2 (See note.)
OF max.	1.47 N	1.47 N	1.47 N	0.28 N
PT	20±10 mm	20±10 mm	40±20 mm	40±20 mm

Note: These values are taken from the top end of the wire or spring.

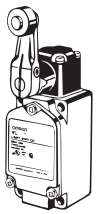
■ Standard Models

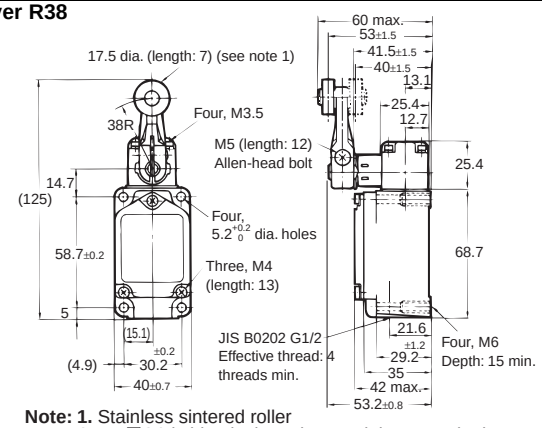
Overtravel

General-purpose/High-sensitivity Models

Note 1. For all models WL□ indicates a standard-load model and WL01□ indicates a microload model.
2. One-side operation is not possible with the general-purpose and high-sensitivity models.
3. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

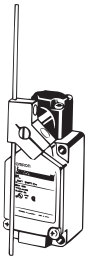
Roller Lever R38
WLH2
WL01H2
WLG2
WL01G2

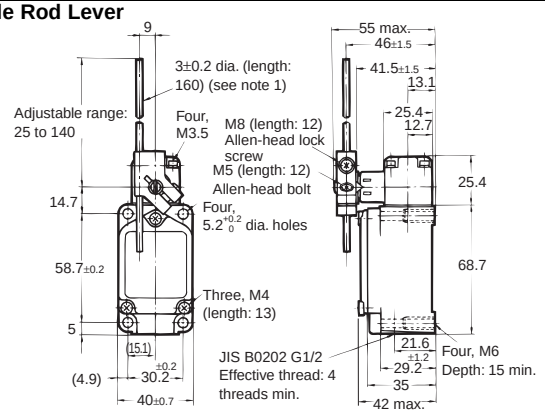




Note: 1. Stainless sintered roller
2. WL□G2 is identical to other models except in the shape of the set position marker plate.
3. The built-in switch for WLH2 is W-10FB3.
4. The built-in switch for WLG2 is W-10FB3-8.

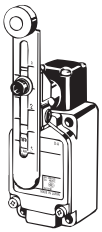
Adjustable Rod Lever
WLHL
WL01HL
WLGL
WL01GL

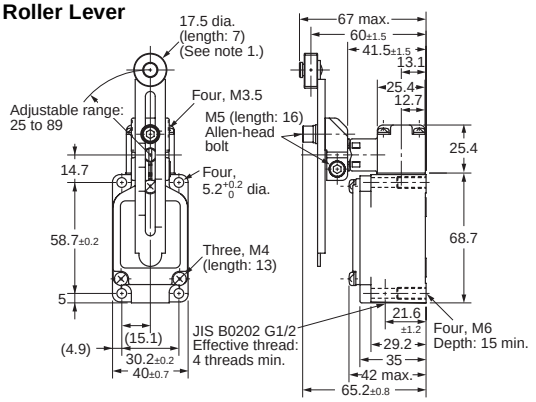




Note: 1. WL□GL is identical to other models except in the shape of the set position marker plate.
2. The built-in switch for WLHL is W-10FB3.
3. The built-in switch for WLGL is W-10FB3-8.

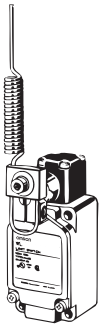
Adjustable Roller Lever
WLH12
WL01H12
WLG12
WL01G12

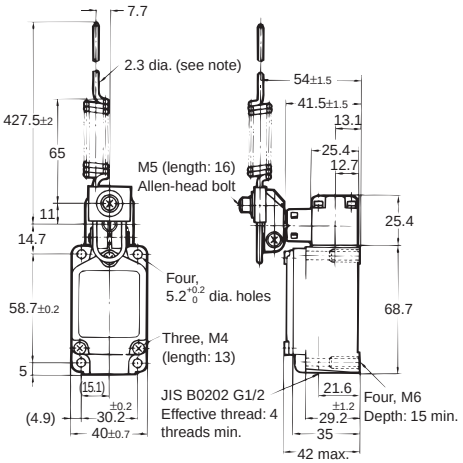




Note: 1. Stainless sintered roller
2. WL□G12 is identical to other models except in the shape of the set position marker plate.
3. The built-in switch for WLH12 is W-10FB3.
4. The built-in switch for WLG12 is W-10FB3-8.

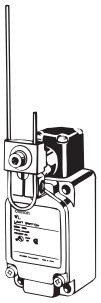
Rod Spring Lever
WLHAL5
WL01HAL5

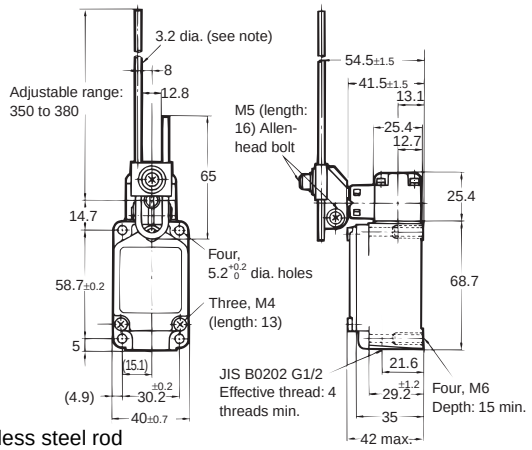




Note: Piano wire

Adjustable Rod Lever
WLHAL4
WL01HAL4





Note: Stainless steel rod

OF and RF for WLH12 and WL01H12, with a lever length of 89 mm.

Operating characteristics	WLH12, WL01H12	WLG12, WL01G12
OF	4.18 N	4.18 N
RF	0.42 N	0.42 N

Operating characteristics	WLH2 WL01H2	WLG2 WL01G2	WLH12 WL01H12 (See note 1.)	WLG12 WL01G12 (See note 1.)	WLHL WL01HL (See note 3.)	WLGL WL01GL (See note 3.)	WLHAL4 WL01HAL4 (See note 4.)	WLHAL5 WL01HAL5
OF max.	9.81 N	9.81 N	9.81 N	9.81 N	2.84 N	2.84 N	0.98 N	0.90 N
RF min.	0.98 N	0.98 N	0.98 N	0.98 N	0.25 N	0.25 N	0.15 N	0.09 N
PT	15±5°	$10^{\circ}{}^{+2^{\circ}}_{-1^{\circ}}$	15±5°	$10^{\circ}{}^{+2^{\circ}}_{-1^{\circ}}$	15±5°	$10^{\circ}{}^{+2^{\circ}}_{-1^{\circ}}$	15±5°	15±5°
OT min.	55°	65°	55°	65°	55°	65°	55°	55°
MD max.	12°	7°	12°	7°	12°	7°	12°	12°

Note 1. With WLHAL4, WL01HAL4, WLHAL5, and WL01HAL5, the actuator's tare is large, so depending on the installation direction, they may not be properly reset. Always install so that the actuator is facing downwards.

2. The operating characteristics of WLH12, WL01HL12, WLG12, and WL01G12 are measured at the lever length of 38 mm.

3. The operating characteristics of WLHL, WL01HL, WLGL, and WL01GL are measured at the rod length of 140 mm.

4. The operating characteristics of WLHAL4, and WL01HAL4 are measured at the rod length of 380 mm.

■ Standard Models

Overtravel

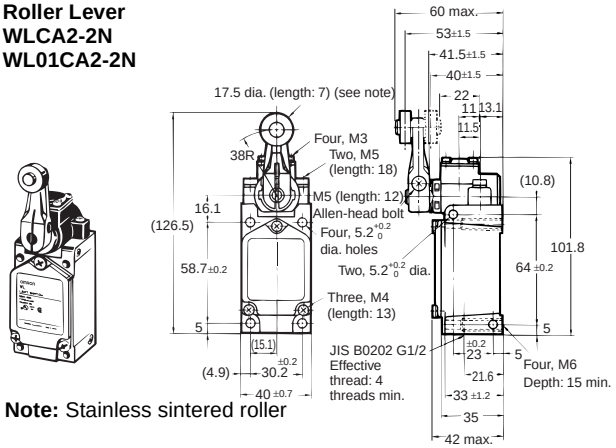
Side-installation Models

Note 1. For all models WL□ indicates a standard-load model and WL01□ indicates a microload model.

2. With the side-installation models, 90° operation on one side is possible by simply changing the direction of the cam.

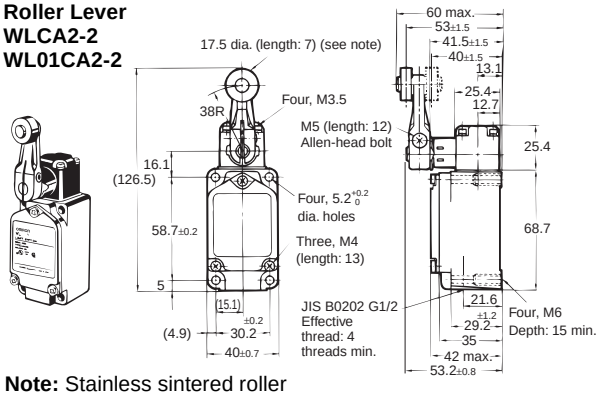
3. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

Roller Lever
WLCA2-2N
WL01CA2-2N



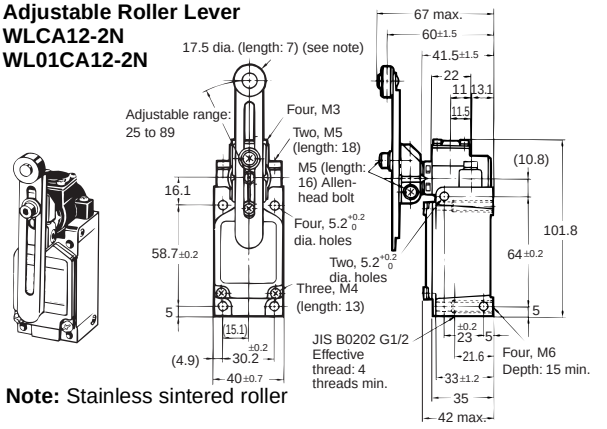
Note: Stainless sintered roller

Roller Lever
WLCA2-2
WL01CA2-2



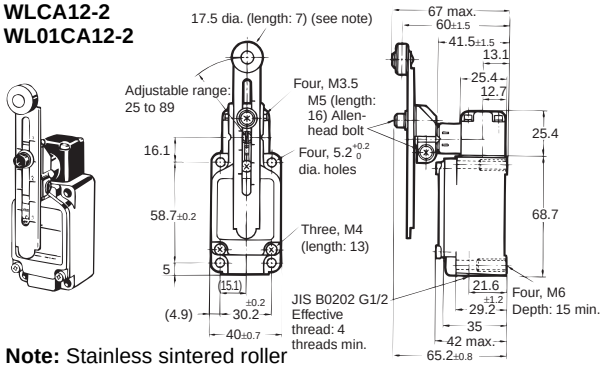
Note: Stainless sintered roller

Adjustable Roller Lever
WLCA12-2N
WL01CA12-2N



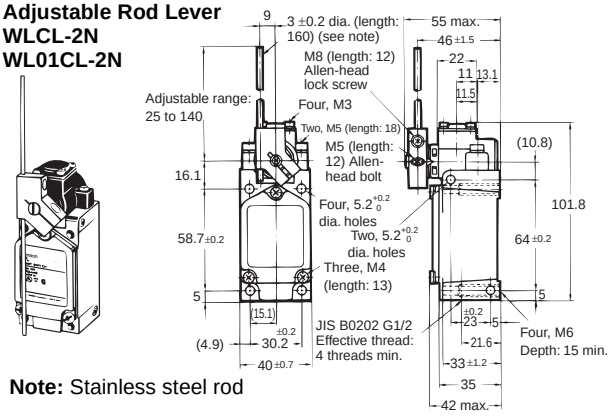
Note: Stainless sintered roller

Adjustable Roller Lever
WLCA12-2
WL01CA12-2



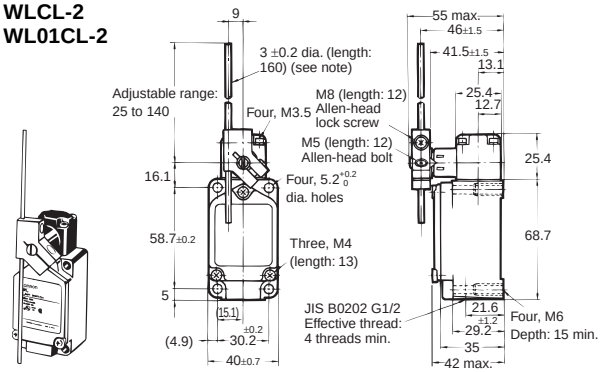
Note: Stainless sintered roller

Adjustable Rod Lever
WLCL-2N
WL01CL-2N



Note: Stainless steel rod

Adjustable Rod Lever
WLCL-2
WL01CL-2



Operating characteristics	WLCA2-2N WL01CA2-2N	WLCA12-2N WL01CA12-2N (See note 1.)	WLCL-2N WL01CL-2N (See note 2.)	WLCA2-2 WL01CA2-2	WLCA12-2 WL01CA12-2 (See note 1.)	WLCL-2 WL01CL-2 (See note 2.)
OF max.	9.61 N	9.61 N	2.84 N	8.83 N	8.83 N	2.55 N
RF min.	1.18 N	1.18 N	0.25 N	0.49 N	0.49 N	0.1 N
PT	20°	20°	20°	25°±5°	25°±5°	25°±5°
OT min.	70°	70°	70°	60°	60°	60°
MD max.	10°	10°	10°	16°	16°	16°

OF and RF for WLCA12-2N and WL01CA12-2N, with a lever length of 89 mm.

Operating characteristics	WLCA12-2N, WL01CA12-2N
OF	4.10 N
RF	0.50 N

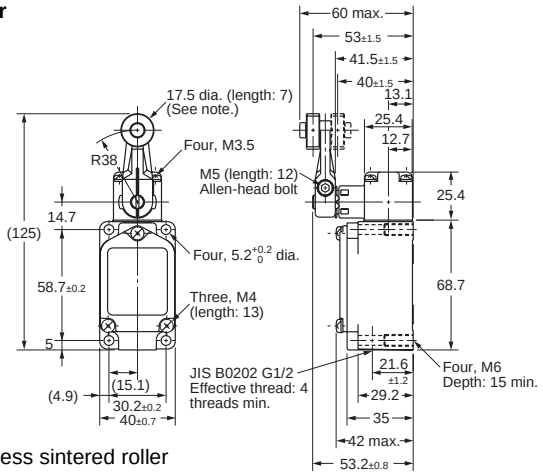
Note 1. The operating characteristics of WLCA12-2N and WL01CA12-2N are measured at the lever length of 38 mm.

2. The operating characteristics of WLCL-2N and WL01CL-2N are measured at the rod length of 140 mm.

High-precision Models

WL□ are Standard Models and WL01□ are Microload Models.

Roller Lever
WLGCA2
WL01GCA2



Note: Stainless sintered roller

Note: Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristics	WLGCA2 WL01GCA2
OF max.	13.34 N
RF min.	1.47 N
PT	5 +2° 0°
OT min.	40°
MD max.	3°

■ Sensor I/O Connector Switches

Direct-wired Connector/Prewired Connector Models

Note: Refer to page 188 for applicable Cables.

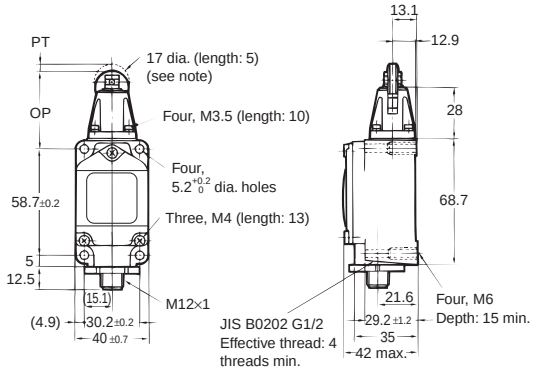
Top-roller Plunger

WLD2

Note 1. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

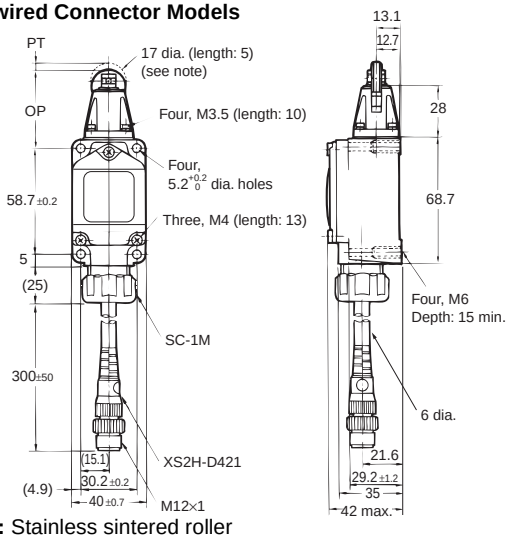
2. The following diagrams are for a indicator-equipped models.

Direct-wired Connector Models



Note: Stainless sintered roller

Pre-wired Connector Models



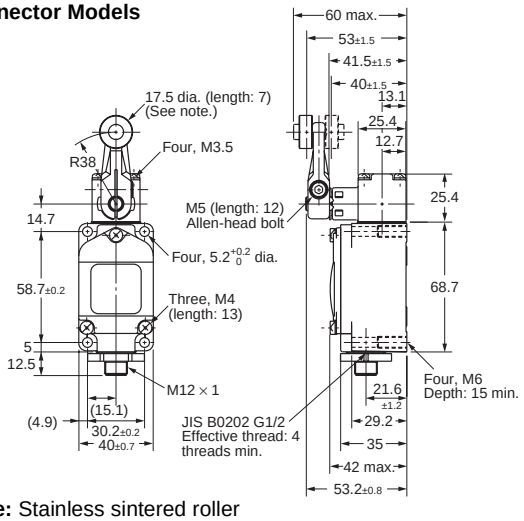
Note: Stainless sintered roller

Roller Lever Plungers

WL□ are Standard Models and WL01□ are Microload Models.

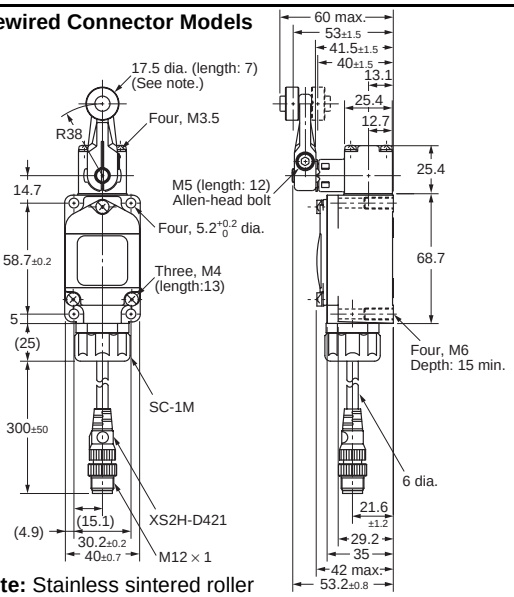
Standard Models (WLCA2), High-precision Models (WLGCA2), Overtravel General-purpose Models (WLH2), Overtravel High-sensitivity Models (WLG2)

Connector Models



Note: Stainless sintered roller

Prewired Connector Models



Note: Stainless sintered roller

Note 1. Only the dimension of the set position marker plate is different for WLG2 Models.

2. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

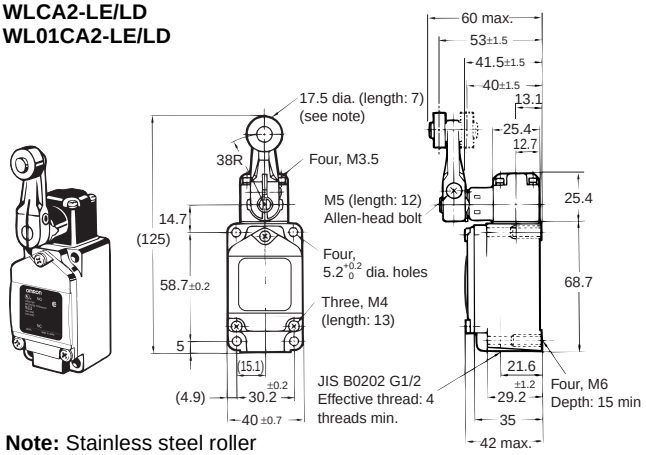
3. The models with operation indicators are shown in the above diagrams.

Operating characteristics	Standard roller lever actuator	High-precision roller lever actuator	Overdrive general-purpose actuator	Overdrive high-sensitivity actuator
OF max.	13.34 N	13.34 N	9.81 N	9.81 N
RF min.	2.23 N	1.47 N	0.98 N	0.98 N
PT max.	15±5°	5° +2° 0°	15±5°	10° +2° −1°
OT min.	30°	40°	55°	65°
MD max.	12°	3°	12°	7°

■ Indicator-equipped Models

Roller Lever

WLCA2-LE/LD
WL01CA2-LE/LD



Note: Stainless steel roller

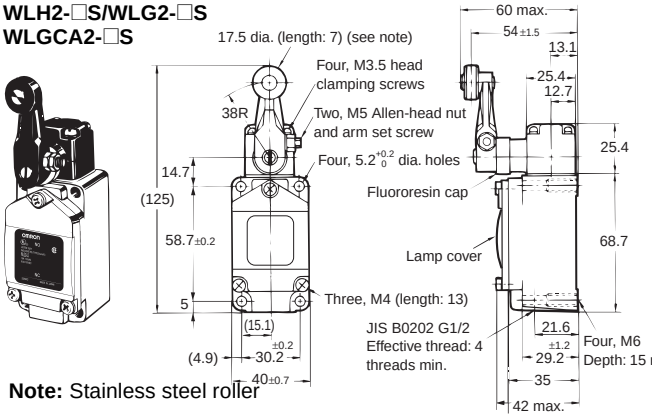
Note: Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristics	WLCA2-LE/LD WL01CA2-LE/LD
OF max.	13.34 N
RF min.	2.23 N
PT	15±5°
OT min.	30°
MD max.	12°

Spatter-prevention Models

Roller Lever (Screw Terminals)

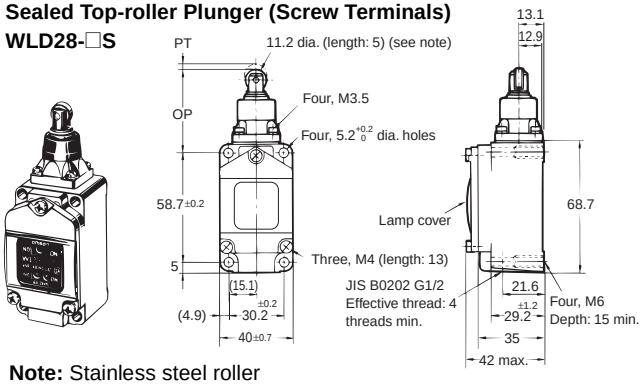
WLCA2-□S/WL01□-□S
WLH2-□S/WLG2-□S
WLGCA2-□S



Note: Stainless steel roller

Sealed Top-roller Plunger (Screw Terminals)

WLD28-□S

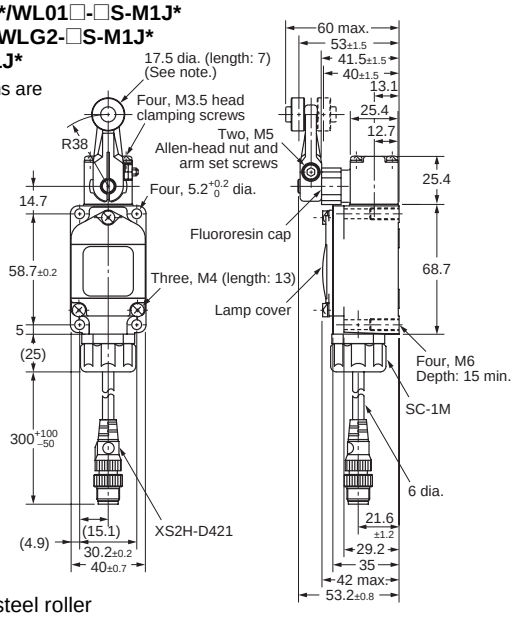


Note: Stainless steel roller

Roller Lever

WLCA2-□S-M1J*/WL01□-□S-M1J*
WLH2-□S-M1J*/WLG2-□S-M1J*
WLGCA2-□S-M1J*

*External dimensions are the same even for different core wires.

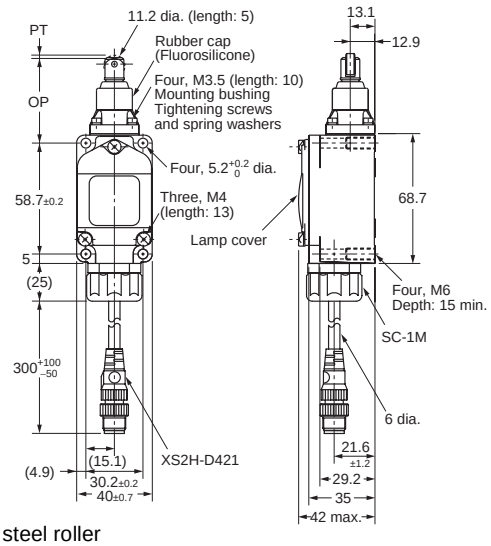


Note: Stainless steel roller

Sealed Top-roller Plunger

WLD28-□S-M1J*

*External dimensions are the same even for different core wires.



Note: Stainless steel roller

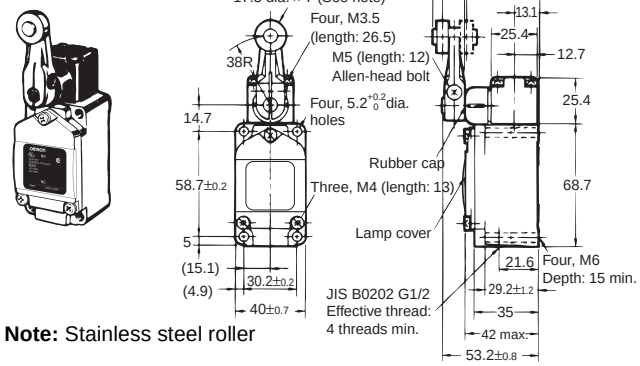
Note: Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristics	Roller Lever				Sealed Top-roller Plunger
	Basic	Overtravel models		High-precision	
		General-purpose	High-sensitivity		
OF max.	13.34 N	9.81 N	9.81 N	13.34 N	16.67 N
RF min.	2.23 N	0.98 N	0.98 N	1.47 N	4.41 N
PT	15°±5°	15°±5°	$10^{\circ}{}^{+2^{\circ}}_{-1^{\circ}}$	$10^{\circ}{}^{+2^{\circ}}_{-1^{\circ}}$	1.7 mm max.
OT min.	30°	55°	65°	40°	5.6 mm
MD max.	12°	12°	7°	3°	1 mm
OP	---	---	---	---	4±0.8 mm
TTP max.	---	---	---	---	39.5 mm

Long-life Models

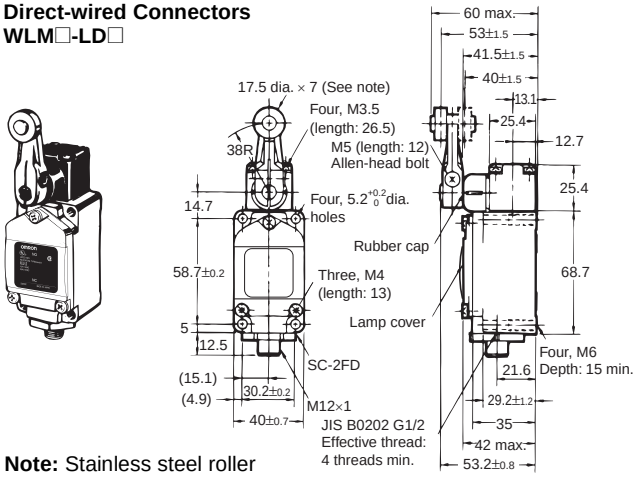
Rotating Lever Models

Screw Terminal
WLM□-LD



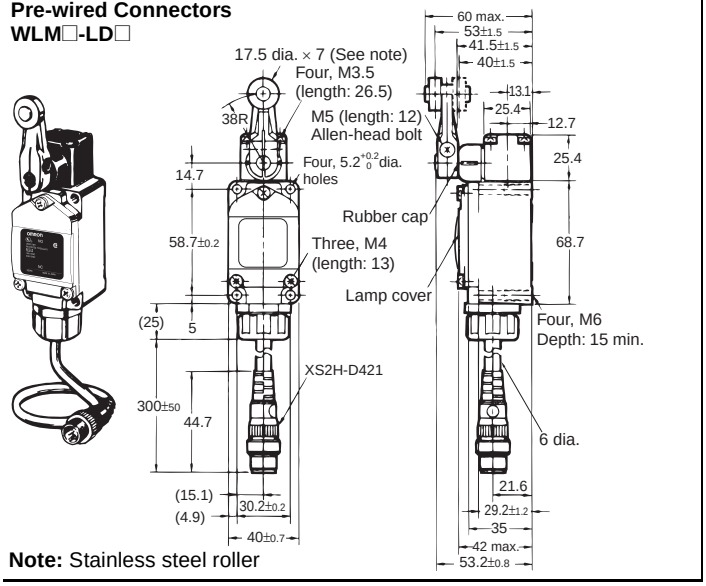
Note: Stainless steel roller

Direct-wired Connectors
WLM□-LD□



Note: Stainless steel roller

Pre-wired Connectors
WLM□-LD□



Note: Stainless steel roller

Note: Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristics	WLMCA2-LD□ Basic models	WLMH2-LD□ General-purpose overtravel models	WLMG2-LD□ High-sensitivity overtravel models	WLMGCA2-LD□ High-precision models
OF max.	9.81 N	9.81 N	9.81 N	13.34 N
RF min.	0.98 N	0.98 N	0.98 N	1.47 N
PT max.	15±5°	15±5°	$10^{\circ}{}^{+2^{\circ}}_{-1^{\circ}}$	$5^{\circ}{}^{+2^{\circ}}_{0^{\circ}}$
OT min.	30°	55°	65°	40°
MD max.	12°	12°	7°	3°

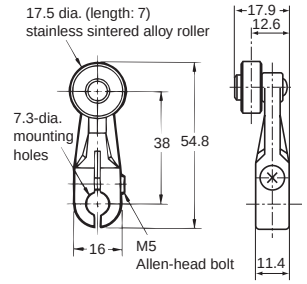
■ Actuators (Levers Only)

Note 1. Lever: Only rotating lever models are illustrated.

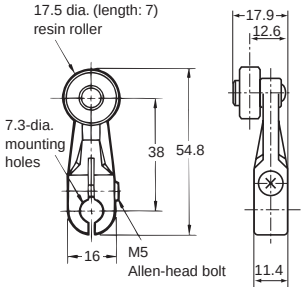
2. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

3. When using the adjustable roller (rod) lever, make sure that the lever is facing downwards. Use caution, as telegraphing (the Switch turns ON and OFF repeatedly due to inertia) may occur.

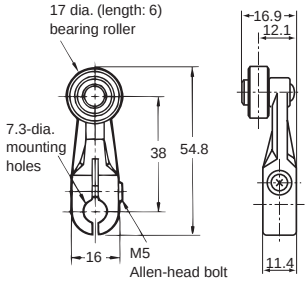
WL-1A100
Standard Lever



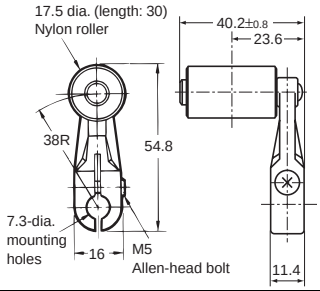
WL-1A115
Resin Roller



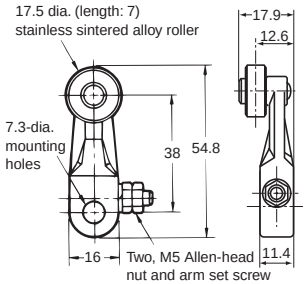
WL-1A400
Bearing Roller



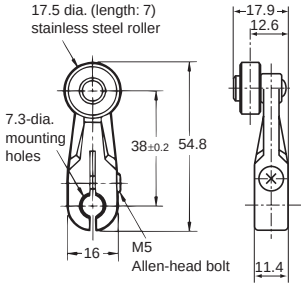
WL-1A118
Nylon Roller:
Roller Width: 30 mm



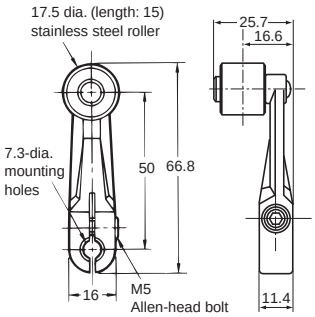
WL-1A105
Double Nut



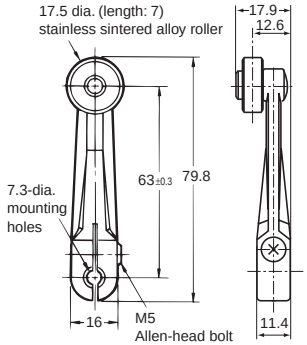
WL-1A103S
Spatter Prevention



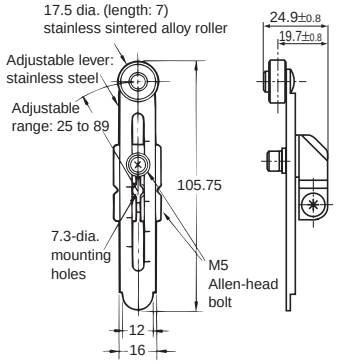
WL-1A200
Lever Length: 50
Roller Width: 15



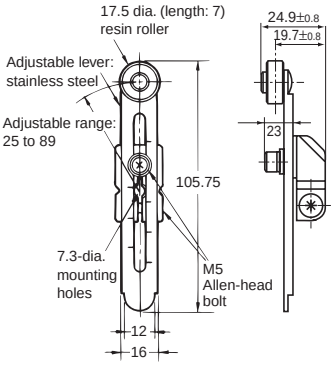
WL-1A300
Lever Length: 63



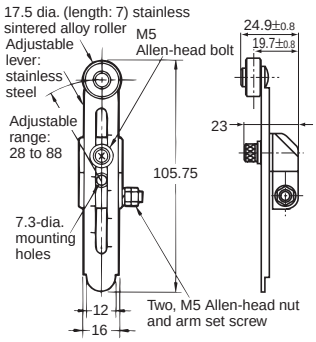
WL-2A100



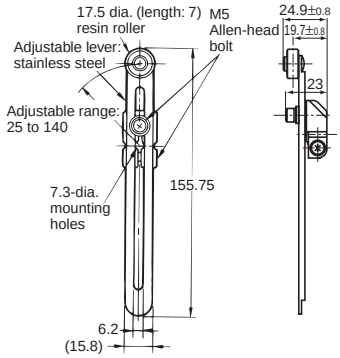
WL-2A111
Resin Roller



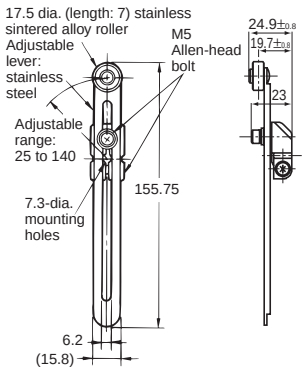
WL-2A107
Double Nut



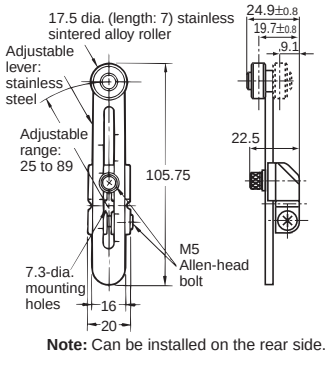
WL-2A108
Resin Roller



WL-2A122

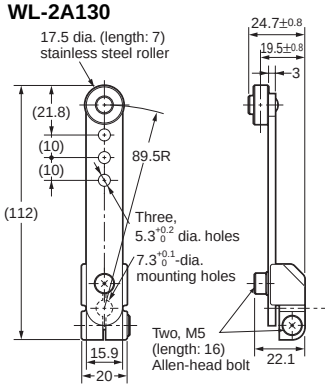


WL-2A106

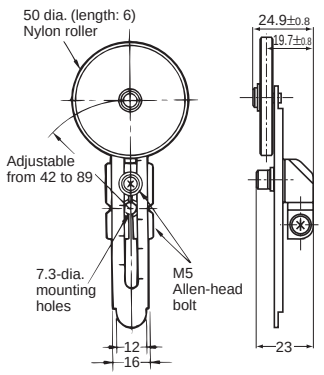


Note: Can be installed on the rear side.

WL-2A130



WL-2A104

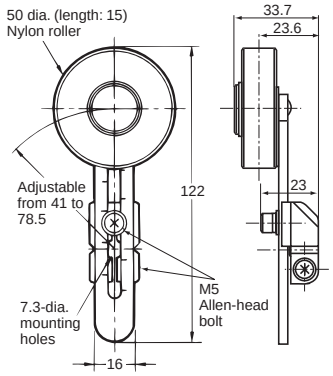


■ Actuators (Levers Only)

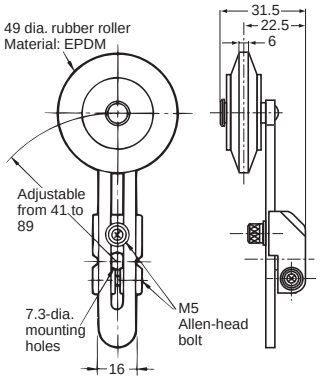
Note 1. Unless otherwise indicated, a tolerance of ±0.4 mm applies to all dimensions.

2. When using the adjustable roller (rod) lever, make sure that the lever is facing downwards. Use caution, as telegraphing (the Switch turns ON and OFF repeatedly due to inertia) may occur.

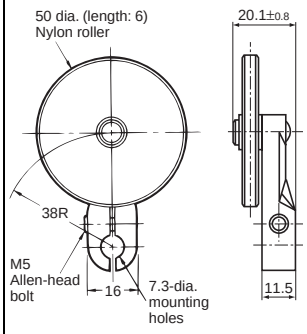
WL-2A110



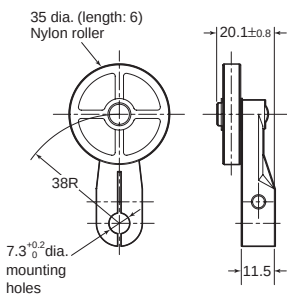
WL-2A105



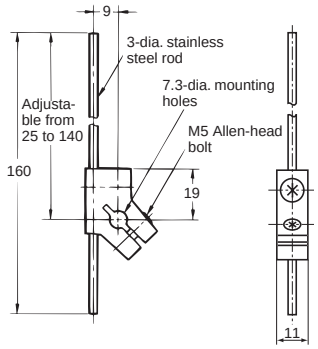
WL-1A106



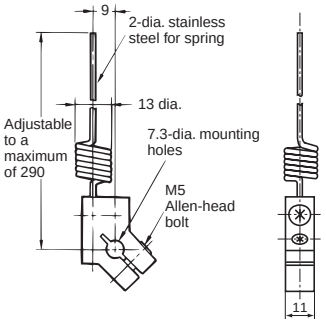
WL-1A110



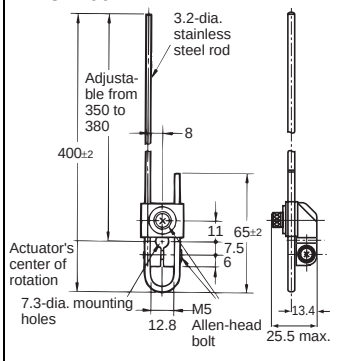
WL-4A100



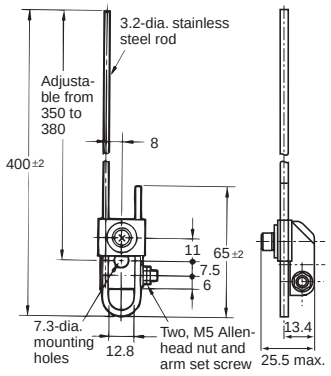
WL-4A201



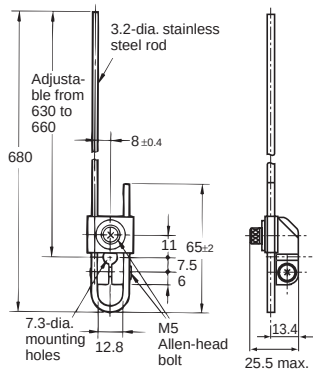
WL-3A100



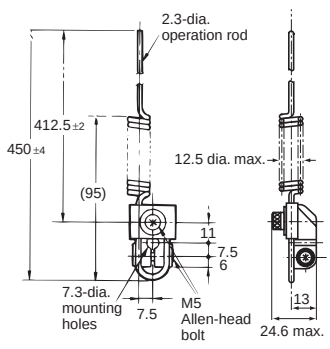
WL-3A106
Double Nut



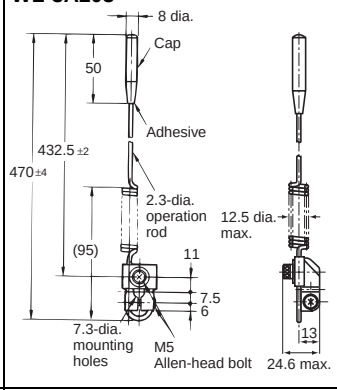
WL-3A108



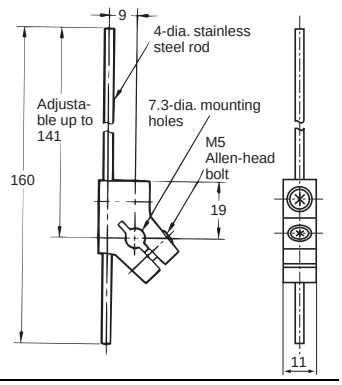
WL-3A200



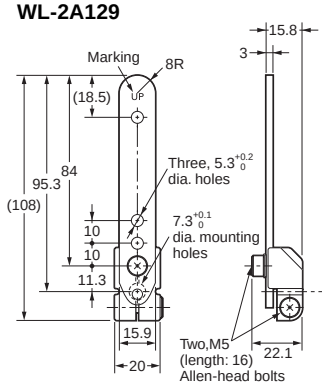
WL-3A203



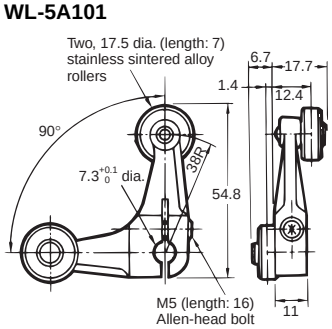
WL-4A112



WL-2A129

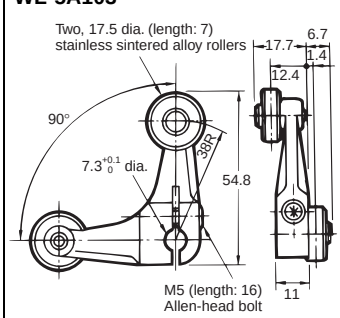


WL-5A101



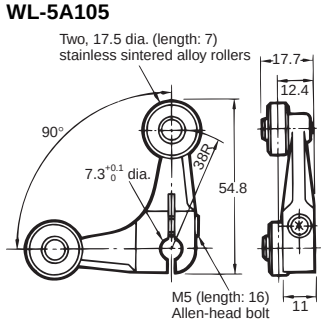
WL-5A100 has a plastic roller

WL-5A103



WL-5A102 has a plastic roller

WL-5A105



WL-5A104 has a plastic roller

Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

When a rod or wired-type actuator is used, do not touch the top end of the actuator. Doing so may result in injury.
Applicable models: WLHAL5 and WL01HAL5 Rod Spring Levers and WLNJ-S2 and WL01NJ-S2 Steel-wire Actuators.

A short-circuit may cause damage to the Switch, so insert a circuit breaker fuse, of 1.5 to 2 times the rated current, in series with the Switch.

In order to meet EN approval ratings, use a 10-A fuse that corresponds to IEC269, either a gI or gG for general-purpose types and spatter-prevention models only.

Precautions for Correct Use

When wiring terminal screws, use M4 round crimp terminals and tighten screws to the recommended torque. Wiring with bare wires, or incorrect crimp terminals, or not tightening screws to the recommended torque can lead to short-circuits, leakage current, and fire.

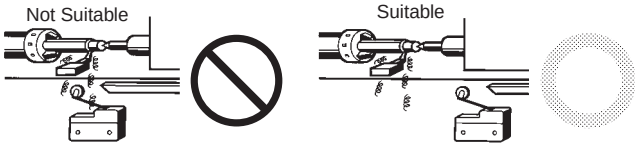
When performing internal wiring there is a chance of short-circuit, leakage current, or fire, so be sure to protect the inside of the Switch from splashes of oil or water, corrosive gases, and cutting powder.

Using an inappropriate connector or assembling Switches incorrectly (assembly, tightening torque) can result in malfunction, leakage current, or fire, so be sure to read the instruction manual thoroughly beforehand.

Even when the connector is assembled and set correctly, the end of the cable and the inside of the Switch may come in contact. This can lead to malfunction, leakage current, or fire, so be sure to protect the end of the cable from splashes of oil or water and corrosive gases.

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

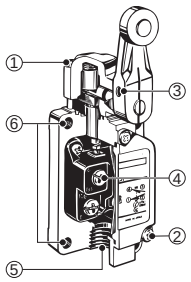
Built-in Switch

Do not remove or replace the built-in switch. If the position of the built-in switch moves, it can cause reduced performance, and if the insulation sheet moves (separator), the insulation may become ineffective.

Tightening Torque

If screws are too loose they can lead to an early malfunction of the Switch, so ensure that all screws are tightened using the correct torque.

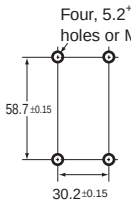
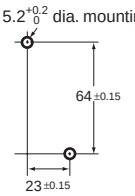
In particular, when changing the direction of the Head, make sure that all screws are tightened again to the correct torque. Do not allow foreign objects to fall into the Switch.



No.	Type	Torque
①	Head mounting screw	0.78 to 0.88 N·m
②	Cover mounting screw	1.18 to 1.37 N·m
③	Allen-head bolt (for securing the lever)	4.90 to 5.88 N·m
④	Terminal screw	0.59 to 0.78 N·m
⑤	Connector	1.77 to 2.16 N·m
⑥	Main Unit screws	4.90 to 5.88 N·m

Installing the Switch

To install the Switch, make a mounting panel, as shown in the following diagram, and tighten screws using the correct torque.

General-purpose Models, Spatter-prevention Models, and Long-life Models	Side installation for 90° Operation Models
	

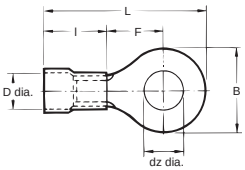
Connectors

Either the easy-to-use Allen-head nut or the SC Connector can be used as connectors. To ensure high-sealing properties, use the SC Connector. Consult your OMRON representative for details.

Wiring

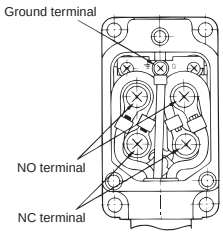
Use 1.25-mm lead wires and M4-insulation covered crimp terminals for wiring.

Crimp Terminal External Dimensions



dz dia.: 4.3
D dia.: 4.5
B: 8.5
L: 21.0
F: 7.8
ℓ: 9.0 (mm)

Wiring Method Switch Box Section



Note: The ground terminal is only installed on models with ground terminals.

Rotating Lever Set Position (General-purpose or Spatter-prevention Switches Only)

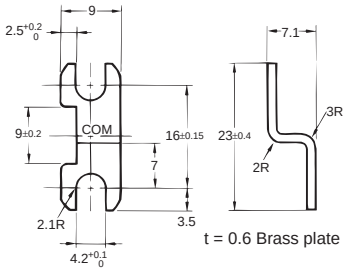
All rotating lever models, except the fork lever lock models, have a set position marker plate. (See page 54.) After operation, set the indicator needle on the marker plate so that is in the convex section of the bearing.

Operation Set Position (Long-life Switches Only)

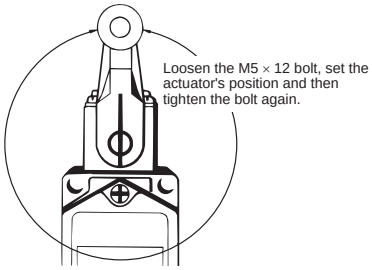
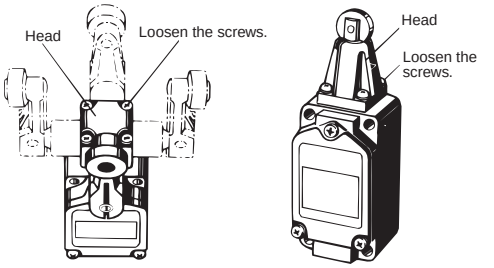
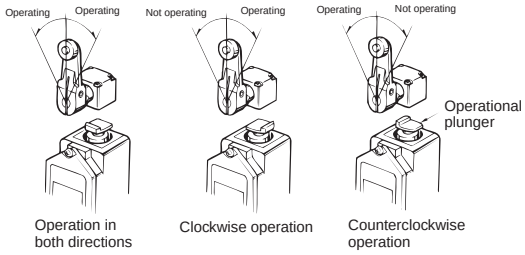
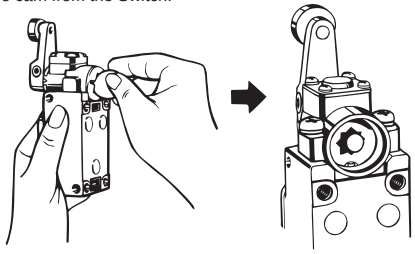
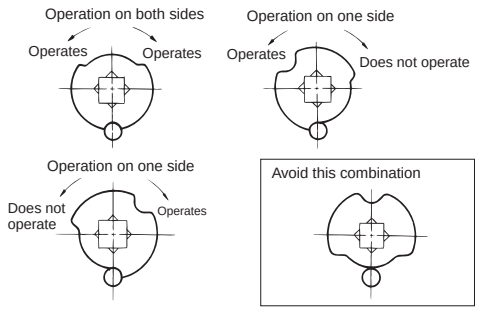
For all Long-life Switching, there is a set position marker slit on the rubber cap of the head. After operation, set the slit on the rubber cap so that the fluorescent color on the shaft section can be seen.

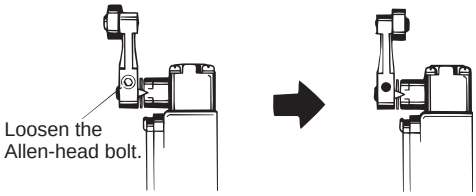
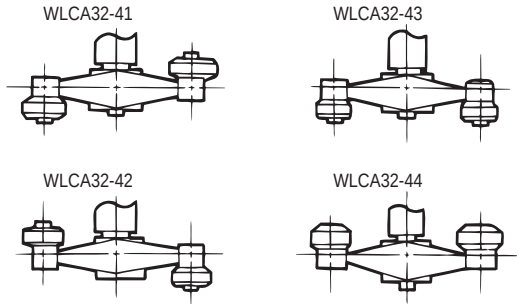
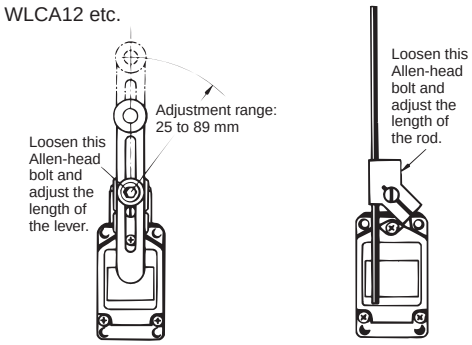
Terminal Plate

By using a short circuit plate, as shown in the following diagram, the Switch can be fabricated into a single-polarity double-break switch. When ordering, specify WL Terminal Plate (product code: WL-9662F).



Installation

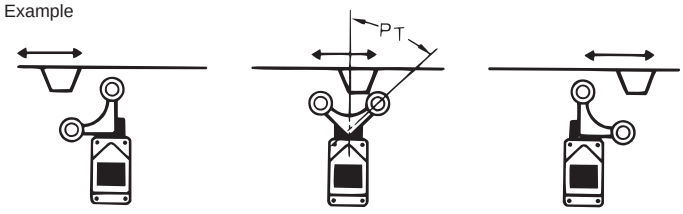
Item	Applicable models and Actuators	Details
Changing the Installation Position of the Actuator By loosening the Allen-head bolt on the actuator lever, the position of the actuator can be set anywhere within the 360°. With Indicator-equipped Switches, the actuator lever comes in contact with the top of the indicator cover, so use caution when rotating and setting the lever. When the lever only moves forwards and backwards, it will not contact the lamp cover (except for long-life models).	Roller Levers: WLCA2, WL01CA2, WLCA2-2, WL01CA2-2, WLH2,WL01H2, WLG2, WL01G2, WLMCA2□, WLMH2□, WLMG2□, WLMGCA2□ Adjustable Roller Levers: WLCA12, WL01CA12, WLCA12-2, WL01CA12-2, WLH12, WL01H12, WLG12, WL01G12, Adjustable Rod Levers: WLCL, WL01CL, WLCL-2, WL01CL-2, WLHL, WL01HL, WLGL, WL01GL	
Changing the Orientation of the Head By removing the screws in the four corners of the Head, the Head can be set in any of the four directions. Be sure to change the plunger for internal operations at the same time. (The operational plunger does not need to be changed on general-purpose and high-sensitivity overtravel models.) The roller plunger can be set in either two positions at 90°. WLCA2-2N and WL01CA2-2N can be set only in either the forward or backward direction.	Roller Levers: WLCA□, WL01CA□, WLCA□-2, WL01CA□-2, WLGCA□, WLMCA2□, WLMH2□, WLMG2□, WLMGCA2□ Adjustable Rod Levers: WLCL, WL01CL, WLCL-2, WL01CL-2 Horizontal Plungers: WLSD□, WL01SD□ Top-roller Plungers: WLD2, WL01D2 Sealed Top-roller Plungers: WLD28, WL01D28 **Note:** Does not include -RP60 Series or -141 Series.	
Changing the Operating Direction By removing the Head on models which can operate on one-side only, and then changing the direction of the operational plunger, one of three operating directions can be selected. For overtravel 90° operation models, one of three operating directions can be selected by loosening the rubber holder using either a coin or a flat-blade screwdriver and changing the direction of the internal rubber section. The tightening torque for the screws on the Head is 0.78 to 0.88 N·m.	Roller Levers: WLCA2, WL01CA2, WLGCA2, WLMGCA2□ Adjustable Roller Levers: WLCA12, WL01CA12 Adjustable Rod Levers: WLCL, WL01CL Overtravel Models: WLCA□-2N, WL01CA□-2N	One-side Operation for General-purpose and High-precision Switches The output of the Switch will be changed, regardless of which direction the lever is pushed. The output of the Switch will only be changed when the lever is pushed in one direction.  Cam Direction Changing Procedure for Overtravel, 90° Operation Switches Loosen the cam holder with a coin or screwdriver. Take out the cam from the Switch. Change the direction of the cam as required by your intended operation and then reinstall the cam.  Relationship of cam to operation as observed from the rear of Switch 

Item	Applicable models and Actuators	Details
Installing the Roller on the Inside By installing the roller lever in the opposite direction, the roller can be installed on the inside. (Set so that operation can be completed within a 180° level range.)	Roller Levers: WLCA□, WL01CA□, WLH□, WLCA□-2, WL01CA□-2, WLMCA2□, WLMH2□, WLMG2□, WLMGCA2□, WLG□, except for the adjustable roller levers. Fork Lever Locks: WLCA32-4□, WL01CA32-4□	
Selecting the Roller Position There are four types of fork lever lock for use depending on the roller position.	Fork Lever Locks: WLCA32-4□, WL01CA32-4□	 **Note:** An explanation of the operation of fork lever locks is provided after this table.
Adjusting the Length of the Rod or Lever The length of the rod or lever can be adjusted by loosening the Allen-head bolt.	Adjustable Roller Levers: WLCA12, WL01CA12 etc. Adjustable Rod Levers: WLCL, WL01CL, etc.	

■ Operation of Fork Lever Locks

The fork lever lock is configured so that the dog pushes the lever to reverse the output and this reversed state is maintained even after the dog continues on. If the dog then pushes the lever from the opposite direction, the lever will return to its original position.

Example



NC terminal: ON NO terminal: ON NO terminal: ON

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C133-E1-02

General-purpose Limit Switch
D4A-□N

The Limit Switch with Better Seal, Shock Resistance, and Strength

- A double seal on the head, a complete gasket cover, and other features ensure a better seal (meets UL NEMA 3, 4, 4X, 6P, 12, 13).
- Block mounting method to reduce weight to 290 g.
- Block mounting method also reduces downtime for maintenance.
- Wide standard operating temperature range: –40°C to 100°C (standard type).
- Models with fluoro-rubber available for greater resistance to chemicals.
- DPDT, double-break models available for complex operations.
- Approved by UL, CSA, and CCC (Chinese standard).

Model Number Structure

■ Model Number Legend

D4A-□□□□N
1 2 3

1. Receptacle Box
- 1: 1/2-14 NPT conduit (SPDT, double-break)
- 2: 1/2-14 NPT conduit (DPDT, double-break)
- 3: G 1/2 conduit (SPDT, double-break)
- 4: G 1/2 conduit (DPDT, double-break)

2. Switch Box
- 1: SPDT, double-break, without indicator
- 3: SPDT, double-break, neon lamp
- E: SPDT, double-break, LED (24 VDC, leakage current: 1.3 mA)
- 5: DPDT, double-break, simultaneous operation, without indicator
- 7: DPDT, double-break, sequential operation, without indicator (See note 1.)
- 9: DPDT, double-break, center neutral operation, without indicator (See note 2.)
- L: DPDT, double-break, simultaneous operation, neon lamp
- P: DPDT, double-break, simultaneous operation, LED

3. Head
- 01: Roller lever, standard
- 02: Roller lever, high-sensitivity
- 03: Roller lever, low torque
- 04: Roller lever, high-sensitivity, low torque
- 05: Roller lever, maintained
- 17: Roller lever, sequential operation
- 18: Roller lever, center neutral operation
- 06: Side plunger, standard
- 07-V: Side plunger, vertical roller
- 07-H: Side plunger, horizontal roller
- 08: Side plunger, adjustable
- 09: Top plunger, standard
- 10: Top plunger, roller
- 11: Top plunger, adjustable
- 12: Flexible rod, spring wire
- 14: Flexible rod, plastic rod
- 15: Flexible rod, cat whisker
- 16: Flexible rod, coil spring

Note: 1. Use the D4A-0017N Special Head.
2. Use the D4A-0018N Special Head.
3. Fluoro-rubber sealed type is also available.

Ordering Information

■ List of Models

SPDT, Double-break Switches

Actuator	Receptacle box / Indicator	G 1/2 Conduit				
		Without indicator		With neon lamp indicator (AC)		With LED indicator (DC)
		Model	Approved standards	Model	Approved standards	Model
Roller lever (See note 1.)	Standard	D4A-3101N	UL, CSA	D4A-3301N	UL, CSA	D4A-3E01N
	High-sensitivity	D4A-3102N	UL, CSA	D4A-3302N	UL, CSA	D4A-3E02N
	Low-torque	D4A-3103N	UL, CSA	---	UL, CSA	---
	High-sensitivity, Low-torque	D4A-3104N	UL, CSA	D4A-3304N	UL, CSA	---
	Maintained (See note 2.)	D4A-3105N	UL, CSA	D4A-3305N	UL, CSA	D4A-3E05N
Side plunger	Standard	D4A-3106N	UL, CSA	---	UL, CSA	---
	Vertical roller	D4A-3107-VN	UL, CSA	D4A-3307-VN	UL, CSA	D4A-3E07-VN
	Horizontal roller	D4A-3107-HN	UL, CSA	D4A-3307-HN	UL, CSA	---
	Adjustable	D4A-3108N	UL, CSA	D4A-3308N	UL, CSA	D4A-3E08N
Top plunger	Standard	D4A-3109N	UL, CSA	D4A-3309N	UL, CSA	---
	Roller	D4A-3110N	UL, CSA	D4A-3310N	UL, CSA	---
	Adjustable	D4A-3111N	UL, CSA	D4A-3311N	UL, CSA	---
Flexible rod	Spring wire	D4A-3112N	UL, CSA	D4A-3312N	UL, CSA	D4A-3E12N
	Plastic rod	D4A-3114N	UL, CSA	D4A-3314N	UL, CSA	D4A-3E14N
	Cat whisker	D4A-3115N	UL, CSA	D4A-3315N	UL, CSA	D4A-3E15N
	Coil spring	D4A-3116N	UL, CSA	D4A-3316N	UL, CSA	D4A-3E16N

Note: 1. The lever is not included with the Roller Level Models. Select the lever from those listed in this data sheet and order it separately (refer to *Levers* on pages 92 and 93).

2. The Maintained Switches have a lock mechanism for the switch operation and thus use a Fork Lever Lock.

3. Switches are also available with □1/2-14 NPT conduits. The model numbers correspond as follows:

G 1/2 Conduits	1/2-14 NPT Conduits
D4A-3□□□N	D4A-1□□□N
D4A-4□□□N	D4A-2□□□N

4. Switches are also available with fluoro-rubber seals for higher resistance to chemicals. (The operating temperature range for these Switches, however, is –10 to 120°C.) Add "-F" to the model number. (Example: D4A-3101N becomes D4A-3101N-F.) Ask your nearest OMRON representative for details.

DPDT, Double-break Switches

Actuator	Receptacle box / Indicator	G 1/2 Conduit				
		Without indicator		With neon lamp indicator (AC)		With LED indicator (DC)
		Model	Approved standards	Model	Approved standards	Model
Roller lever (See note 1.)	Standard	D4A-4501N	UL, CSA	D4A-4L01N	UL, CSA	D4A-4P01N
	High-sensitivity	D4A-4502N	UL, CSA	---	---	---
	Low-torque	D4A-4503N	UL, CSA	---	---	---
	High-sensitivity, Low-torque	D4A-4504N	UL, CSA	---	---	---
	Maintained (See note 2.)	D4A-4505N	UL, CSA	---	---	---
	Sequential operation	D4A-4717N	UL, CSA	---	---	---
	Center neutral operation	D4A-4918N	UL, CSA	---	---	---
Side plunger	Standard	D4A-4506N	UL, CSA	---	---	---
	Vertical roller	D4A-4507-VN	UL, CSA	---	---	---
	Horizontal roller	D4A-4507-HN	UL, CSA	---	---	---
	Adjustable	D4A-4508N	UL, CSA	---	---	---
Top plunger	Standard	D4A-4509N	UL, CSA	---	---	---
	Roller	D4A-4510N	UL, CSA	D4A-4L10N	UL, CSA	D4A-4P10N
	Adjustable	D4A-4511N	UL, CSA	---	---	---
Flexible rod	Spring wire	D4A-4512N	UL, CSA	---	---	---
	Plastic rod	D4A-4514N	UL, CSA	---	---	---
	Cat whisker	D4A-4515N	UL, CSA	---	---	---
	Coil spring	D4A-4516N	UL, CSA	---	---	---

Note: 1. The lever is not included with the Roller Level Models. Select the lever from those listed in this data sheet and order it separately (refer to *Levers* on pages 92 and 93).

2. The Maintained Switches have a lock mechanism for the switch operation and thus use a Fork Lever Lock.

3. Switches are also available with □1/2-14 NPT conduits. The model numbers correspond as follows:

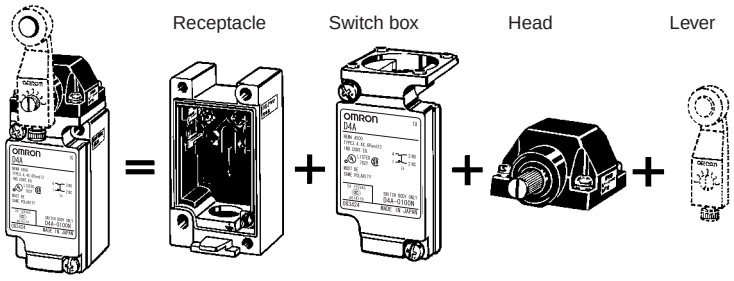
G 1/2 Conduits	1/2-14 NPT Conduits
D4A-3□□□N	D4A-1□□□N
D4A-4□□□N	D4A-2□□□N

4. Switches are also available with fluoro-rubber seals for higher resistance to chemicals. (The operating temperature range for these Switches, however, is –10 to 120°C.) Add "-F" to the model number. (Example: D4A-4501N becomes D4A-4501N-F.) Ask your nearest OMRON representative about delivery times and prices.

Individual Parts

Replacement of Parts

Because the D4A-□N employs block mounting construction, the switch box, receptacle, and operating head may be ordered as a complete assembly or individually as replacement parts.



D4A-1101N D4A-1000N D4A-0100N D4A-0001N

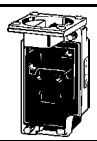
Levers for Roller Lever Switches are optionally available. Select the lever from those listed in this datasheet and order (refer to *Levers* on pages 92 and 93).

Receptacle Box

Type	Appearance	1/2-14NPT conduit (See note 2.)		G1/2 conduit (See note 1.)	
		Model	Approved standards	Model	Approved standards
SPDT double-break		D4A-1000N	UL, CSA	D4A-3000N	UL, CSA
DPDT double-break		D4A-2000N	UL, CSA	D4A-4000N	UL, CSA

Note: 1. M6-screw mounting (standard mounting)
2. 10-32UNF-screw mounting (standard mounting)

Switch Box

Type	Appearance		Without indicator		With neon lamp indicator (AC)		With LED indicator (DC)
			Model	Approved standards	Model	Approved standards	Model
SPDT double-break	 (Without indicator lamp)		D4A-0100N	UL, CSA	D4A-0300N	UL, CSA	D4A-0E00N
DPDT double-break	 (Without indicator lamp)	Simultaneous operation	D4A-0500N	UL, CSA	D4A-0L00N	---	D4A-0P00N
		Sequential operation	D4A-0700N	UL, CSA	---	---	---
		Center neutral operation	D4A-0900N	UL, CSA	---	---	---

Heads

Type	Appearance	Approved standards
Roller lever (See note 1.)	 Standard: D4A-0001N High-sensitivity: D4A-0002N Low torque: D4A-0003N (see note 2) Sequential operation: D4A-0017N (see note 3) Center neutral operation: D4A-0018N (see note 3)	UL, CSA
	 Maintained: D4A-0005N	UL, CSA
Side plunger	 Standard: D4A-0006N  Horizontal roller: D4A-0007-HN  Vertical roller: D4A-0007-VN  Side adjustable: D4A-0008N	UL, CSA
Top plunger	 Standard: D4A-0009N  Roller plunger: D4A-0010N  Plunger adjustable: D4A-0011N	UL, CSA
Flexible rod	 Spring wire D4A-0012N  Plastic rod D4A-0014N  Cat whisker D4A-0015N  Coil spring D4A-0016N	UL, CSA

Note: 1. Levers for Roller Lever Switches are optionally available. Select the lever from those listed in this data sheet and order (refer to *Levers* on pages 92 and 93).

2. The D4A-C00 adjustable roller lever is too heavy and long for these heads and it should not be used or mechanical malfunction will result.

3. These heads cannot be used for double break operations.

Levers

Actuator type	Model
Roller Lever	D4A-A00
	D4A-A10
	D4A-A20
	D4A-A30
	D4A-B06
Adjustable Roller Lever	D4A-C00
	D4A-D00
Resin Loop Lever	D4A-F00
Fork Lever Lock	D4A-E30
	D4A-E20
	D4A-E10
	D4A-E00

Note: Refer to page 92 for Lever shapes and applicable models.

Specifications

■ Approved Standards

Agency	Standard	File No.
UL	UL508	E76675
CSA	CSA C22.2 No. 14	LR45746
CCC (CQC)	GB14048.5	2003010305077615

Note: Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL/CSA

A600

D4A-□1□□N (SPDT, Double-break, Without Indicator)

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC 240 VAC 480 VAC 600 VAC	10 A	60 A 30 A 15 A 12 A	6 A 3 A 1.5 A 1.2 A	7,200 VA	720 VA

A300

D4A-□3□□N (SPDT, Double-break, With Neon Lamp)

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC 240 VAC	10 A	60 A 30 A	6 A 3 A	7,200 VA	720 VA

B600

D4A-□5□□N (DPDT, Double-break, Simultaneous Operation)
D4A-□7□□N (DPDT, Double-break, Sequential Operation)
D4A-□9□□N (DPDT, Double-break, Center Neutral Operation)

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC 240 VAC 480 VAC 600 VAC	5 A	30 A 15 A 7.5 A 6.0 A	3 A 1.5 A 0.75 A 0.6 A	3,600 VA	360 VA

CCC (GB14048.5)

Applicable category and ratings
AC-15 2 A/125 VAC

■ General Ratings

Type	Rated voltage	Non-inductive load				Inductive load			
		Resistive load		Lamp load		Inductive load		Motor load	
		NC	NO	NC	NO	NC	NO	NC	NO
SPDT double-break (with/without indicator)	125 VAC (See note 5.)	10 A	10 A	3 A	1.5 A	10 A		5 A	2.5 A
	250 VAC (See note 5.)	10 A	10 A	2 A	1 A	10 A		3 A	1.5 A
	480 VAC	10 A	10 A	1.5 A	0.8 A	3 A		1.5 A	0.8 A
	600 VAC	3 A	1 A	1 A	0.5 A	1.5 A		1 A	0.5 A
	8 VDC	10 A		6 A	3 A	10 A		6 A	
	14 VDC	10 A		6 A	3 A	10 A		6 A	
	30 VDC	6 A		4 A	3 A	6 A		4 A	
	125 VDC (See note 5.)	0.8 A		0.2 A	0.2 A	0.8 A		0.2 A	
	250 VDC (See note 5.)	0.4 A		0.1 A	0.1 A	0.4 A		0.1 A	
DPDT double-break (without indicator)	125 VAC	5 A		2 A		4 A		3 A	
	250 VAC	3 A		1 A		2 A		1.5 A	
	480 VAC	1.5 A		0.5 A		1 A		0.8 A	
	600 VAC	1 A		0.4 A		0.7 A		0.5 A	
	14 VDC	5 A		2 A		4 A		3 A	
	30 VDC	3 A		1 A		2 A		1.5 A	
	125 VDC	0.4 A		0.1 A		0.4 A		0.1 A	
	250 VDC	0.2 A		0.05 A		0.2 A		0.05 A	
DPDT double-break (with indicator)	125 VAC	5 A		2 A		4 A		3 A	
	250 VAC	3 A		1 A		2 A		1.5 A	
	12 VDC	5 A	---	---		---		---	
	24 VDC	3 A							
	48 VDC	1 A							

Type		SPDT, double-break		DPDT, double-break	
		Without indicator	With indicator	Without indicator	With indicator
Inrush current	Normally closed	30 A max.			
	Normally open	20 A max.			

Note: 1. The above current ratings are for steady-state current.

2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).

3. Lamp loads have an inrush current of 10 times the steady-state current.

4. Motor loads have an inrush current of 6 times the steady-state current.

5. For those with indicators, refer to the following rated voltages.

Ratings for Indicators

Classification	Indicator	Model	Rated voltage	Carry current	Internal resistance
SPDT double-break	Neon lamp	D4A-0300N	125 VAC, 250 VAC	Approx. 0.47 mA	150 kΩ
	LED	D4A-0E00N	12 VDC	Approx. 3.2 mA	2.2 kΩ
			24 VDC	Approx. 4 mA	4.7 kΩ
			24 VDC	Approx. 1.3 mA	15 kΩ
			48 VDC	Approx. 2 mA	22 kΩ
DPDT double-break	Neon lamp	D4A-0L00N	125 VAC, 250 VAC	Approx. 0.28 mA	240 kΩ
	LED	D4A-0P00N	48 VDC	Approx. 1.4 mA	---

■ Characteristics

Degree of protection	IP67
Durability (See note 3.)	Mechanical: SPDT, double-break, roller lever: 50,000,000 operations min. (See note 2.) DPDT, double-break, roller lever: 30,000,000 operations min. (See note 2.) Electrical: SPDT, double-break: for 125 VAC, 10 A resistive load: 1,000,000 operations min. DPDT, double-break: for 125 VAC, 5 A resistive load: 750,000 operations min.
Operating speed	1 mm to 2 m/s (for D4A-3101N roller lever model)
Operating frequency	Mechanical: 300 operations/minute Electrical: 30 operations/minute
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC) between terminals of the same polarity, between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part
Contact resistance	25 mΩ max. (initial value)
Temperature rise	50°C max.
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min. between terminals of same polarity 2,200 VAC, 50/60 Hz for 1 min. between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part (See note 4.)
Pollution degree (operating environment)	3
Protection against electric shock	Class I (with grounding terminal)
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (See note 5.)
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: SPDT, double-break, roller lever: 600 m/s^2 min. (See note 5.) DPDT, double-break, roller lever: 300 m/s^2 min. (See note 5.)
Ambient operating humidity	35% to 95% (with no icing)
Weight	Approx. 290 g (for D4A-3101N roller lever model)

Note: 1. The above figures are initial values.

2. Excluding maintained models.

3. The values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

4. 1,500 VAC is applied to the indicator lamp type.

5. Not including wobble levers (cat whisker, plastic rod, coil spring, and spring wire types).

Type	Roller lever (See note 5-1.)	Plunger, flexible rod (See note 5-2.)	With indicator	Fluoro-rubber seal
Ambient temperature	–40°C to 100°C	–20°C to 100°C	–10°C to 80°C	–10°C to 120°C

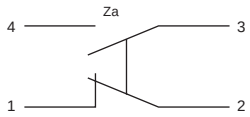
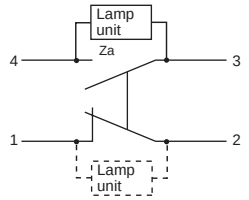
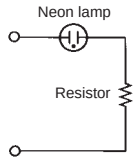
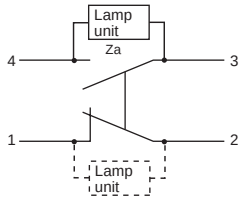
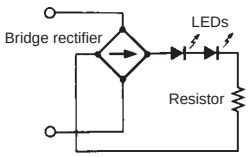
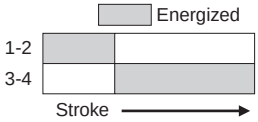
5-1. Excluding low-torque and high-sensitivity models.

5-2. Including roller lever low-torque and high-sensitivity operating models.

Connections

■ Contact Forms (Switch Boxes)

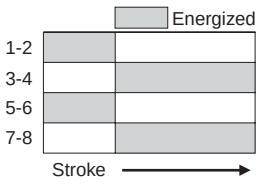
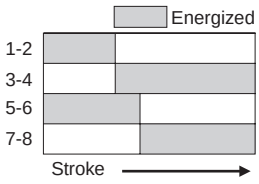
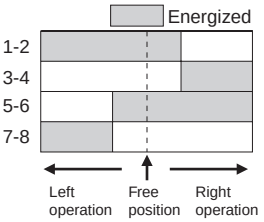
STDP Double-break Switches

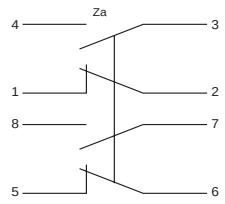
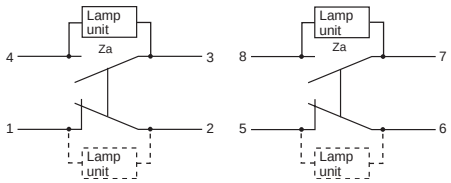
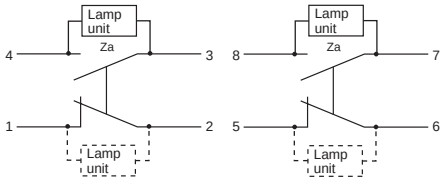
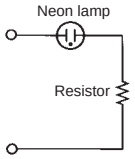
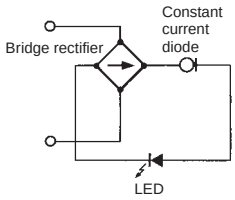
Type	Contact model			Operating pattern
	Without indicator	With neon lamp indicator (See note.)	With LED indicator (See note.)	
1NC/1NO snap-action	D4A-0100N 	D4A-0300N  Lamp Unit Internal Circuits 	D4A-0E00N  Lamp Unit Internal Circuits 	

Note: Switches with indicators are factory-set to light when the switch is not operated.

DTDP Double-break Switches

Each of these Switches can be used to replace two limit switches in applications, such as high-speed control in machine tools and switching motors between forward and reverse, that previously required 2 limit switches. This simplifies wiring, saves space, and reduces costs.

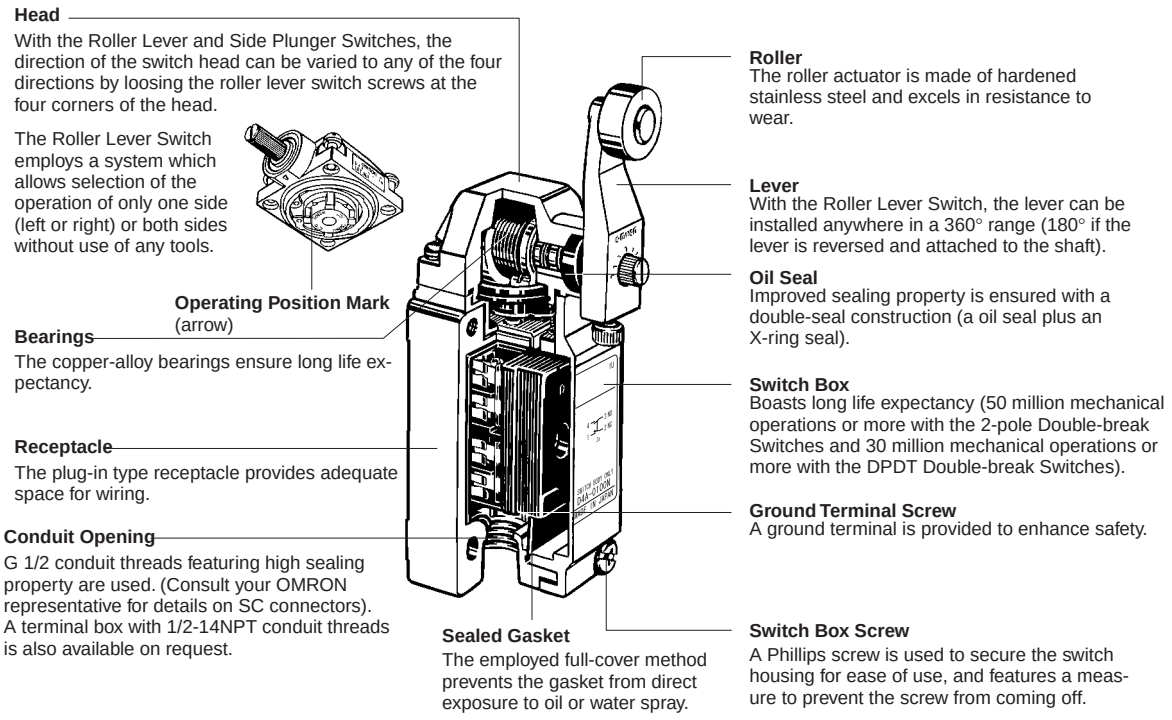
Type	Contact model			Operating pattern	Remarks
	Without indicator	With neon lamp indicator (See note.)	With LED indicator (See note.)		
2NC/2NO snap-action, simultaneous operation	D4A-0500N	D4A-0L00N	D4A-0P00N		Head is compatible with double-break head. Can be switched for operation on both sides of actuator.
2NC/2NO snap-action, sequential operation (2-step operation)	D4A-0700N	---	---		Use the D4A-0017N Special Head.
2NC/2NO snap-action, central neutral operation	D4A-0900N	---	---		Use the D4A-0018N Special Head.

Item	Without indicator	With neon lamp indicator (See note.)	With LED indicator (See note.)
Contact form	D4A-0500N D4A-0700N D4A-0900N 	D4A-0L00N 	D4A-0P00N 
Lamp unit internal circuit	---		

Note: Switches with indicators are factory-set to light when the switch is not operated, but the setting can be changed to light for operation (dotted lines).

Nomenclature

DPDT Double-break



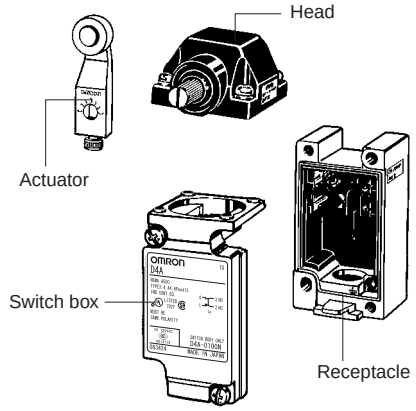
Note: 1. NBR is used in rubber components.

2. Fluoro-rubber sealed types use fluoro-rubber.

3. For Roller Levers, there is some lever play in the free position (about 2 mm), but this is due to the structure of the head and does not interfere with performance.

Easy-maintenance Block Mounting

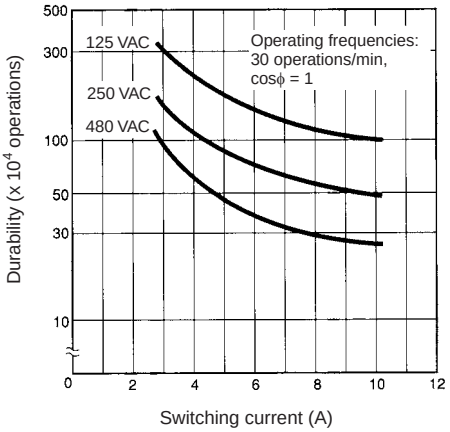
Block mounting makes it possible to easily assemble or disassemble the head, switch body, and receptacle of the D4A-□N by tightening or loosening the attached screws.

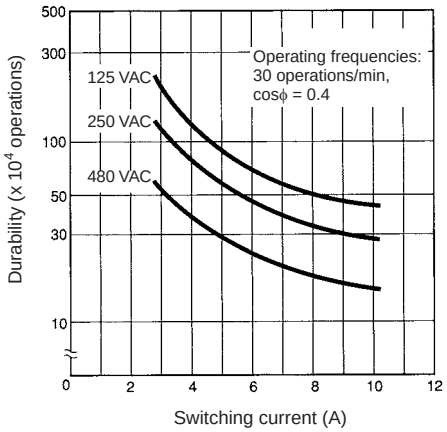


Engineering Data

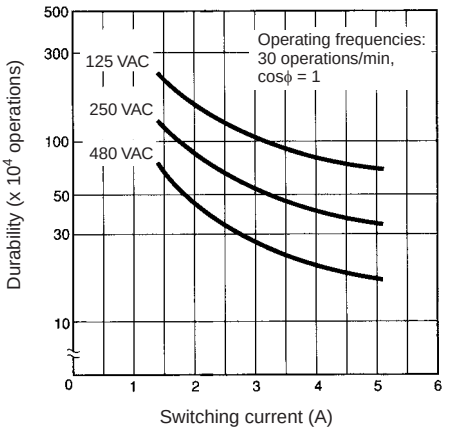
■ Electrical Durability (SPDT Double-break)

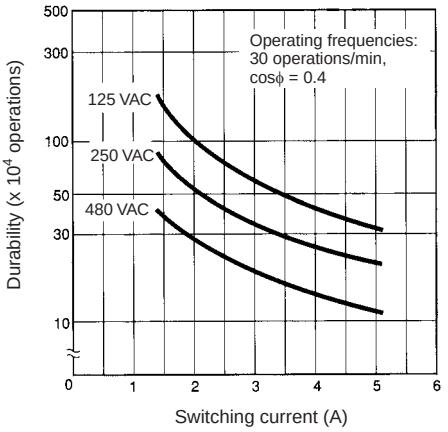
(Ambient temperature: 5°C to 35°C; ambient humidity: 40% to 70%)





Electrical Durability (DPDT Double-break)





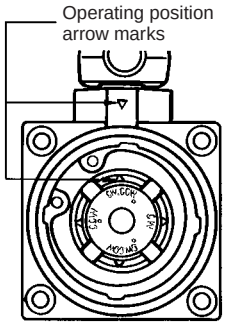
Installation

■ Operation

Changing the Operating Direction

The head of the side rotary type can be converted in seconds to CW, CCW, or both-way operation. Follow the procedures on the right hand side for conversion (not applicable to the Maintained, Sequential Operating, Center Neutral Operating Switches).

Operating Part (Rear of Head)



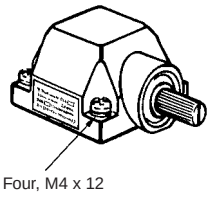
Procedures

1. Dismount the head by loosening the four screws that secure it.
2. Turn over the head to set the desired operation (CW, CCW, or both). The desired side can be selected by setting the mode selector knob shown in the figure. This knob is factory set to the “CW+CCW” (both-way operation) position.
3. When set to the CW position, the head rotates in clockwise direction.
   When set to the CCW position, the head rotates in counterclockwise direction.
   In either case, be sure to accurately align the arrow mark to the setting position.

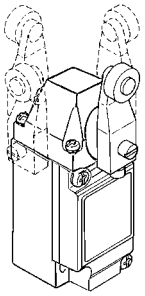
Head and Lever Positions

The operating head can be positioned and locked in any of four 90° positions and a lever can lock in any position through 360° around the shaft of the Limit Switch. Furthermore, the lever can be reversed and attached to the shaft (refer to the figures below on the right hand side). Therefore the roller is compatible with a wide movement range of a dog. A Fork Lever Lock can be used with maintained models (D4A-0005N) only.

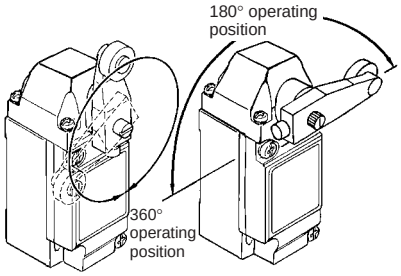
Remove the head from the Switch by loosening the screws (the screws can be loosened but not removed from the head).



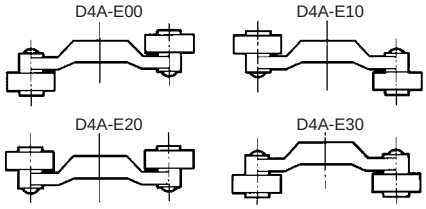
The operating head can be positioned and locked in any of four 90° positions.



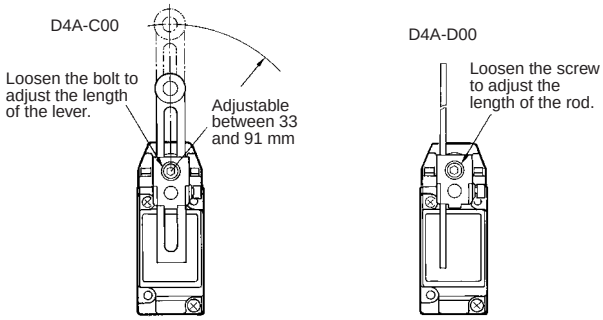
The lever can lock in any position through 360° around the shaft. The lever can be reversed and attached to the shaft, in which case the switching operation should complete in a range of 0° to 180°.



There are four kinds of fork lever locks. The position of each roller is different. It is possible to use D4A-E00 through D4A-E30 levers instead, if they are reversed before attacking. They can be used with D4A-□□05N models only.



By loosening the Allen-head bolt on an adjustable roller lever or rod lever, the length of the lever can be adjusted.

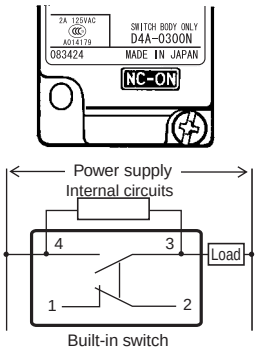


Lighting Mode Selection of Indicators

The lighting mode of the operation indicator can be changed easily between two modes: lighting when the Switch is operating and lighting when the Switch is not operating.

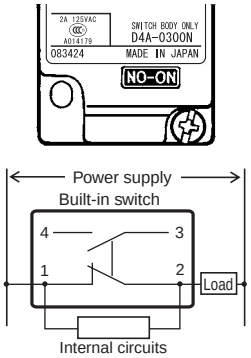
Lights When Not Operating

(See note 1.)



Lights When Operating

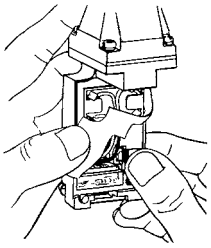
(See note 2.)



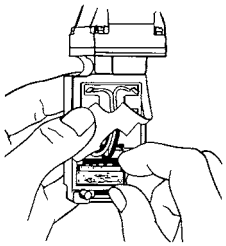
Note: 1. The lamp is lit when the actuator is at the free position. The lamp will be off when the contacts of the Limit Switch have been actuated and snapped to each other at the operating position.

2. The lamp is lit when the contacts have been released and snapped only from the operating position.

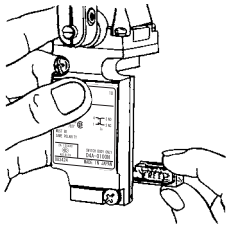
Change the lighting mode as follows:



Push the claw securing the lamp section to the right (do not push strongly).



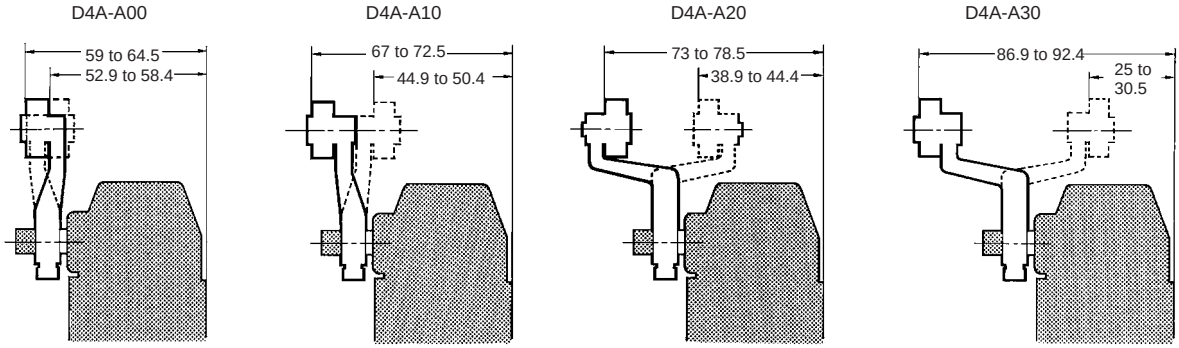
Remove the lamp section.



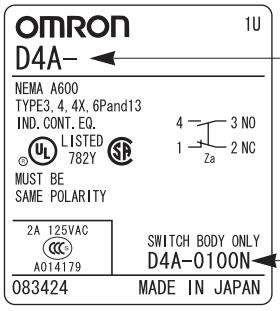
Mount the lamp section so that legend "NC-ON" or "NO-ON" will appear in the display window.

Note: In either case, the lamp will not light when the load is ON.

Lever Position



■ Nameplate

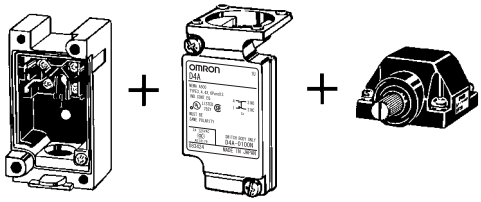


The whole switch model without lever is printed.

The type of switch box is printed. (The type is also indicated on the head and receptacle.)

■ Compatibility with D4A-□

The D4A-□N is compatible with the D4A-□ when the following accessories are attached to the D4A-□N.



D4A-□
Receptacle box

D4A-□N
Switch box

D4A-□N
Head

Note: The D4A-□N without the above accessories is not compatible with the D4A-□.

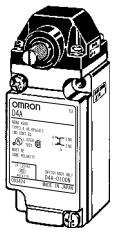
Dimensions

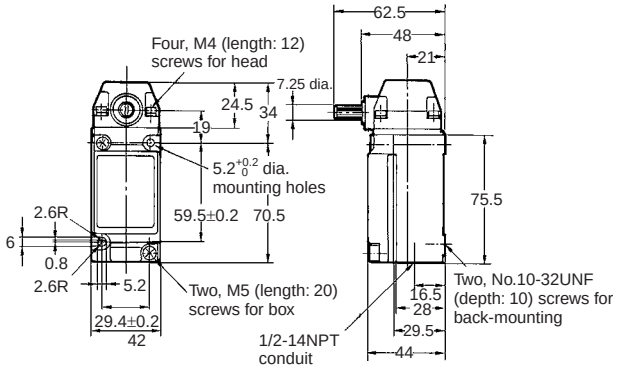
Note: 1. All units are in millimeters unless otherwise indicated.
2. Insert the model number code in □ for the switch body.
3. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Roller Lever Switches

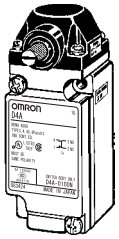
Note: Levers of the side rotary type are optionally available.

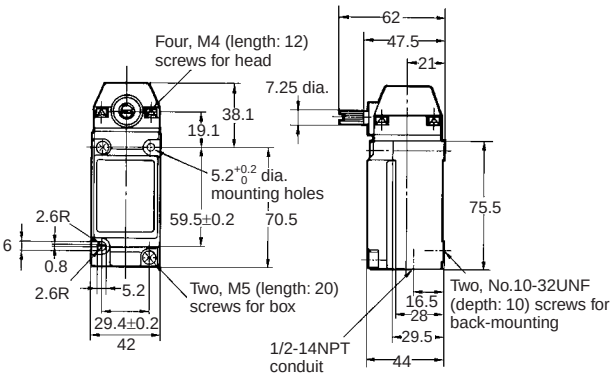
Standard
D4A-1□01N, D4A-2□01N
High-sensitivity
D4A-1□02N, D4A-2□02N
Low Torque
D4A-1□03N, D4A-2□03N
High-sensitivity/Low Torque
D4A-1□04N, D4A-2□04N
Sequential Operation
D4A-2□17N
Center Neutral Operating
D4A-2□18N





Maintained
D4A-1□05N, D4A-2□05N





SPDT Double-break

Model	D4A-1□01N	D4A-1□02N	D4A-1□03N	D4A-1□04N	D4A-1□05N
OF max.	0.39 N·m	0.39 N·m	0.2 N·m	0.2 N·m	0.39 N·m
RF min.	0.05 N·m	0.05 N·m	---	---	---
PT max.	15° (12°)	7° (6°)	15° (12°)	7° (6°)	65° (60°)
OT min.	70°	75°	70°	75°	20°
MD max.	5° (4°)	4° (3°)	5° (4°)	4° (3°)	35° (30°)

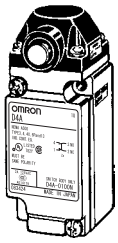
DPDT Double-break

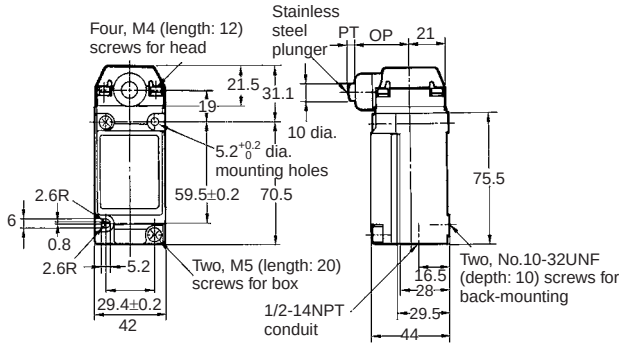
Model	D4A-2□01N	D4A-2□02N	D4A-2□03N	D4A-2□04N	D4A-2□05N	D4A-2□17N	D4A-2□18N
OF max.	0.39 N·m	0.39 N·m	0.2 N·m	0.2 N·m	0.39 N·m	0.39 N·m	0.39 N·m
RF min.	0.05 N·m	0.05 N·m	---	---	---	0.05 N·m	0.02 N·m
PT max.	15° (12°)	7° (6°)	15° (12°)	7° (6°)	65° (60°)	1-stage: 12° (10°) 2-stage: 20° (17°)	19° (15°)
OT min.	70°	75°	70°	75°	20°	65°	65°
MD max.	7° (6°)	5° (4°)	7° (6°)	5° (4°)	35° (30°)	6° (5°)	5° (4°)

The figures in the parentheses are average values.

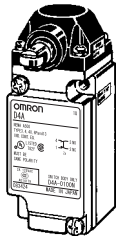
Side Plunger Switches

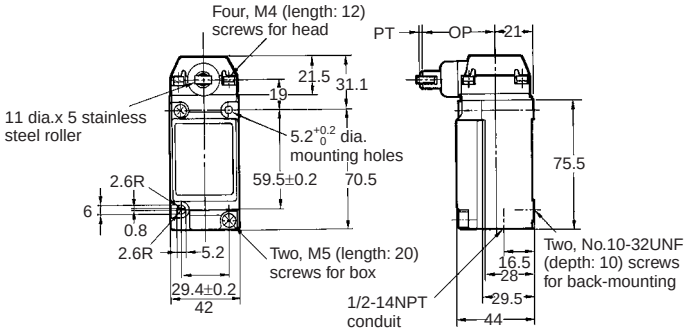
Standard
D4A-1□06N, D4A-2□06N



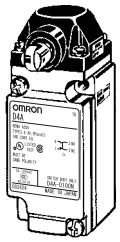


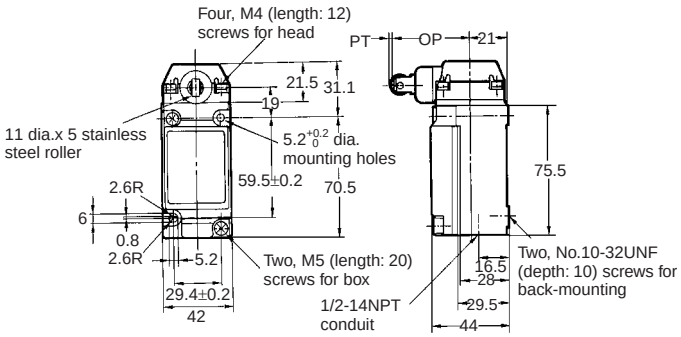
Horizontal Roller
D4A-1□07-HN, D4A-2□07-HN



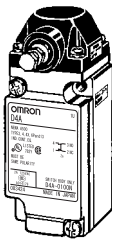


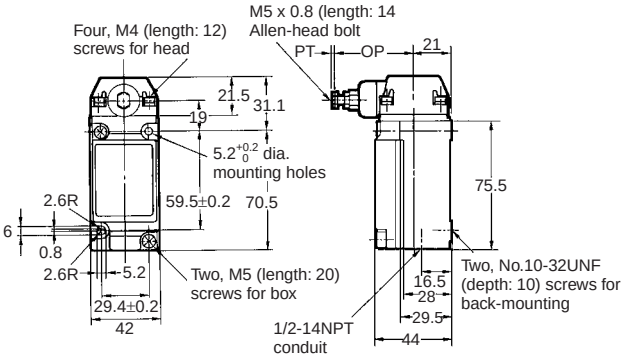
Vertical Roller
D4A-1□07-VN, D4A-2□07-VN





Adjustable
D4A-1□08N, D4A-2□08N

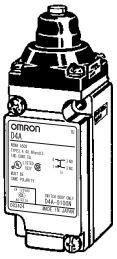


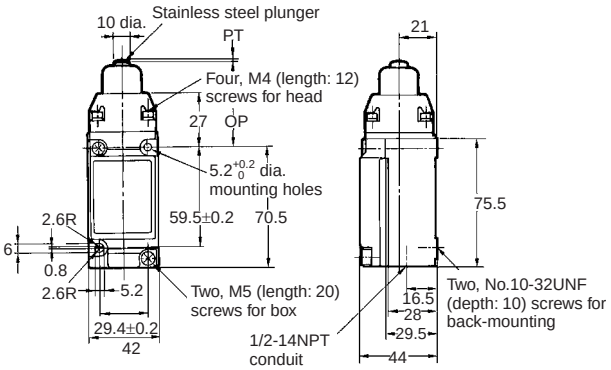


Model	SPDT double-break				DPDT double-break			
	D4A-1□06N	D4A-1□07-HN	D4A-1□07-VN	D4A-1□08N	D4A-2□06N	D4A-2□07-HN	D4A-2□07-VN	D4A-2□08N
OF max.	19.61 N	19.61 N	19.61 N	19.61 N	19.61 N	19.61 N	19.61 N	19.61 N
RF min.	4.90 N	4.90 N	4.90 N	4.90 N	4.90 N	4.90 N	4.90 N	4.90 N
PT max.	2.4 mm	2.4 mm	2.4 mm	2.4 mm	2.4 mm	2.4 mm	2.4 mm	2.4 mm
OT min.	5.1 mm	5.1 mm	5.1 mm	5.1 mm	5.1 mm	5.1 mm	5.1 mm	5.1 mm
MD max.	0.6 mm	0.6 mm	0.6 mm	0.6 mm	1.0 mm	1.0 mm	1.0 mm	1.0 mm
OP	34±0.8 mm	44±0.8 mm	44±0.8 mm	41 to 47.5 mm	34±0.8 mm	44±0.8 mm	44±0.8 mm	41 to 47.5 mm

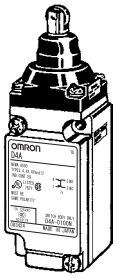
Top Plunger Switches

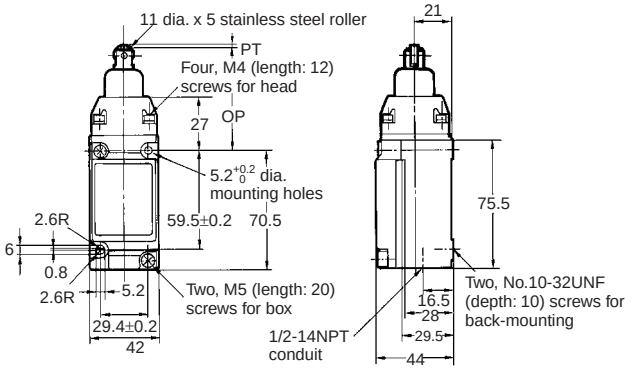
Standard
D4A-1□09N, D4A-2□09N



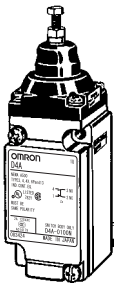


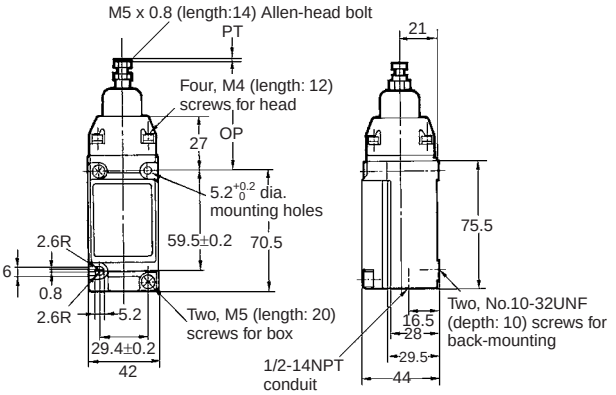
Roller Plunger
D4A-1□10N, D4A-2□10N





Adjustable
D4A-1□11N, D4A-2□11N

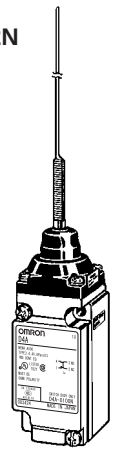


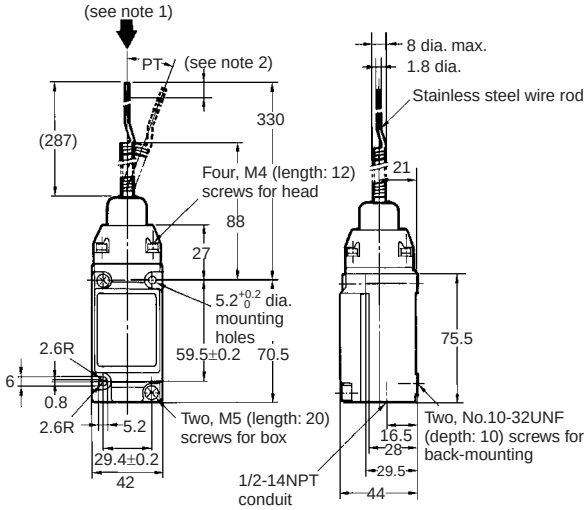


Model	SPDT double-break			DPDT double-break		
	D4A-1□09N	D4A-1□10N	D4A-1□11N	D4A-2□09N	D4A-2□10N	D4A-2□11N
OF max.	17.65 N	17.65 N	17.65 N	17.65 N	17.65 N	17.65 N
RF min.	4.90 N	4.90 N	4.90 N	4.90 N	4.90 N	4.90 N
PT max.	1.6 mm	1.6 mm	1.6 mm	1.6 mm	1.6 mm	1.6 mm
OT min.	5.1 mm	5.1 mm	5.1 mm	5.1 mm	5.1 mm	5.1 mm
MD max.	0.4 mm	0.4 mm	0.4 mm	1.0 mm	1.0 mm	1.0 mm
OP	46±0.8 mm	56±0.8 mm	55.5 to 62 mm	46±0.8 mm	56±0.8 mm	55.5 to 62 mm

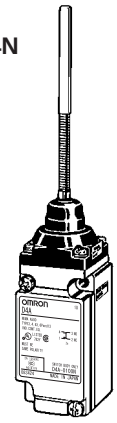
Flexible Rod Switches

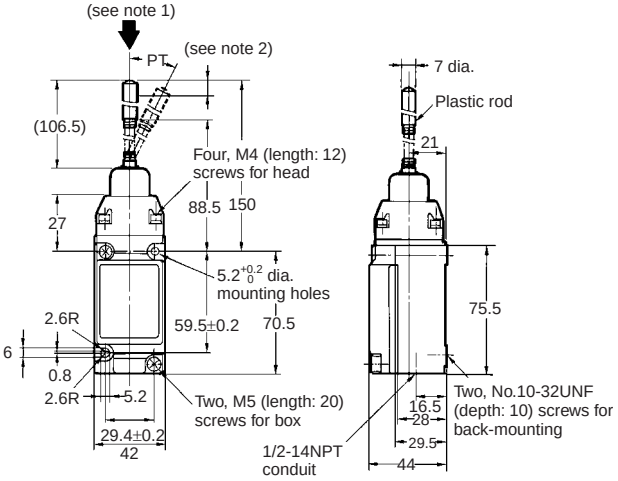
Spring Wire
D4A-1□12N, D4A-2□12N



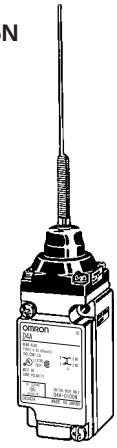


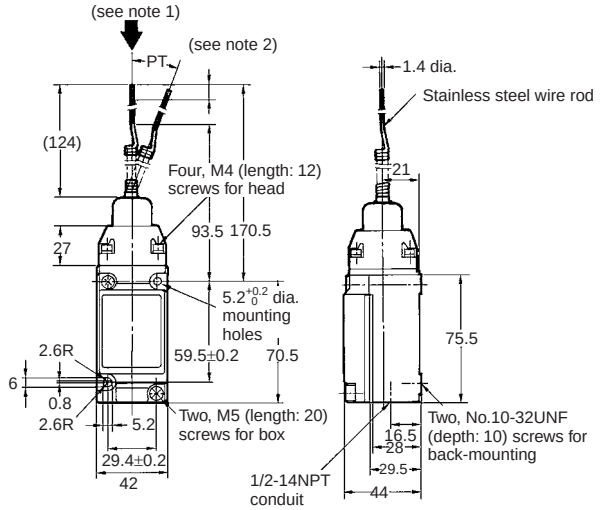
Plastic Rod
D4A-1□14N, D4A-2□14N





Cat Whisker
D4A-1□15N, D4A-2□15N

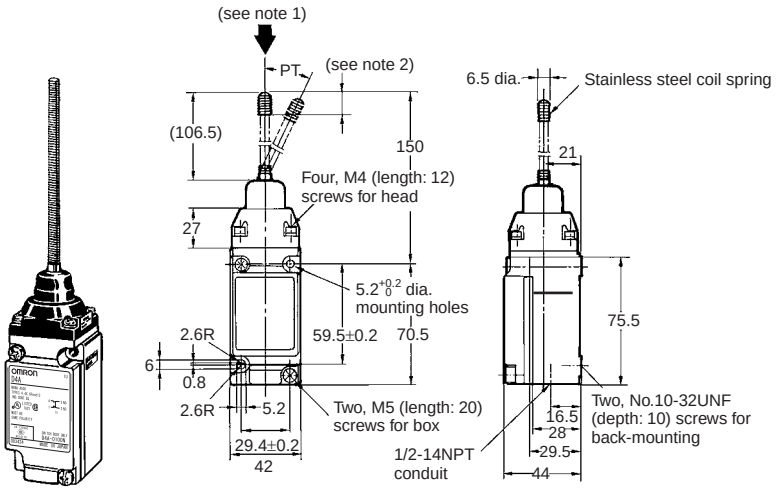




Note: 1. The stainless rod can be operated from any direction except the axial direction (i.e., from the top).

2. The optimum operating range of the stainless rod is within 1/3 of the entire length from the top end.

Coil Spring
D4A-1□16N, D4A-2□16N



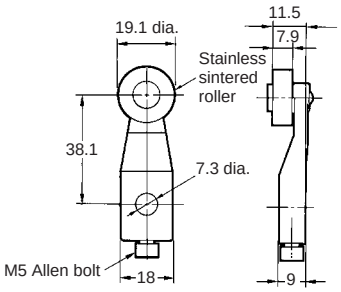
Note: 1. The stainless rod can be operated from any direction except the axial direction (i.e., from the top).
2. The optimum operating range of the stainless rod is within 1/3 of the entire length from the top end.

Model	SPDT double-break			DPDT double-break		
	D4A-1□12N	D4A-1□14N D4A-1□15N	D4A-1□16N	D4A-2□12N	D4A-2□14N D4A-2□15N	D4A-2□16N
OF max.	0.98 N	1.47 N		0.98 N	1.47 N	
PT max.	15° (5°)	15° (5°)		15° (5°)	15° (5°)	

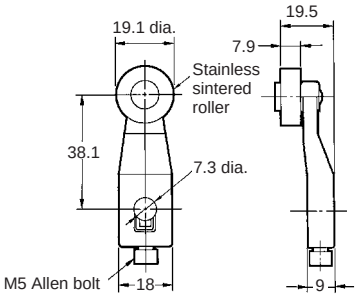
Levers (for Roller Lever Switches)

Note: No D4A-0003N or D4A-0004N head should be used with the adjustable roller lever or mechanical malfunctioning could result because the total weight of the adjustable roller lever is comparatively large. Use a standard-load head (D4A-0001N or D4A-0002N) instead.

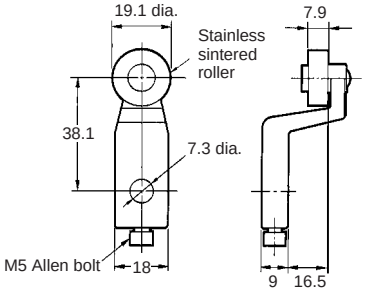
Roller Lever
D4A-A00



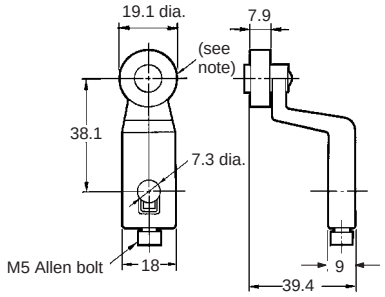
Roller Lever
D4A-A10



Roller Lever
D4A-A20

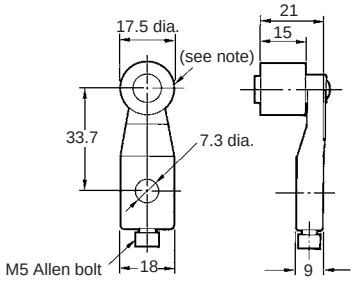


Roller Lever
D4A-A30



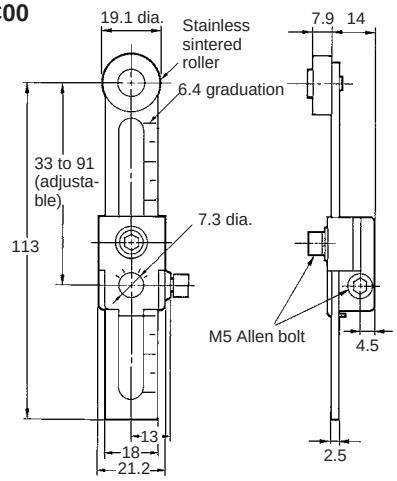
Note: Stainless sintered roller

Roller Lever
D4A-B06

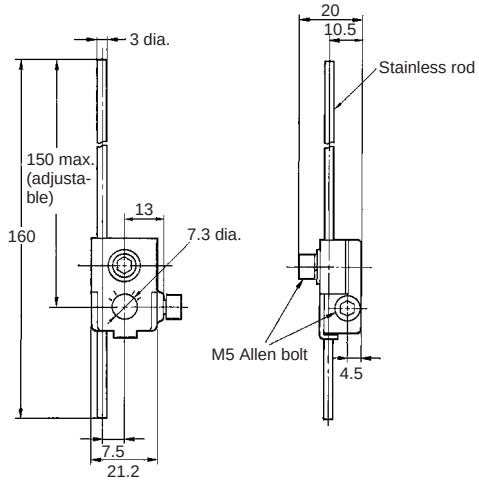


Note: Stainless sintered roller

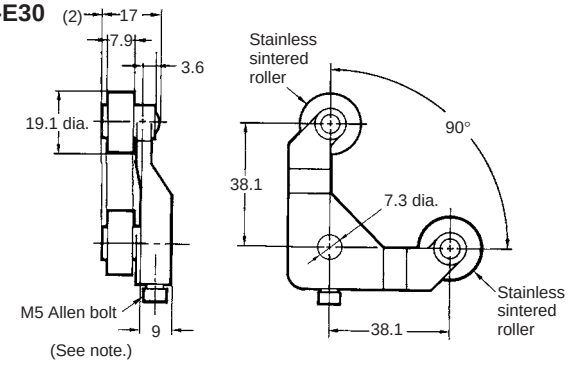
Adjustable Roller Lever
D4A-C00



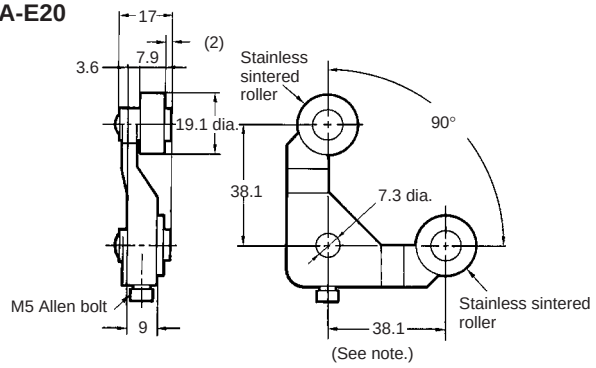
Adjustable Rod Lever
D4A-D00



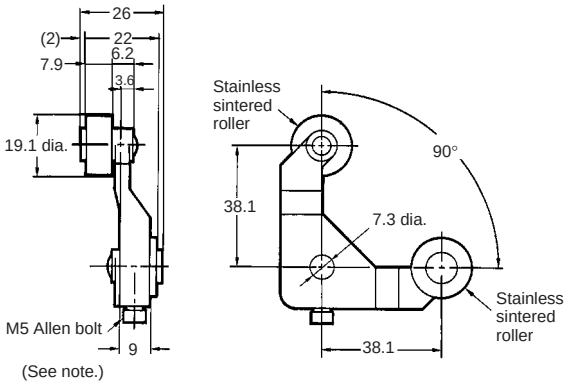
Fork Lever Lock
D4A-E30



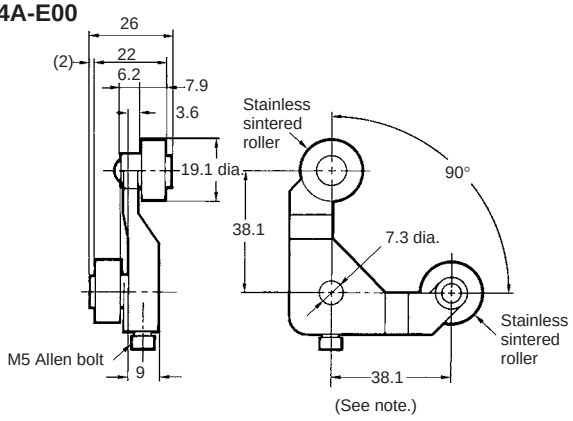
Fork Lever Lock
D4A-E20



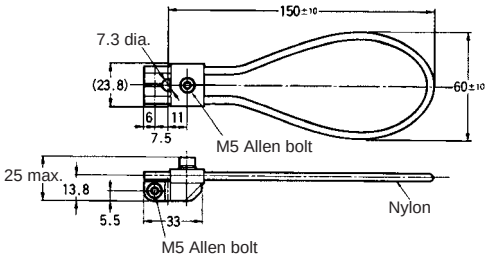
Fork Lever Lock
D4A-E10



Fork Lever Lock
D4A-E00



Nylon Loop Lever
D4A-F00



Note: A Fork Lever Lock can be used with D4A-□□05N models only.

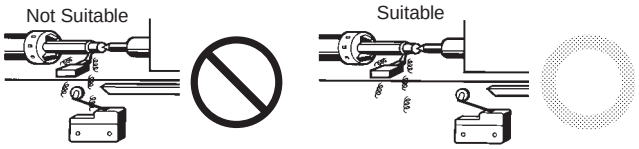
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17*.

■ Correct Use

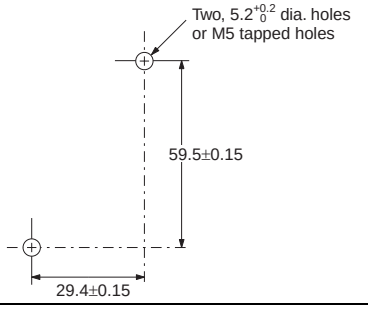
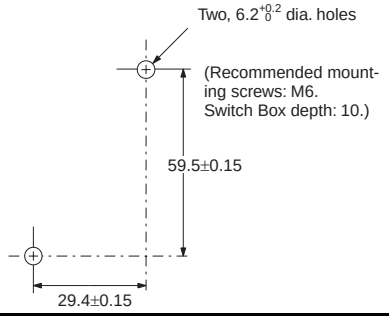
Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Mounting

Model	1/2-14NPT Conduit
	D4A-1□□□N **D4A-2□□□N**
Front Mounting	
Rear Mounting (Rear View)	

Tightening Torque

To maintain the high sealing capability of the Limit Switch, tighten the screws for the head and switch box with the following torques:

Head (four 12-mm M4 screws): 1.2 to 1.4 N·m
Switch box (two 20-mm M5 screws): 2.4 to 2.7 N·m

Solderless Terminals

The D4A-□N with DPDT double-break incorporates solderless terminals.

Operation

The operating methods, cam and dog shapes, operating frequency, and overtravel (OT) have a significant effect on the service life and accuracy of the Limit Switch. The shape of the cam should be as smooth as possible.

A marginal overtravel (OT) value should be set. The ideal value is the rated OT value x 0.7.

The actuator should not be remodeled to change the operating position.

Connectors

To satisfy IP67, apply sealing tape to the connector conduit.

Appropriate outer diameter of cables is 5.5 to 14 dia.

Use OMRON's SC-□M Series.

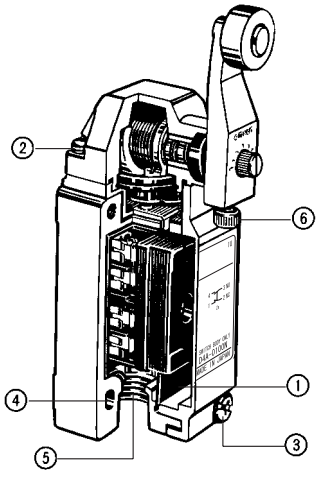
Tighten the Connectors to a torque of 1.8 to 2.2 N·m.

Maintenance and Repair

The user must not maintain or repair equipment incorporating any D4A-N model. Contact the manufacturer of the equipment for any maintenance or repairs required.

Tightening Torque

A loose screw may cause malfunctions. Be sure to tighten each screw to the proper tightening torque as shown in the table.



No.	Type	Appropriate tightening torque
1	Terminal screws (M3.5 screws) (including grounding terminals)	0.78 to 0.88 N·m
2	Head mounting screws	1.18 to 1.37 N·m
3	Switch box mounting screws	2.35 to 2.75 N·m
4	Body mounting screws (See note.)	4.90 to 5.88 N·m
5	Connectors	1.77 to 2.16 N·m
6	Actuator mounting screws	2.45 to 2.65 N·m

Note: When using M5 Allen-head bolts, particularly when the head direction has been changed, check the torque of each screw and make sure that the screws are free of foreign substances, and that each screw is tightened to the proper torque.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C092-E1-05

General-purpose Limit Switch
HL-5000

Economical, Miniature Limit Switch Boasting Rigid Construction

- Highly rigid construction (head and cover snugly fit in box).
- Dustproof and drip-proof construction.
- Smooth operation with greater OT.
- Easy-to-wire conduit opening design.
- Models with grounding terminals conform to the CE marking.
- Approved by CCC (Chinese standard).

Model Number Structure

■ Model Number Legend

HL-5□□
1 2

1. Actuators
- 000: Roller lever
- 030: Adjustable roller lever
- 050: Adjustable rod lever
- 100: Sealed plunger
- 200: Sealed roller plunger
- 300: Coil spring

2. Ground Terminal Specifications
- Blank: Without ground terminal
- G: With ground terminal/M5 tapping on the rear side

Ordering Information

■ List of Models

Actuator	Roller lever	Adjustable roller lever	Adjustable rod lever	Sealed plunger	Sealed roller plunger	Coil spring
Model	HL-5000	HL-5030	HL-5050	HL-5100	HL-5200	HL-5300

Note: HL-5000 Limit Switches are offered with a choice of ground terminal/M5 tapping on the rear side conforming to various standards. When placing an order, add the code to the model number to indicate if ground terminal/M5 tapping on the rear side is required.
-G: with ground terminal/M5 tapping on the rear side.

Specifications

■ Approved Standards

Agency	Standard	File No.
CCC (CQC)	GB14048.5	2003010303077624

Note: Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

CCC (GB14048.5)

Applicable category and ratings
AC-15 3 A/250 VAC

■ General Ratings

Rated voltage	Non-inductive load				Inductive load			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	5 A		1.5 A	0.7 A	3 A		2 A	1 A
250 VAC	5 A		1 A	0.5 A	3 A		1.5 A	0.8 A
12 VDC	5 A		3 A		4 A		3 A	
24 VDC	5 A		3 A		4 A		3 A	
125 VDC	0.4 A	0.2 A	---		---		---	
250 VDC	0.4 A	0.2 A	---		---		---	

Inrush current	NC	24 A max.
	NO	12 A max.

Note: 1. The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.

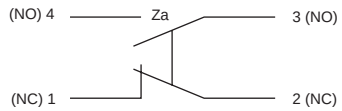
■ Characteristics

Degree of protection	IP65
Durability (see note 3)	Mechanical: 10,000,000 operations min. (under rated conditions) Electrical: See the following *Electrical Durability*.
Operating speed	5 mm/s to 0.5 m/s
Operating frequency	Mechanical: 120 operations/min Electrical: 30 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	25 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part
Rated frequency	50/60 Hz
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note 4)
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min. (see note 4)
Ambient temperature	Operating: –5°C to 65°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 130 to 190 g

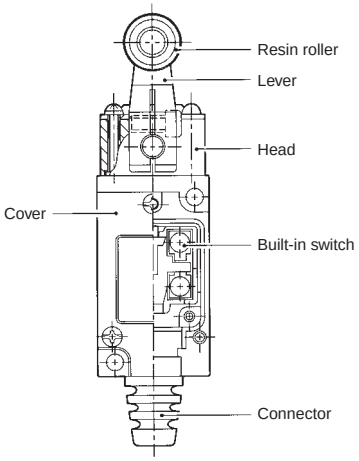
Note: 1. The above figures are initial values.
2. The above characteristics may vary depending on the model. For further details, contact your OMRON sales representative.
3. The values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.
4. These values do not apply to the coil spring model.

Connections

■ Contact Form



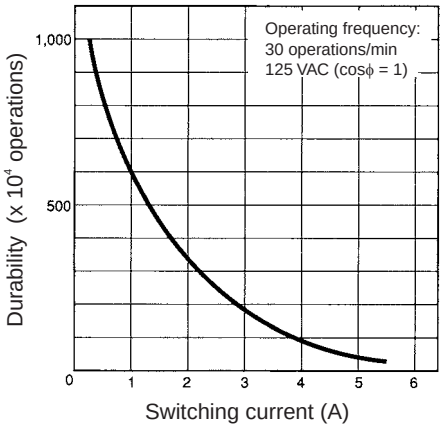
Nomenclature



Engineering Data

■ Electrical Durability (cosϕ=1)

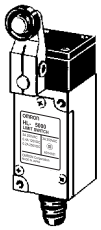
Operating temperature: 5°C to 35°C
Operating humidity: 40% to 70%

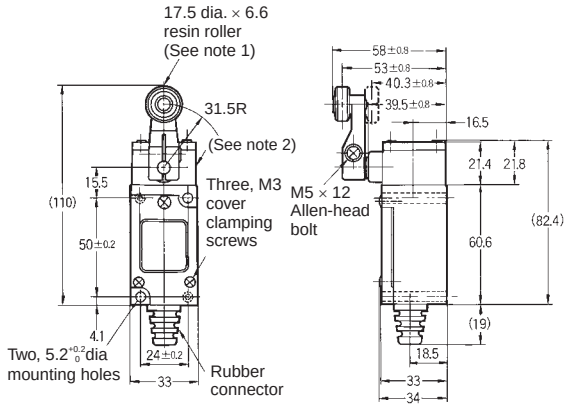


Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Roller Lever
HL-5000

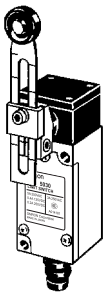


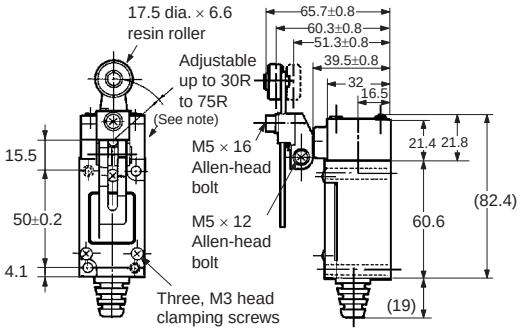


Note: 1. The head can be mounted anywhere in 360°.
2. The head can be mounted in any of the four directions.

Model	HL-5000
OF max.	7.35 N
RF min.	0.98 N
PT max.	20°
OT min.	50°
MD max.	12°
OP	---

Adjustable Roller Lever
HL-5030



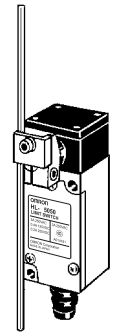


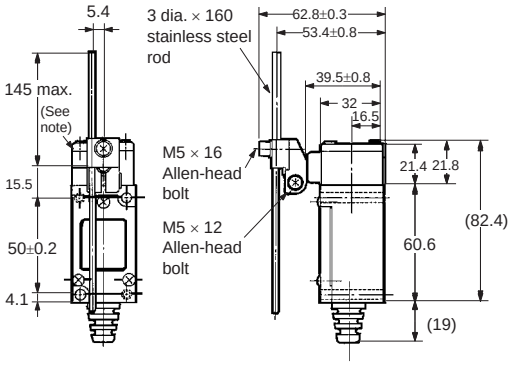
Note: The head can be mounted in any of the four directions. Dimensions not shown are the same as HL-5000.

Model	HL-5030 (see note)
OF max.	7.35 N
RF min.	0.98 N
PT max.	20°
OT min.	50°
MD max.	12°
OP	---

Note: Measured with the types of the 31.5-mm arm or rod length.

Adjustable Rod Lever HL-5050



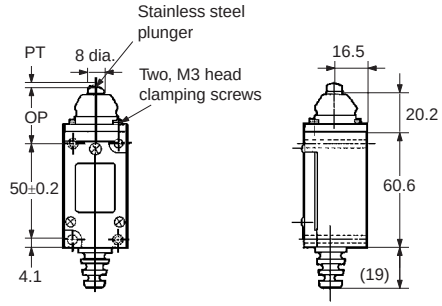


Note: The head can be mounted in any of the four directions. Dimensions not shown are the same as HL-5000.

Model	HL-5050 (see note)
OF max.	7.35 N
RF min.	0.98 N
PT max.	20°
OT min.	50°
MD max.	12°
OP	---

Note: Measured with the types of the 31.5-mm arm or rod length.

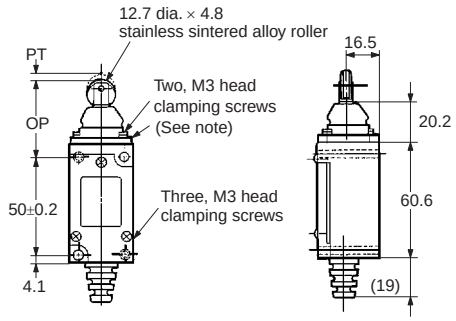
Sealed Plunger HL-5100



Note: Dimensions not shown are the same as HL-5000.

Model	HL-5100
OF max.	8.83 N
RF min.	1.47 N
PT max.	1.5 mm
OT min.	4 mm
MD max.	1 mm
OP	30±0.8 mm

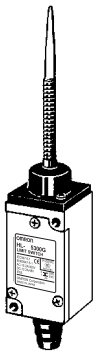
Sealed Roller Plunger HL-5200

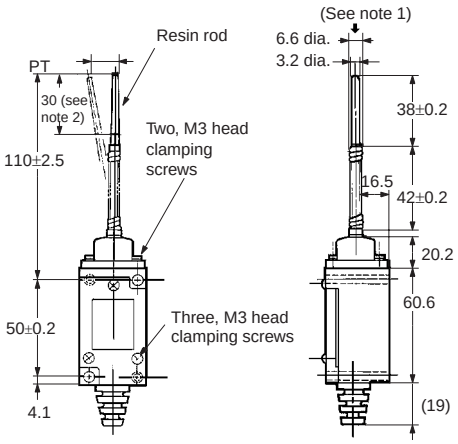


Note: The head can be mounted in either of the two directions. Dimensions not shown are the same as HL-5000.

Model	HL-5200
OF max.	8.83 N
RF min.	1.47 N
PT max.	1.5 mm
OT min.	4 mm
MD max.	1 mm
OP	40±0.8 mm

Coil Spring
HL-5300





Note: 1. The coil spring may be operated from any directions except axial directions (↓).
2. The operating range of the dog or cam is the top third (i.e. from the tip of the rod) of the whole actuator.
3. Dimensions not shown are the same as HL-5000.

Model	HL-5300
OF max.	1.47 N
RF min.	---
PT max.	30 mm
OT min.	---
MD max.	---
OP	---

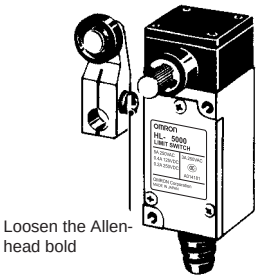
Note: OF and RF measured at the arm length of 75 mm for HL-5030, and 145 mm for HL-5050 (reference values).

Model	HL-5030	HL-5050
OF	3.09 N	1.60 N
RF	0.41 N	0.22 N

Installation

Actuator Position Change (HL-5000, HL-5030, HL-5050)

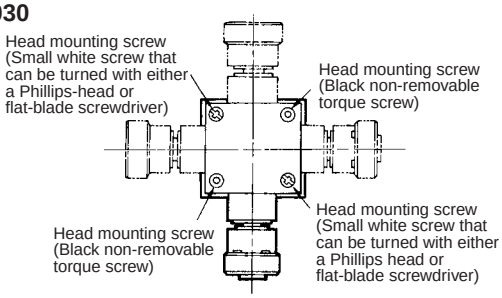
To change the angle of the actuator, loosen the Allen-head bolt on the side of the actuator lever. Then the actuator can be set at any angle.



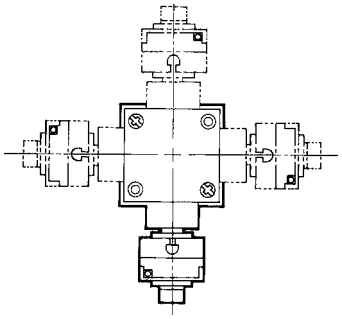
Head Direction Change (HL-5000, HL-5030, HL-5050, HL5200)

To change the head direction, loosen the two mounting screws. Then the head can be changed at 90° increments in one of four directions.

HL-5000
HL-5030

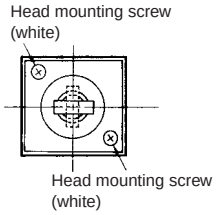


HL-5050



The head of the HL-5200 can be mounted in two directions only. Refer to the following illustration.

HL-5200



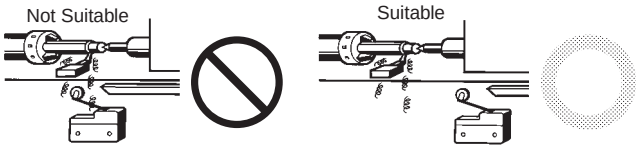
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.

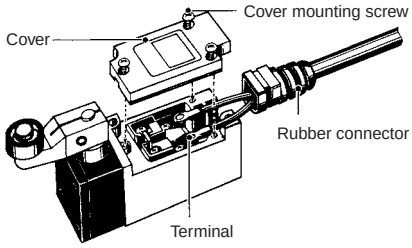


- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Wiring

Wiring Procedure

1. Loosen the cover mounting screws and remove the cover.
2. Disconnect the rubber connector from the box conduit and press-fit a solderless terminal. The following solderless terminals are available.
3. After inserting the solderless terminal into the Switch, tighten the terminal screws securely.
4. After wiring the Limit Switch, insert the rubber connector into the groove of the box securely.
5. Tighten the three mounting screws evenly. The optimum tightening torque for each screw is 0.49 to 0.59 N·m.



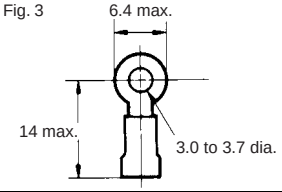
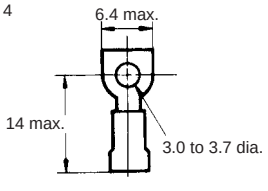
Applicable Lead Wires

Wire name	Applicable wire		
	Number of conductors	Conductor size	External size
Vinyl cabtire cord (VCTF)	2 3 4	0.75 mm^2	Round, 6 to 9 dia. Flat, 9.4 max.
Vinyl cabtire cable (VCT)	2	0.75 mm^2	
600-V vinyl-insulated sheath cable	2	1 dia./1.2 dia./1.6 dia.	

Note: Do not use wires containing silicone, otherwise a contact failure may result.

Applicable Solderless Terminal

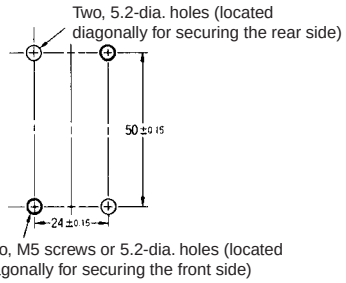
The following solderless terminals are available. Do not use fork or any other type of terminals, otherwise an accidental disconnection resulting in a ground fault may result.

Terminal with insulated grip	
Fig. 3  	Fig. 4 

Mounting

To mount the Limit Switch securely, be sure to use two M5 Allen-head bolts and washers. The tightening torque applied to each bolt is 4.90 to 5.88 N·m. To mount the Limit Switch more securely, use two M5 screw holes on the rear panel and rear holes for positioning if the model is the HL-5□□□G-Series Limit Switches.

Mounting holes



Only the HL-5□□□G has M5 x 0.8 screw holes on the rear side.

Others

Do not use the Limit Switch outdoors, otherwise the Limit Switch will become damaged by rust or ozone.

The Limit Switch is not suitable in places exposed to the spray of rainwater, seawater, or oily water. Consult your OMRON representative for models resisting rainwater, seawater, and oily water.

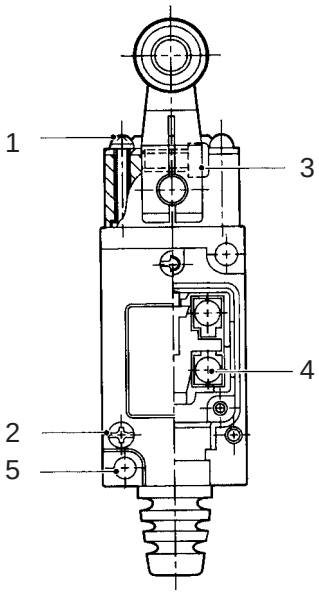
If high-sealing performance is required along with shielded wiring or conduit wiring, use the D4C or WL.

Tightening Torque

A loose screw may result in a malfunction. Be sure to tighten each screw to the proper tightening torque as shown below.

No.	Type	Optimum tightening torque
1	Head mounting screw	0.49 to 0.59 N·m
2	Cover mounting screw	0.49 to 0.59 N·m
3	Allen-head bolt	4.90 to 5.88 N·m
4	Terminal screw (M3 screw)	0.49 to 0.59 N·m
5	Switch mounting screw (M5 Allen-head bolt)	4.90 to 5.88 N·m

Note: If the head direction has been changed, check the torque of each screw and make sure that the screws are free of foreign substances, and that each screw is tightened to the proper torque.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C004-E1-12

Enclosed Switches
ZE/ZV/ZV2/XE/XV/XV2

Long Service Life and Large Breaking Power

- ZE, ZV, and ZV2 incorporate Model Z Basic Switches with rugged diecast cases.
- Available with various models of built-in switches (including split contact model, maintained operation type, magnetic blowout model) and various actuators.
- XE, XV, and XV2 Switches have a built-in X-type magnetic blowout basic switch for DC applications.
- Three mounting methods: Side, base, and diagonal side.
- Easy wiring: Terminals on internal switch are facing forward when the cover is opened.
- Switches with ground terminals have CE marking.
- Approved by UL, CSA, and CCC (Chinese standard).

Model Number Structure

■ Model Number Legend

□□-□-2□
1 2 3 4

1. Built-in Switch
- Z: SPDT (AC)
- X: SPDT (DC)

2. Mounting Direction
- E: Side mounting
- V: Base mounting
- V2: Diagonal side mounting

3. Actuator
- Q: Plunger
- Q22: Roller plunger
- Q21: Crossroller plunger
- QA2: Roller arm lever
- QA277: One-way action roller arm lever
- N: Sealed plunger
- N22: Sealed roller plunger (ZE, ZV, ZV2 only)
- N21: Sealed crossroller plunger (ZE, ZV, ZV2 only)
- NA2: Sealed roller arm lever
- NA277: Sealed one-way action roller arm lever

4. Conduit/Ground Terminal
- None: G $^1/_2$/without ground terminal
- G1: G $^1/_2$/with ground terminal
- G: Pg13.5/with ground terminal
- SG1: $^1/_2$-14NPSM/with ground terminal
- YG1: M20/with ground terminal
- S: $^1/_2$-14NPSM/without ground terminal
- Y: M20/without ground terminal

Ordering Information

■ List of Models

Standard Switches

Contact		Actuator	Side mounting		Diagonal side mounting		Base mounting	
			General purpose	Sealed (Booted)	General purpose	Sealed (Booted)	General purpose	Sealed (Booted)
AC/DC load	SPDT	Plunger	ZE-Q-2	ZE-N-2	ZV2-Q-2	ZV2-N-2	ZV-Q-2	ZV-N-2
		Roller plunger	ZE-Q22-2	ZE-N22-2	ZV2-Q22-2	ZV2-N22-2	ZV-Q22-2	ZV-N22-2
		Crossroller plunger	ZE-Q21-2	ZE-N21-2	ZV2-Q21-2	ZV2-N21-2	ZV-Q21-2	ZV-N21-2
		Roller arm lever	ZE-QA2-2	ZE-NA2-2	ZV2-QA2-2	ZV2-NA2-2	ZV-QA2-2	ZV-NA2-2
		One-way action roller arm lever	ZE-QA277-2	ZE-NA277-2	ZV2-QA277-2	ZV2-NA277-2	---	ZV-NA277-2
DC load	SPDT	Plunger	XE-Q-2	XE-N-2	XV2-Q-2	XV2-N-2	XV-Q-2	XV-N-2
		Roller plunger	XE-Q22-2	---	XV2-Q22-2	---	XV-Q22-2	---
		Crossroller plunger	XE-Q21-2	---	---	---	XV-Q21-2	---
		Roller arm lever	XE-QA2-2	XE-NA2-2	XV2-QA2-2	XV2-NA2-2	XV-QA2-2	XV-NA2-2
		One-way action roller arm lever	XE-QA277-2	XE-NA277-2	---	XV2-NA277-2	XV-QA277-2	XV-NA277-2

Note: 1. The diagonal side mounting model feature improved sealing property, improved mounting strength through use of M5 screws, increased stability in seating with large mounting width (31 x 75 mm) and permit coupling of a number of Switch units.

2. ZE, ZV, and ZV2 series are approved by UL, CSA, and CCC.

3. Ask your OMRON representative for information on models with ground terminals.

Specifications

■ Approved Standards

Agency	Standard	File No.
UL	UL508	E76675
CSA	CSA C22.2 No. 14	LR45746
CCC (CQC)	GB14048.5	2003010303077623

Note: 1. Models XE, XV, and XV2 are not approved by UL, CSA, and CCC.

2. Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL/CSA

Model	Rated voltage	Current	Horsepower
ZE	125 VAC 250 VAC 480 VAC	15 A	1/8 HP 1/4 HP
	125 VDC 250 VDC	0.5 A 0.25 A	---

CCC (GB14048.5)

Applicable category and ratings
AC-12 10 A/250 VAC

■ General Ratings

Contact	Contact	Rated voltage	Non-inductive load				Inductive load			
			Resistive load		Lamp load		Inductive load		Motor load	
			NC	NO	NC	NO	NC	NO	NC	NO
ZE-□ ZV-□ ZV2-□		125 VAC	15 A		3 A	1.5 A	15 A		5 A	2.5 A
		250 VAC	15 A		2.5 A	1.25 A	15 A		3 A	1.5 A
		480 VAC	10 A		1.5 A	0.75 A	6 A		1.5 A	0.75 A
		125 VDC	0.5 A		0.5 A		0.05 A		0.05 A	
		250 VDC	0.25 A		0.25 A		0.03 A		0.03 A	
XE-□ XV-□ XV2-□		8 VDC	10 A		3 A	1.5 A	10 A	10 A	5 A	2.5 A
		14 VDC	10 A		3 A	1.5 A	10 A	10 A	5 A	2.5 A
		30 VDC	10 A		3 A	1.5 A	10 A	10 A	5 A	2.5 A
		125 VDC	10 A		3 A	1.5 A	7.5 A	6 A	2 A	2.5 A
		250 VDC	3 A		1.5 A	0.75 A	2 A	1.5 A	2 A	1.5 A

Note: 1. The above figures are for standard currents.

2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).

3. Lamp load has an inrush current of 10 times the steady-state current.

4. Motor load has an inrush current of 6 times the steady-state current.

Inrush current	NC	30 A max.
	NO	15 A max.

■ Characteristics

Degree of protection	IP65 (see note 2)
Durability (see note 3)	Mechanical: Z□: 10,000,000 operations min. X□: 1,000,000 operations min. Electrical: Z□: 500,000 operations min., for 15 A, 250 VAC resistive load X□: 100,000 operations min., for 10 A, 125 VDC resistive load
Operating speed	Plunger type: 0.01 mm to 0.5 m/s Lever type: 0.02 mm to 0.5 m/s
Operating frequency	Mechanical: 120 operations/min Electrical: 20 operations/min
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	15 mΩ max. (initial value)
Terminal temperature rise	50°C max.
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity 2,000 VAC, 50/60 Hz for 1 min between current-carrying metal part and ground, and between each terminal and non-current-carrying metal part (1,500 VAC for Z□ models and X□ models)
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note 4)
Shock resistance (see note 4)	Destruction: 1,000 m/s^2 min. Malfunction: 100 m/s^2 min. (see note 5), 50 m/s^2 min. (see note 6)
Ambient temperature (see note 1)	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: General-purpose type: 35% to 85% Sealed type: 35% to 95%
Weight	Approx. 260 to 280 g

Note: 1. The above figures are initial values.

2. IP65 for □-N models and IP60 for □-Q models.

3. The values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

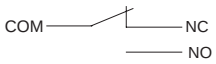
4. At the operation limit positions.

5. Only for plunger, sealed plunger, roller arm lever, and sealed roller arm lever.

6. Only for crossroller plunger, sealed crossroller plunger, roller plunger, and sealed roller plunger.

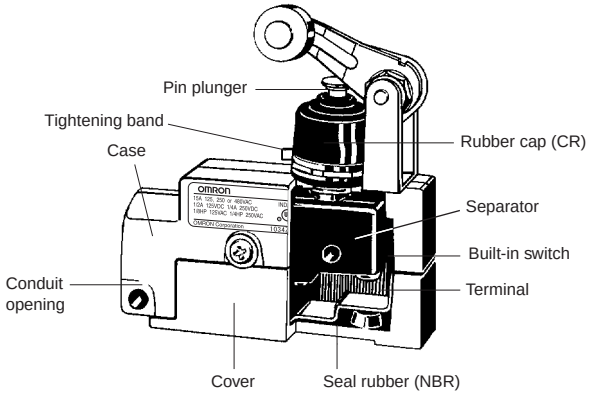
Connections

■ Contact Form



Note: With the XE-□, XV-□, and XV2-□, be sure to connect COM to the + terminal.

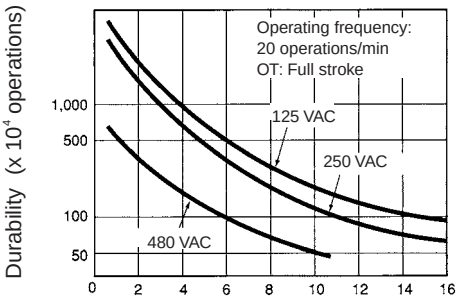
Nomenclature



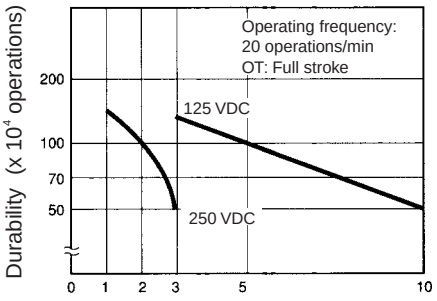
Engineering Data

■ Electrical Durability

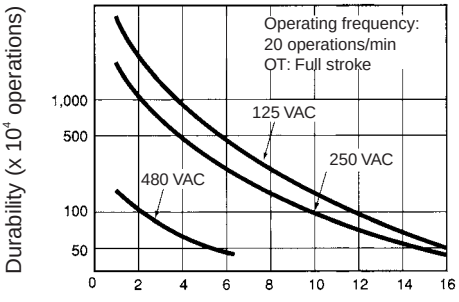
ZE (cosϕ = 1)



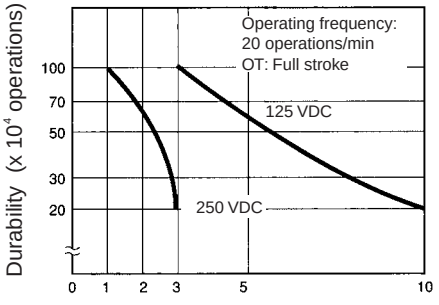
XE (L/R = 0)



ZE (cosϕ = 0.4)



XE (L/R = 7 ms)



Dimensions

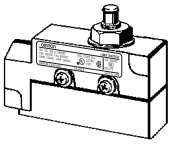
Note: 1. All units are in millimeters unless otherwise indicated.

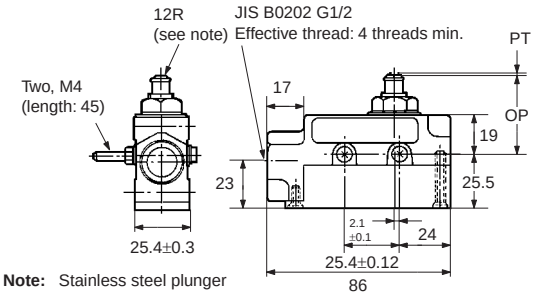
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

3. In the drawings for the Base Mounting Type Switches (ZV), the mounting surfaces (flanges) are shown by lines of alternate long and two short dashes.

Side Mounting

Plunger
ZE-Q-2, XE-Q-2

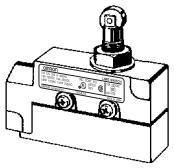


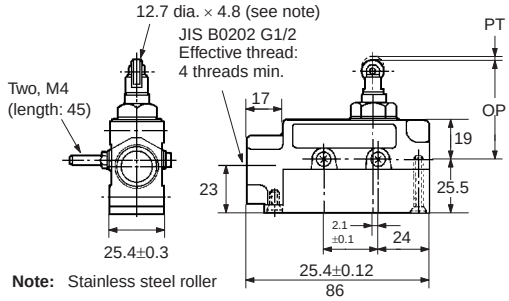


Note: Stainless steel plunger

Model	ZE-Q-2	XE-Q-2
OF	2.45 to 3.43 N	5.00 N max.
RF min.	1.12 N	1.12 N
PT max.	0.4 mm	0.9 mm
OT min.	5.5 mm	5.5 mm
MD max.	0.05 mm	0.47 mm
OP	38.2±0.8 mm	

Roller Plunger
ZE-Q22-2, XE-Q22-2

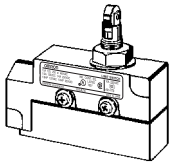


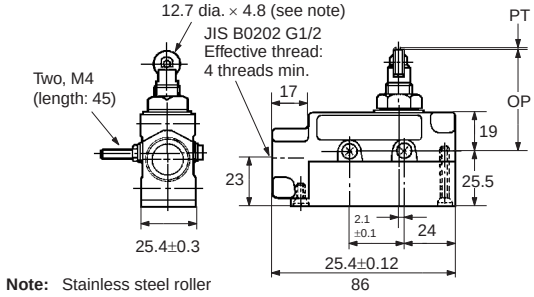


Note: Stainless steel roller

Model	ZE-Q22-2	XE-Q22-2
OF	2.45 to 3.43 N	5.00 N max.
RF min.	1.12 N	1.12 N
PT max.	0.5 mm	0.9 mm
OT min.	3.6 mm	3.6 mm
MD max.	0.05 mm	0.47 mm
OP	49.7±1 mm	

Crossroller Plunger
ZE-Q21-2, XE-Q21-2

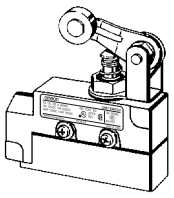


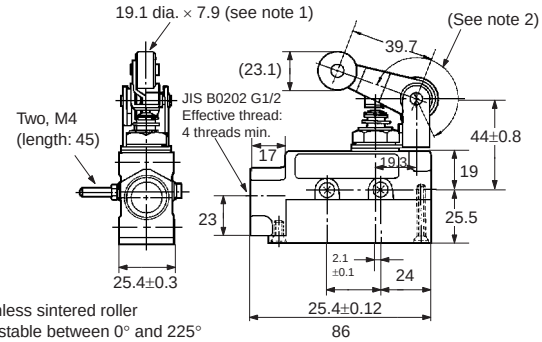


Note: Stainless steel roller

Model	ZE-Q21-2	XE-Q21-2
OF	2.45 to 3.43 N	5.00 N max.
RF min.	1.12 N	1.12 N
PT max.	0.5 mm	0.9 mm
OT min.	3.6 mm	3.6 mm
MD max.	0.05 mm	0.47 mm
OP	49.7±1 mm	

Roller Arm Lever
ZE-QA2-2, XE-QA2-2

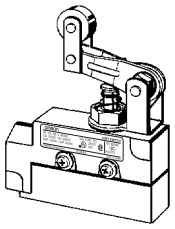


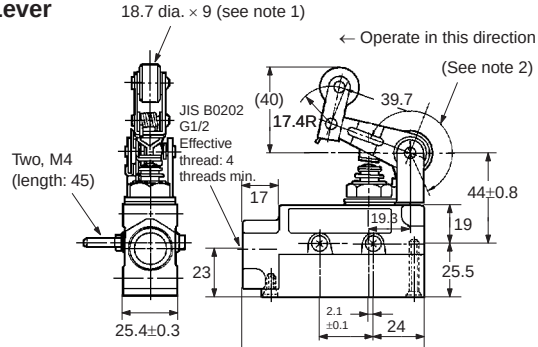


Model	ZE-QA2-2	XE-QA2-2
OF	5.59 N max.	6.47N max.
RF min.	1.67 N	1.67 N
PT max.	4 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
OP	---	

Note: **1.** Stainless sintered roller
2. Adjustable between 0° and 225°

One-way Action Roller Arm Lever
ZE-QA277-2, XE-QA277-2

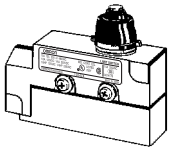


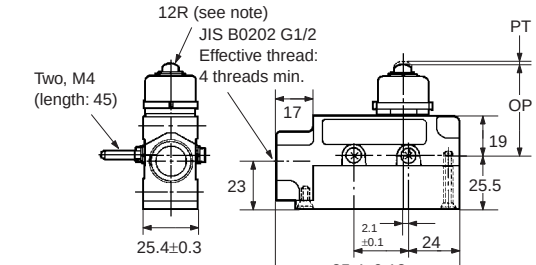


Model	ZE-QA277-2	XE-QA277-2
OF	5.59 N	6.47 N
RF min.	1.67 N	1.67 N
PT max.	4 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
OP	---	

Note: **1.** Stainless sintered alloy roller
2. Adjustable between 0° and 225°

Sealed Plunger
ZE-N-2, XE-N-2

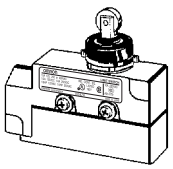


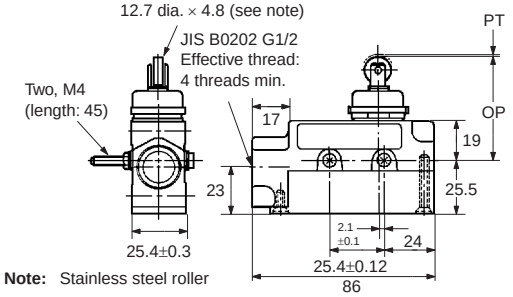


Model	ZE-N-2	XE-N-2
OF	7.85 N	10.20 N
RF min.	2.35 N	2.35 N
PT max.	2 mm	3 mm
OT min.	5 mm	4 mm
MD max.	0.1 mm	0.47 mm
OP	45.8±0.8 mm	

Note: Stainless steel plunger

Sealed Roller Plunger
ZE-N22-2

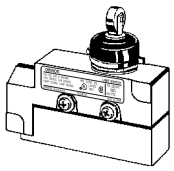


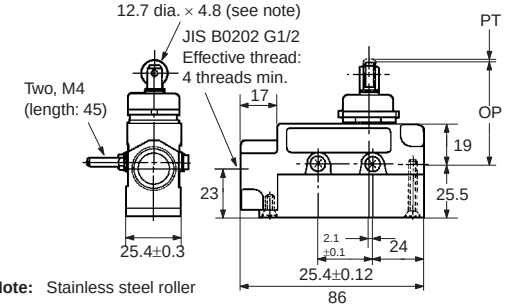


Model	ZE-N22-2
OF	4.90 N
RF min.	0.98 N
PT max.	1 mm
OT min.	3.5 mm
MD max.	0.12 mm
OP	49.7±0.8 mm

Note: Stainless steel roller

Sealed Crossroller Plunger
ZE-N21-2

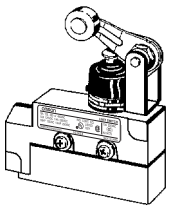


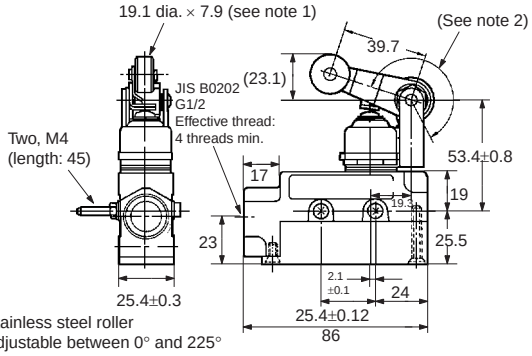


Model	ZE-N21-2
OF	4.90 N
RF min.	0.98 N
PT max.	1 mm
OT min.	3.5 mm
MD max.	0.12 mm
OP	49.7±0.8 mm

Note: Stainless steel roller

Sealed Roller Arm Lever
ZE-NA2-2, XE-NA2-2

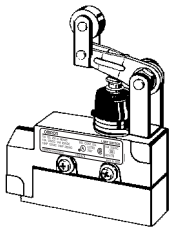


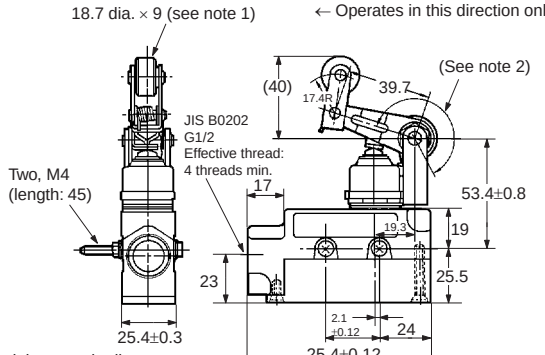


Note: **1.** Stainless steel roller
2. Adjustable between 0° and 225°

Model	ZE-NA2-2	XE-NA2-2
OF	6.28 N	7.26 N
RF min.	2.26 N	2.26 N
PT max.	5 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
OP	---	

One-way Action Sealed Roller Arm Lever
ZE-NA277-2, XE-NA277-2



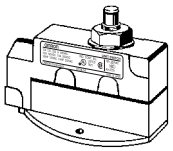


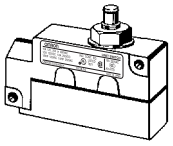
Note: **1.** Stainless steel roller
2. Adjustable between 0° and 225°

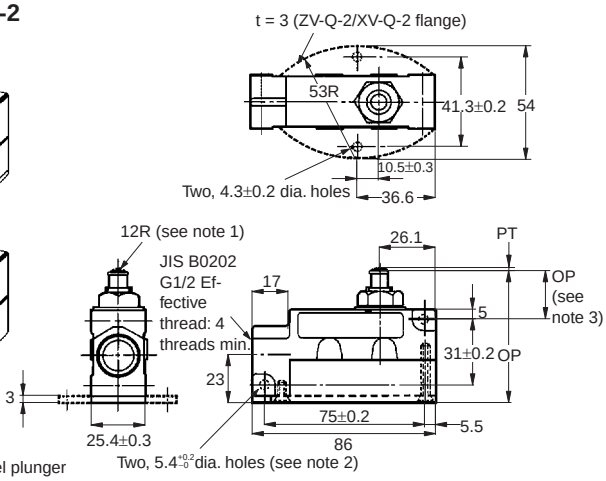
Model	ZE-NA277-2	XE-NA277-2
OF	6.28 N	7.26 N
RF min.	2.26 N	2.26 N
PT max.	5 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
OP	---	

Base Mounting/Diagonal Side Mounting

Plunger
ZV(2)-Q-2, XV(2)-Q-2



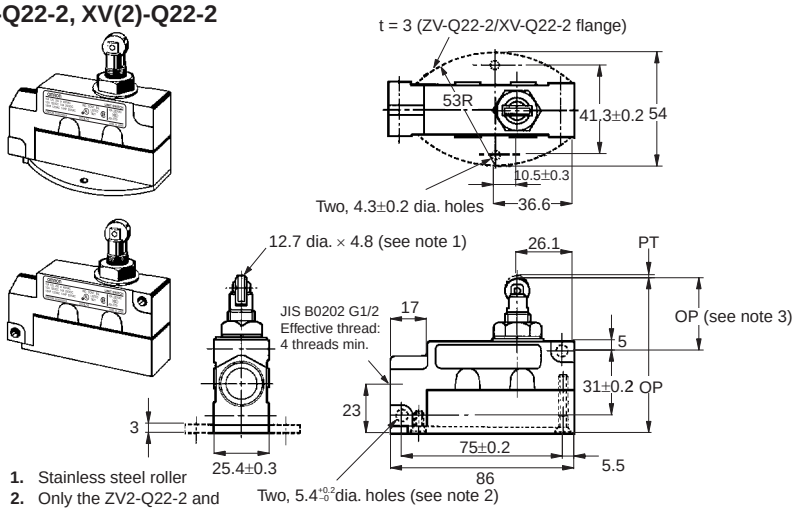




Note: **1.** Stainless steel plunger
2. Only the ZV2-Q-2 and XV2-Q-2 incorporate mounting holes.
3. OP for ZV2-Q-2 and XV2-Q-2 is 24.2 ±0.8 mm.

Model	ZV(2)-Q-2	XV(2)-Q-2
OF	2.45 to 3.43 N	5.00 N max.
RF min.	1.12 N	1.12 N
PT max.	0.4 mm	0.9 mm
OT min.	5.5 mm	5.5 mm
MD max.	0.05 mm	0.47 mm
OP	63.7±0.8 mm (ZV-Q-2, XV-Q-2)	

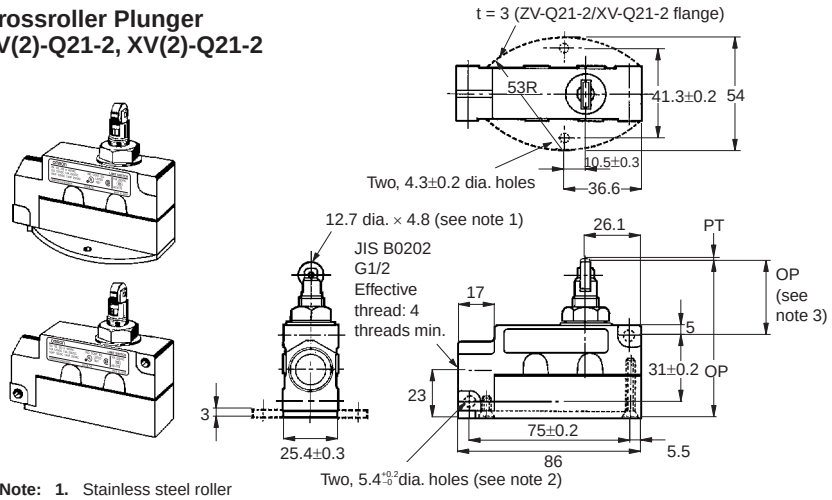
Roller Plunger
ZV(2)-Q22-2, XV(2)-Q22-2



Note: **1.** Stainless steel roller
2. Only the ZV2-Q22-2 and XV2-Q22-2 incorporate mounting holes.
3. OP for ZV2-Q22-2 and XV2-Q22-2 is 35.7 ±1 mm.

Model	ZV(2)-Q22-2	XV(2)-Q22-2
OF	2.45 to 3.43 N	5.00 N max.
RF min.	1.12 N	1.12 N
PT max.	0.5 mm	0.9 mm
OT min.	3.6 mm	3.6 mm
MD max.	0.05 mm	0.47 mm
OP	75.2±0.8 mm (ZV-Q-22-2, XV-Q21-2)	

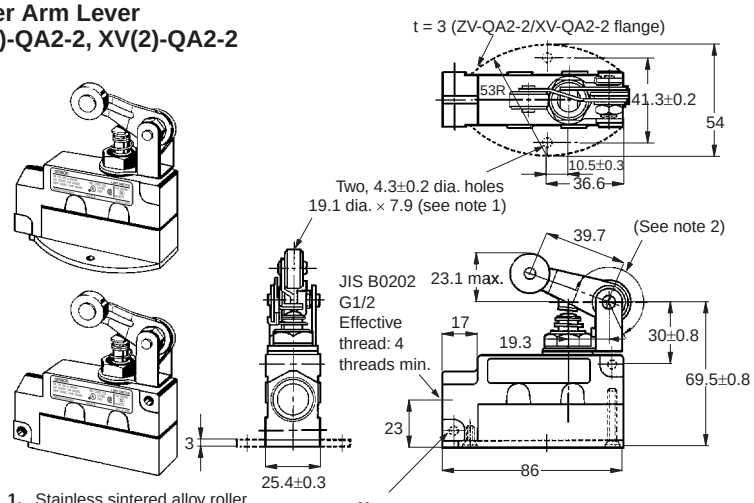
Crossroller Plunger
ZV(2)-Q21-2, XV(2)-Q21-2



Note: **1.** Stainless steel roller
2. Only the ZV2-Q21-2 and XV2-Q21-2 incorporate mounting holes.
3. OP for ZV2-Q21-2 and XV2-Q21-2 is 35.7 ±0.8 mm.

Model	ZV(2)-Q21-2	XV(2)-Q21-2
OF	2.45 to 3.43 N	5.00 N max.
RF min.	1.12 N	1.12 N
PT max.	0.5 mm	0.9 mm
OT min.	3.6 mm	3.6 mm
MD max.	0.05 mm	0.47 mm
OP	75.2±0.8 mm (ZV-Q22-2, XV-Q21-2)	

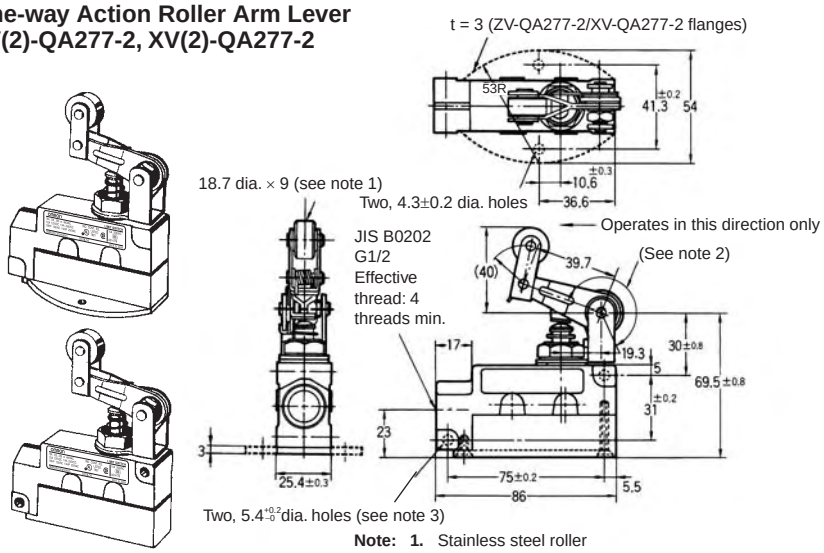
Roller Arm Lever
ZV(2)-QA2-2, XV(2)-QA2-2



Note: **1.** Stainless sintered alloy roller
2. Adjustment between 0° to 225°.
3. Only the ZV2-QA2-2 and XV2-QA2-2 incorporate mounting holes.

Model	ZV(2)-QA2-2	XV(2)-QA2-2
OF	5.59 N max.	6.47 N max.
RF min.	1.67 N	1.67 N
PT max.	4 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
OP	---	

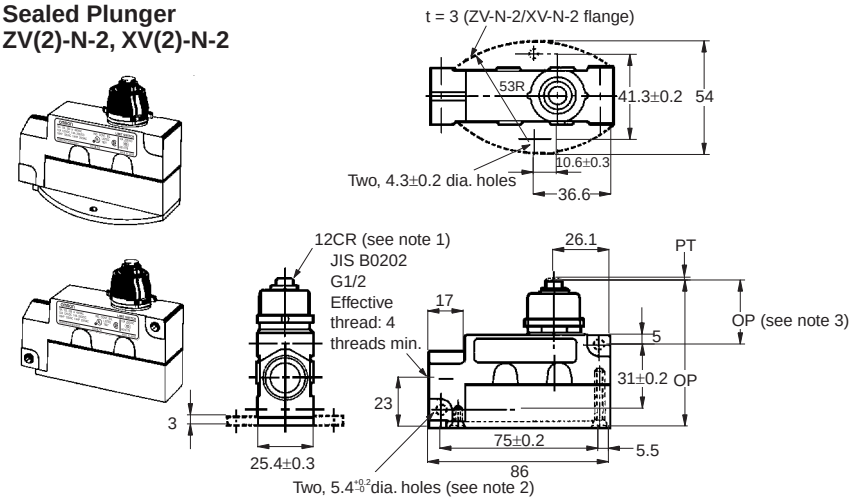
One-way Action Roller Arm Lever
ZV(2)-QA277-2, XV(2)-QA277-2



Model	ZV(2)-QA277-2	XV(2)-QA277-2
OF	5.59 N	6.47 N
RF min.	1.67 N	1.67 N
PT max.	4 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
OP	---	

Note: **1.** Stainless steel roller
2. Adjustment between 0° to 225°.
3. Only the ZV2-QA277-2 and XV2-QA277-2 incorporate mounting holes.

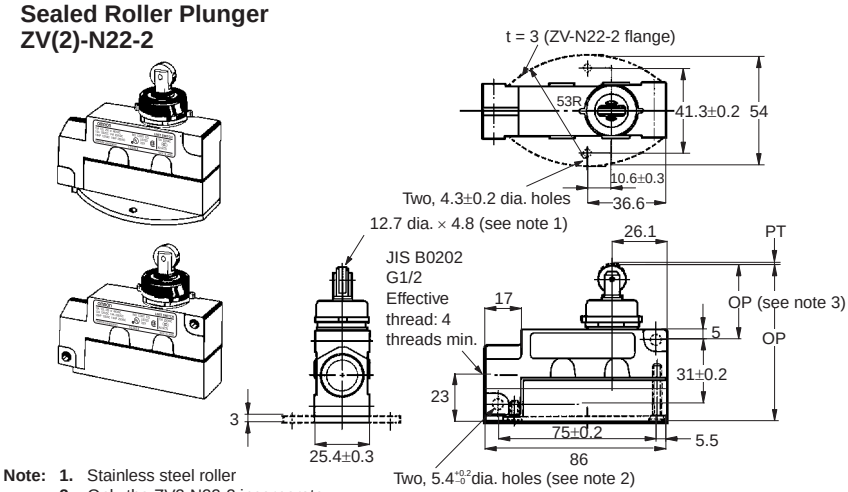
Sealed Plunger
ZV(2)-N-2, XV(2)-N-2



Model	ZV(2)-N-2	XV(2)-N-2
OF	7.85 N	10.20 N
RF min.	2.35 N	2.35 N
PT max.	2 mm	3 mm
OT min.	5 mm	4 mm
MD max.	0.1 mm	0.47 mm
OP	71.4±0.8 mm (ZV-N-2, XV-N-2)	

Note: **1.** Stainless steel plunger
2. Only the ZV2-N-2 and XV2-N-2 incorporate mounting holes.
3. OP for ZV2-N-2 and XV2-N-2 is 31.9 ±0.8 mm.

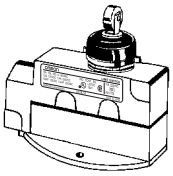
Sealed Roller Plunger
ZV(2)-N22-2

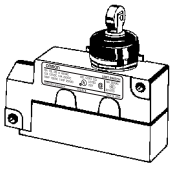


Model	ZV(2)-N22-2
OF	4.90 N
RF min.	0.98 N
PT max.	1 mm
OT min.	3.5 mm
MD max.	0.12 mm
OP	75.2±0.8 mm (ZV-N22-2, ZV-N21-2)

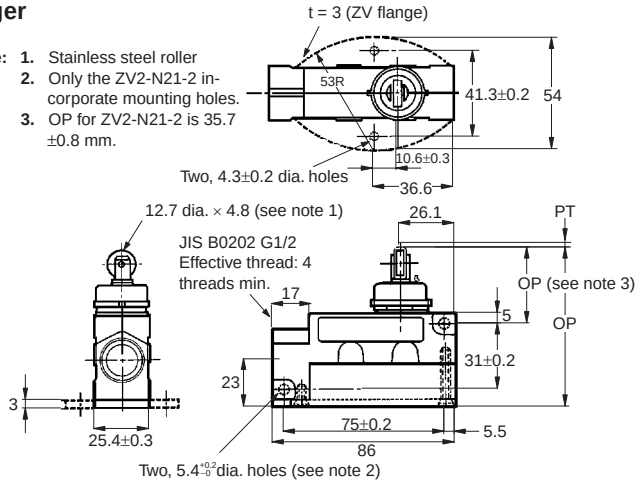
Note: **1.** Stainless steel roller
2. Only the ZV2-N22-2 incorporate mounting holes.
3. OP for ZV2-N22-2 is 35.7 ±0.8 mm.

Sealed Crossroller Plunger ZV(2)-N21-2



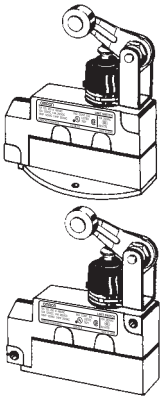


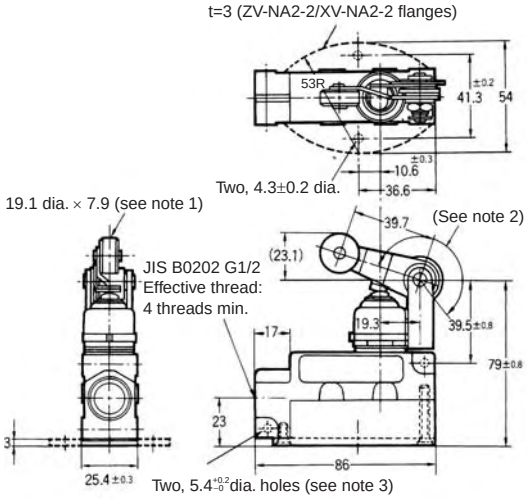
Note: **1.** Stainless steel roller
2. Only the ZV2-N21-2 incorporate mounting holes.
3. OP for ZV2-N21-2 is 35.7 ±0.8 mm.



Model	ZV(2)-N21-2
OF	4.90 N
RF min.	0.98 N
PT max.	1 mm
OT min.	3.5 mm
MD max.	0.12 mm
OP	75.2±0.8 mm (ZV-N22-2, ZV-N21-2)

Sealed Roller Arm Lever ZV(2)-NA2-2, XV(2)-NA2-2

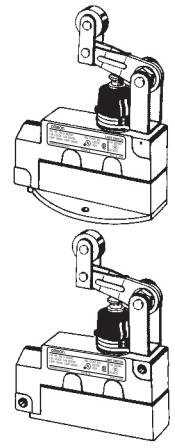


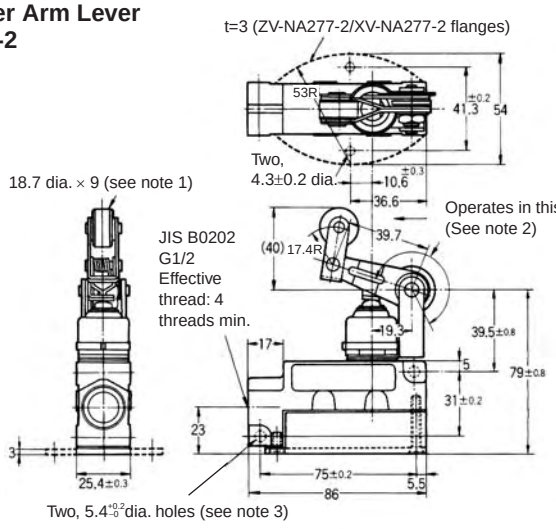


Note: **1.** Stainless steel roller
2. Adjustment between 0° to 225°.
3. Only the ZV2-NA2-2 and XV2-NA2-2 incorporate mounting holes.

Model	ZV(2)-NA2-2	XV(2)-NA2-2
OF	6.28 N	7.26 N
RF min.	2.26 N	2.26 N
PT max.	5 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
FP max.	---	
OP	---	

One-way Action Sealed Roller Arm Lever ZV(2)-NA277-2, XV(2)-NA277-2





Note: **1.** Stainless steel roller
2. Adjustment between 0° to 225°.
3. Only the ZV2-NA277-2 and XV2-NA277-2 incorporate mounting holes.

Model	ZV(2)-NA277-2	XV(2)-NA277-2
OF	6.28 N	7.26 N
RF min.	2.26 N	2.26 N
PT max.	5 mm	6 mm
OT min.	6 mm	5.5 mm
MD max.	0.4 mm	0.72 mm
FP max.	---	
OP	---	

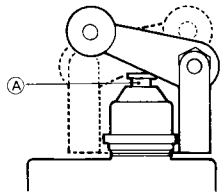
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

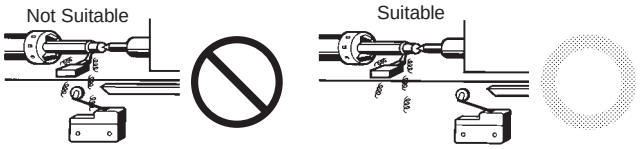
■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Be sure to protect part A with grease in order to maintain the mechanical durability and performance of the Limit Switch. The use of molybdenum disulfide grease is recommended.



- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Mounting

With the Roller Lever-type Enclosed Switches, the roller arm has been temporarily tightened prior to shipment, so that its position may be adjusted later. When mounting the Switch, be sure to re-tighten the roller arm so as to prevent it from becoming loose during operation.

To adequately maintain the seals at the mounting screw section on the side of the Enclosed Switch, insert each O-ring correctly and secure it with the lock nut.

To provide the Switch with improved sealing property, use of the SC Connector is recommended.

When routing wires into the conduit opening, be sure that cuttings and other foreign matter do not enter the Switch.

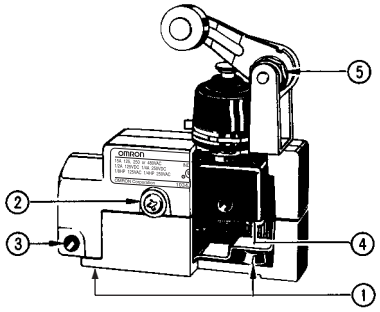
Tightening Torque

A loose screw may result in a malfunction. Be sure to tighten each screw to the proper tightening torque as shown below.

No.	Type	Torque
1	Cover mounting screw	1.18 to 1.37 N·m
2	Switch mounting screw (see note 1)	1.18 to 1.37 N·m
3	Switch mounting screw (see note 2)	4.90 to 5.88 N·m
4	Switch terminal screw (M4 screws for head)	0.78 to 1.18 N·m
5	Roller arm mounting nut	4.90 to 5.88 N·m

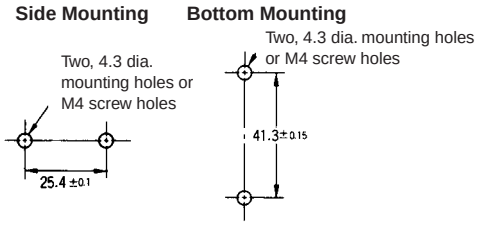
Note: 1. This torque range applies to side mounting or bottom mounting. (M4 screws for head)

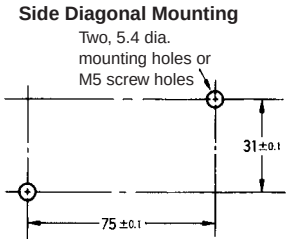
2. This torque range applies to side diagonal mounting. (M5 Allen-head bolt)



Mounting

Mounting Holes





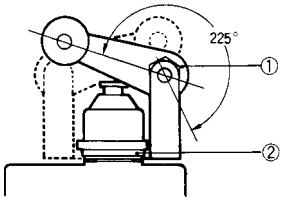
Operation

- Operating method, shape of cam or dog, operating frequency, and the overtravel (OT) have significant effect on the service life and precision of the Limit Switch. Make sure that the shape of the cam is smooth enough.
- Check that OT has a sufficient margin. The actual OT should be rated OT x 0.7 to 1.

Dedicated Wrench

The roller arm can be set freely within a range of 225° after loosening the nut.

The roller arm mounting bracket can be set in any direction after loosening the nut.



A dedicated wrench is provided separately.

Model: SUPANA FOR ZE

Make sure that the nut is free of foreign substances when the nut is loosened.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C020-E1-11

Enclosed Switch
ZC-□55

Small, High-precision Enclosed Switch

- Employs a modified version of Z Basic Switch as built-in switch.
- Same mounting pitch as Z Basic Switch.
- Pre-wired molded terminal models are available.
- Requires less operating force than conventional limit switches.
- Long life expectancy and economical.
- Approved by EN, UL, CSA, and CCC (Chinese standard).

Model Number Structure

■ Model Number Legend

ZC-□55
1

1. Actuator

D: Plunger
Q: Panel mount plunger
Q22: Panel mount roller plunger
Q21: Panel mount crossroller plunger
N22: Sealed roller plunger
N21: Sealed crossroller plunger
W: Short hinge lever
W1: Hinge lever
W2: Short hinge roller lever
W21: Hinge roller lever
W3: One-way action short hinge roller lever
W31: One-way action hinge roller lever

Ordering Information

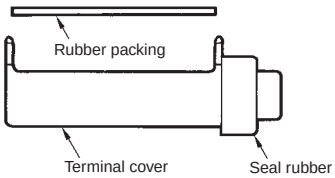
■ List of Models

Actuator	Model	Actuator	Model
Plunger	ZC-D55	**Short hinge lever**	ZC-W55
Panel mount plunger	ZC-Q55	**Hinge lever**	ZC-W155
Panel mount roller plunger	ZC-Q2255	**Short hinge roller lever**	ZC-W255
Panel mount crossroller plunger	ZC-Q2155	**Hinge roller lever**	ZC-W2155
Sealed roller plunger	ZC-N2255	**One-way action short hinge roller lever**	ZC-W355
Sealed crossroller plunger	ZC-N2155	**One-way action hinge roller lever**	ZC-W3155

Note: Use molded terminal models (refer to page 125) when using the Switch under one of the following conditions:
a) dusty, b) high amount of dripping oil, or c) high humidity.
Models are available with lead outlets in three positions: right-hand, left-hand, and underside.

Terminal Protective Cover, Seal Rubber, and Rubber Packing

(The Switch is equipped with these 3 items as a standard.)



- ZC Terminal Cover
  (Product code: ZC55-0002H)
- ZC Seal Rubber
  (Product code: SC-1404C)
- ZC Rubber Packing
  (Product code: ZC55-0003F)

Specifications

■ Approved Standards

(Except Molded Terminal Models and Operation Indicator-equipped Model)

Agency	Standard	File No.
UL	UL508	E76675
CSA	C22.2, No. 14	LR45258
TÜV Rheinland	EN60947-1, EN60947-5-1	J9650089
CCC (CQC)	GB14048.5	2003010303077620

Note: Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL/CSA

A300

Voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

Microloads	0.1 A 125 VAC 0.1 A 30 VDC

TÜV Rheinland (EN60947-1, EN60947-5-1), CCC (GB14048.5)

Applicable category and ratings
AC-12 10 A/250 VAC

■ General Ratings

Rated voltage	Non-inductive load				Inductive load			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10 A		3 A	1.5 A	10 A		5 A	2.5 A
250 VAC	10 A		2.5 A	1.25 A	10 A		3 A	1.5 A
8 VDC	10 A		3 A	1.5 A	6 A		5 A	2.5 A
14 VDC	10 A		3 A	1.5 A	6 A		5 A	2.5 A
30 VDC	6 A		3 A	1.5 A	5 A		5 A	2.5 A
125 VDC	0.5 A		0.4 A	0.4 A	0.05 A		0.05 A	0.05 A
250 VDC	0.25 A		0.2 A	0.2 A	0.03 A		0.03 A	0.03 A

Inrush current	NC	30 A max.
	NO	15 A max.

Note: **1.** The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.
5. The above ratings were tested under the following conditions according.
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 20 operations/min

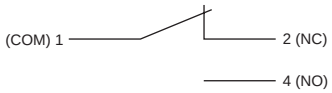
■ Characteristics

Degree of protections	IP67
Durability	Mechanical: 10,000,000 operations min. Electrical: 500,000 operations min.
Operating speed	0.05 mm to 0.5 m/s (at pin plunger)
Operating frequency	Mechanical: 120 operations/min Electrical: 20 operations/min
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	15 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between non-continuous terminals 2,000 VAC, 50/60 Hz for 1 min between current-carrying metal part and ground, and between each terminal and non-current-carrying metal parts
Rated insulation voltage (U_i)	1,000 VAC
Pollution degree (operating environment)	3 (IEC947-5-1)
Short-circuit protective device	10 A-fuse type gG (IEC 269)
Protection against electric shock	Class II
PT1 (tracking characteristics)	175
Switch category	D (IEC335)
Rated operating current (Ie)	10 A
Rated operating voltage (Ue)	250 VAC
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note)
Shock resistance	Destruction: 1,000 m/s^2 max. Malfunction: 300 m/s^2 max. (at pin plunger) (see note)
Ambient temperature	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 92 g (in case of ZC-Q22(21)55)

Note: Less than 1 ms under a free state at the operating limits.

Connections

■ Contact Form



■ Operation Indicator-equipped Models (Not Approved by UL, CSA, or EN)

All the models can be equipped upon request with a operation indicator to facilitate maintenance and inspection.

Because the indicator is incorporated in the Terminal Protective Cover, the dimensions of the Limit Switch are not affected. In this model, the lead wire is to be connected to the screw terminal. (A connecting washer is provided on the tip of the lead wire).

The lead wire can be connected to either the NC or NO terminal.

Operating characteristics are the same as the standard model from which the operation indicator equipped model is fabricated.

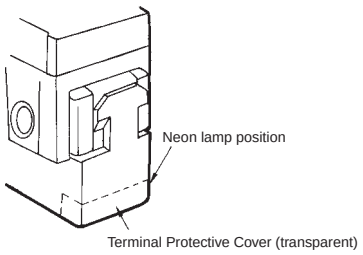
AC Operation

The operating voltage range is from 90 to 250 VAC.

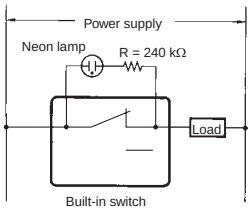
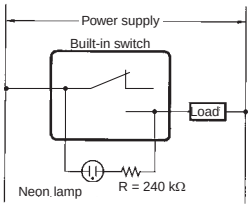
The dimensions are the same as the standard type. The top of the Terminal Protective Cover is transparent to allow checking the operation easily.

When placing your order for the indicator equipped, AC-operated model, add suffix “L” to the end of the model number.

Example:
Standard type: ZC-Q2255
Indicator equipped type: ZC-Q2255-L



Contact Circuit

NC terminal	
NO terminal	

Note: If the wiring is as shown above, the operation of the respective parts will be as shown in the following table. The neon lamp is not wired when the Switch is delivered. Connect it as required.

Contact	Neon lamp	Load	Actuator
NC	ON	Does not operate	Operates
	OFF	Operates	Does not operate
NO	ON	Does not operate	Does not operate
	OFF	Operates	Operates

DC Operation

The DC-operated is provided with an LED indicator.

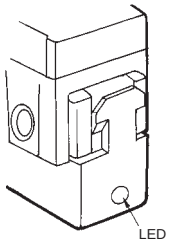
There is no protective structure.

Since a rectifier stack is incorporated into the unit to permit reversing the polarity, this type can also operate on AC power source.

The LED projects from the housing for easy visibility.

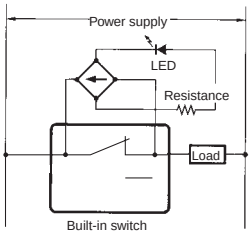
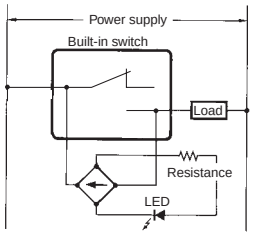
When placing your order, add suffix “L2” or “L4” to the model number of the standard type.

Example:
Standard type: ZC-Q2255
Indicator equipped type: ZC-Q2255-L2



Type	Voltage rating	Leakage current	Internal resistance
L2	12 V	Approx. 2.4 mA	4.3 kΩ
L4	24 V	Approx. 1.2 mA	18 kΩ

Contact Circuit

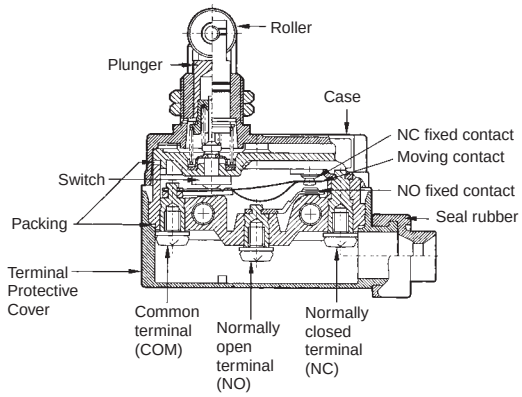
NC terminal	
NO terminal	

Note: If the wiring is as shown above, the operation of the respective parts will be as shown in the following table. The LED terminals are not wired when the Switch is delivered. Connect it as required.

Contact	LED	Load	Actuator
NC	ON	Does not operate	Operates
	OFF	Operates	Does not operate
NO	ON	Does not operate	Does not operate
	OFF	Operates	Operates

Nomenclature

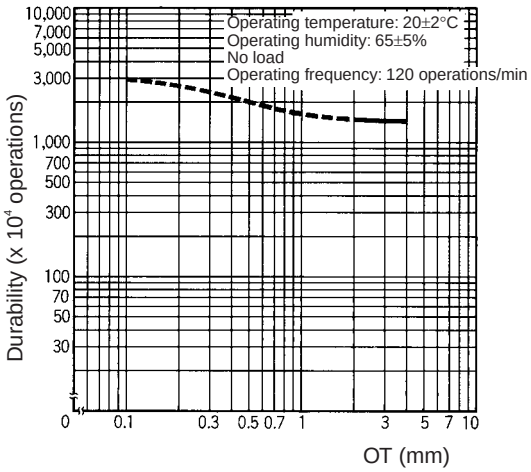
Changing the Terminal Protective Cover around allows the cable to be pulled out from either the right or the left.



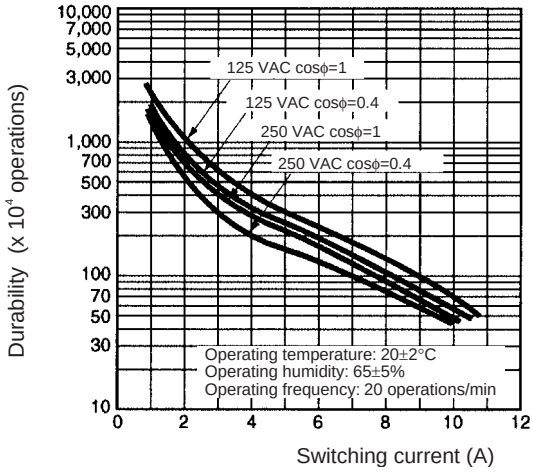
Note: M4 binding head screws (with toothed washers) are used as the terminal screws.

Engineering Data

■ Mechanical Durability (for ZC-Q55)



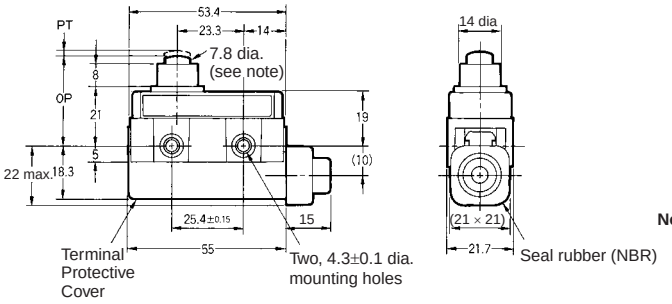
■ Electrical Durability



Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

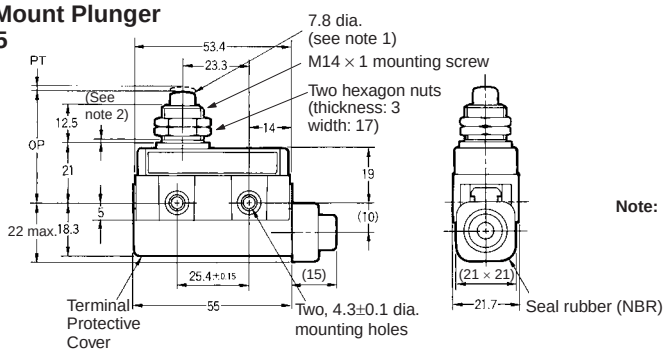
Plunger
ZC-D55



Model	ZC-D55
OF max.	11.8 N
RF max.	4.90 N
PT max.	1.5 mm
OT min.	2.4 mm
MD max.	0.2 mm
OP	32.4±0.8 mm

Note: Stainless steel plunger

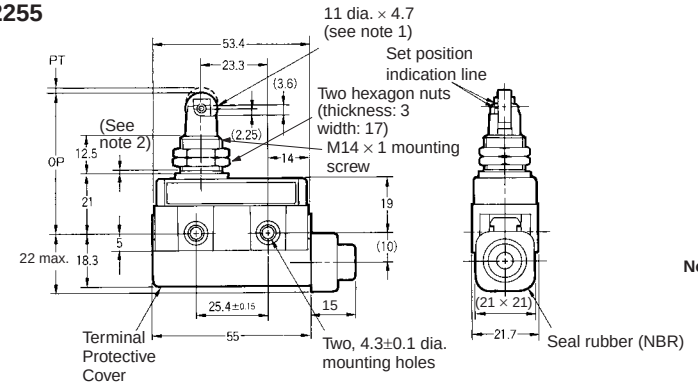
Panel Mount Plunger
ZC-Q55



Model	ZC-Q55
OF max.	11.8 N
RF max.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD max.	0.2 mm
OP	38.2±0.8 mm

Note: **1.** Stainless steel plunger
2. The length of the imperfect threads is 1.5 mm maximum.
3. Do not use the M14 mounting screw and the case mounting hole at the same time.

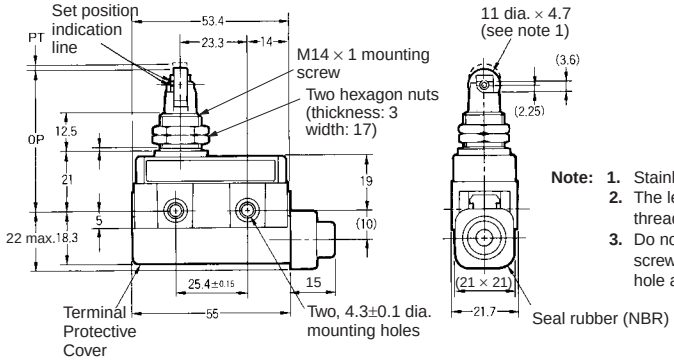
Panel Mount Roller Plunger
ZC-Q2255



Model	ZC-Q2255
OF max.	11.8 N
RF max.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD max.	0.2 mm
OP	47.4±0.8 mm

Note: **1.** Stainless sintered alloy roller
2. The length of the imperfect threads is 1.5 mm maximum.
3. Do not use the M14 mounting screw and the case mounting hole at the same time.

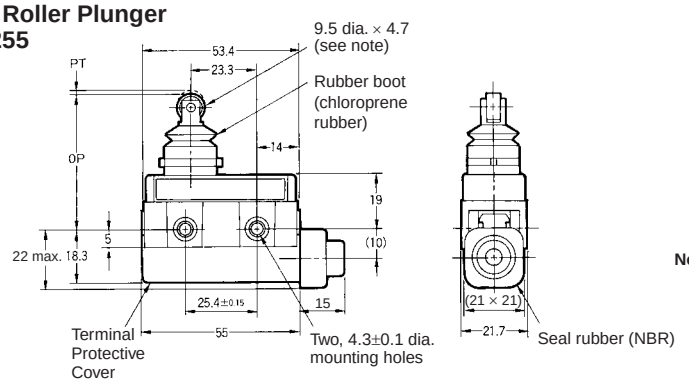
Panel Mount Crossroller Plunger
ZC-Q2155



Model	ZC-Q2155
OF max.	11.8 N
RF max.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD max.	0.2 mm
OP	47.4±0.8 mm

Note: **1.** Stainless sintered alloy roller
2. The length of the imperfect threads is 1.5 mm maximum.
3. Do not use the M14 mounting screw and the case mounting hole at the same time.

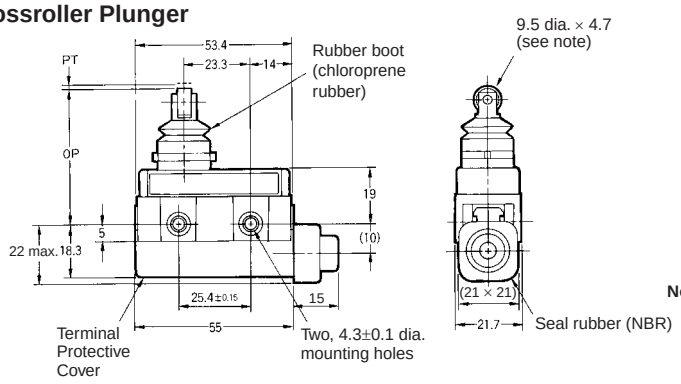
Sealed Roller Plunger
ZC-N2255



Model	ZC-N2255
OF max.	6.86 N
RF max.	1.67 N
PT max.	1.5 mm
OT min.	2.5 mm
MD max.	0.2 mm
OP	47.4±0.8 mm

Note: Stainless sintered alloy roller

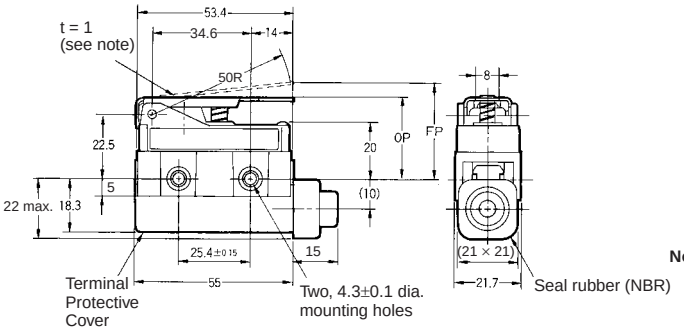
Sealed Crossroller Plunger
ZC-N2155



Model	ZC-N2155
OF max.	6.86 N
RF max.	1.67 N
PT max.	1.5 mm
OT min.	2.5 mm
MD max.	0.2 mm
OP	47.4±0.8 mm

Note: Stainless sintered alloy roller

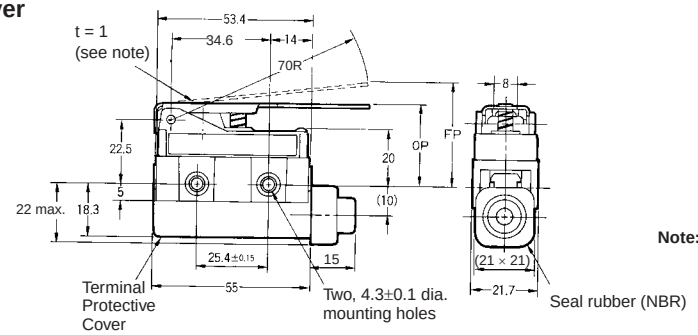
Short Hinge Roller Lever
ZC-W55



Model	ZC-W55
OF max.	3.92 N
RF max.	0.78 N
PT max.	6 mm
OT min.	1 mm
MD max.	28.5±1.2 mm
OP	34.7 mm

Note: Stainless steel lever

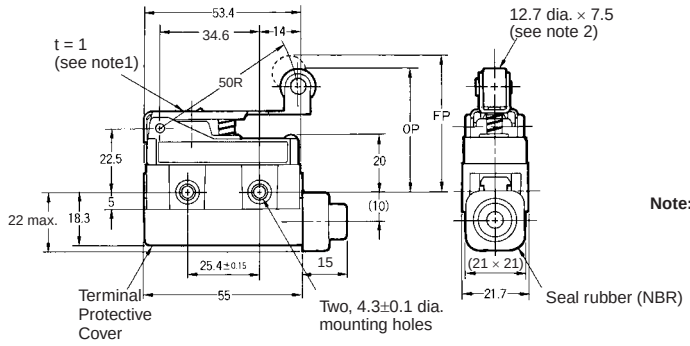
Hinge Lever
ZC-W155



Model	ZC-W155
OF max.	2.75 N
RF max.	0.59 N
PT max.	8.4 mm
OT min.	1.4 mm
MD max.	28.5±1.2 mm
OP	36.7 mm

Note: Stainless steel lever

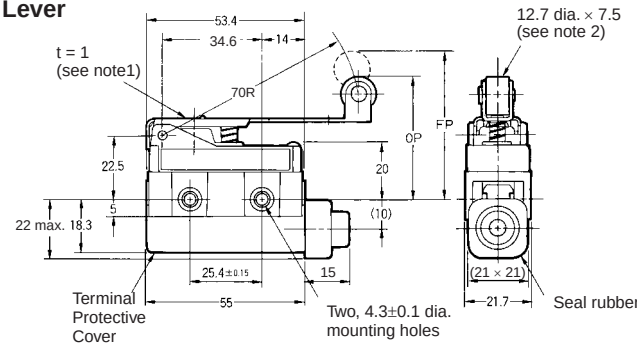
Short Hinge Roller Lever
ZC-W255



Note: 1. Stainless steel lever
2. Stainless steel roller

Model	ZC-W255
OF max.	3.92 N
RF max.	0.78 N
PT max.	6 mm
OT min.	1 mm
MD max.	43±1.2 mm
OP	49.2 mm

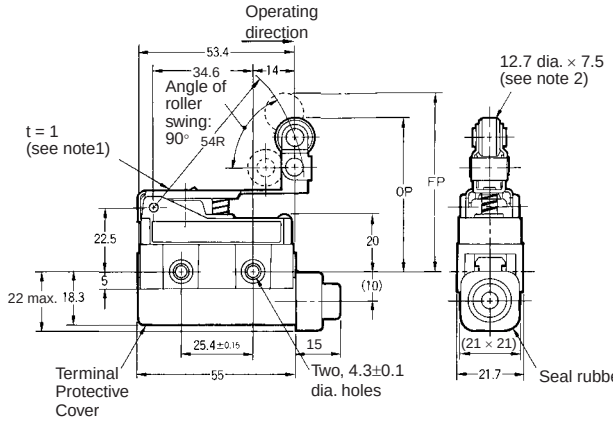
Hinge Roller Lever
ZC-W2155



Note: 1. Stainless steel lever
2. Stainless steel roller

Model	ZC-W2155
OF max.	2.75 N
RF max.	0.59 N
PT max.	8.4 mm
OT min.	1.4 mm
MD max.	43±1.2 mm
OP	51.3 mm

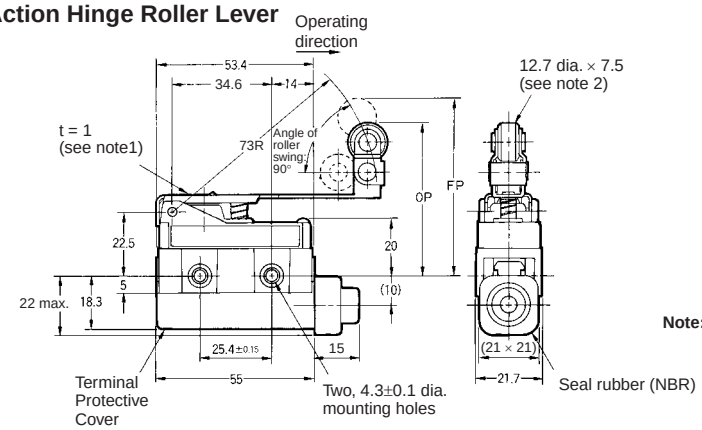
One-way Action Short Hinge Roller Lever
ZC-W355



Note: 1. Stainless steel lever
2. Stainless steel roller

Model	ZC-W355
OF max.	3.92 N
RF max.	0.78 N
PT max.	6 mm
OT min.	1 mm
MD max.	53±1.2 mm
OP	59.2 mm

One-way Action Hinge Roller Lever
ZC-W3155



Note: 1. Stainless steel lever
2. Stainless steel roller

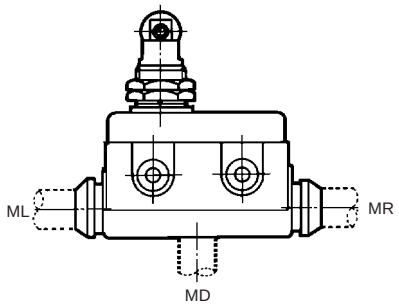
Model	ZC-W3155
OF max.	2.75 N
RF max.	0.59 N
PT max.	8.4 mm
OT min.	1.4 mm
MD max.	53±1.2 mm
OP	61.2 mm

Molded Terminal Models

■ Molded Terminal Model

The molded-terminal model is available with right-hand, left-hand and underside leads and is recommended for use where the Switch is exposed to dust, oil or moisture.

The molded-terminal model is not approved by UL, CSA, or EN.



Note: When placing your order for the Switch, specify the required length of V.C.T. cable in addition to the model number of the Switch.

Example:
Standard type: ZC-Q2255
Location of lead output: Right side
Length of lead: 1 m (V.C.T. lead)
When placing your order for the above Switch, specify the model number as ZC-Q2255-MR VCT 1M.

Suffix by Location of Lead Outlet

Location of lead output	Model
	COM, NC and NO
Right-hand	ZC-□-MR
Left-hand	ZC-□-ML
Underside	ZC-□-MD

Lead Supplies

Leads	Nominal cross-sectional area	Finished outside diameter	Terminal connections	Standard length
V.C.T. (vinyl cabtire cable)	1.25 mm^2	3 core: 10.5 dia.	Black: COM White: NO Red: NC	1, 3 m

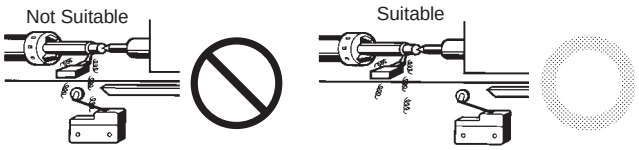
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



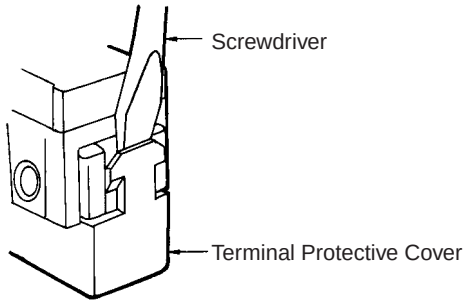
- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Dog Angle

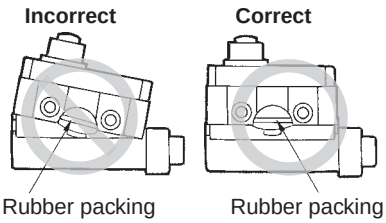
When operating the roller type, be sure to set the dog angle to less than 30° (even when operating at a low speed). Operating the model at a dog angle exceeding 30° will soon cause abrasion or damage. Do not apply a twisting force to the plunger. Set the OT to 70% to 100% of the specified value so that the actuator will not exceed the OT.

Handling

When detaching the Terminal Protective Cover, insert a screwdriver and apply a force in the opening direction. Do not use excess force to remove the cover. Doing so may cause deformation in the fitting section and reduce the holding force.



When mounting the Terminal Protective Cover to the case, align the cover on the case and then press the cover down to mount it firmly. If the cover is pressed down in an inclined position, rubber packing will deform and thus affect the sealing capability.

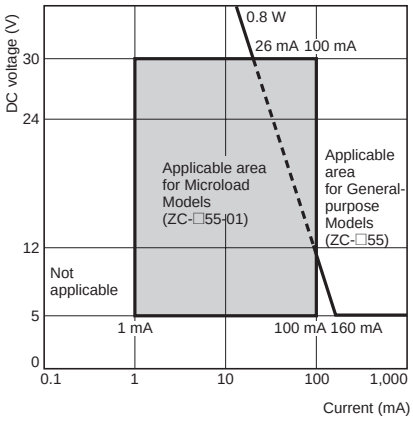


- A 8.5- to 10.5-dia. cable can be applied as seal rubber for the lead wire outlet. (Use two- or three-core cable of VCT1.25 mm^2.)
- Use weather-proof rubber (chloroprene rubber) as seal rubber for the ZC-N22(21)55.

Microload Models

Contact failure may occur is a General-purpose Switch is used to switch a microload circuit. Use Switches within the areas shown in the following chart. Even when using Microload Switches within the area shown below, contact wear will become more extreme with loads that generate surge current when switching and durability will be adversely affected. If necessary, insert a contact protective circuit. Microloads are indicated by N standard reference values. This value represents the failure rate at a 60% (λ60) reliability level. (JIS C5003)

The equation $\lambda 60 = 0.5 \times 10^{-6}$/operations indicates that a failure rate of 1/2,000,000 operations can be expected at a reliability level of 60%.

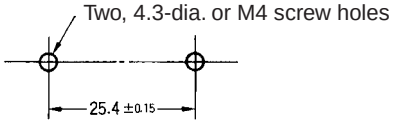


Model	ZC-□55-01	ZC-□55
Minimum applicable load	5 VDC 1 mA	5 VDC 160 mA

Mounting

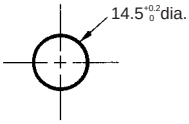
- When mounting the Switch with screws on a side surface, fasten the Switch with M4 screws and use washers, spring washers, etc., to ensure secure mounting.

Mounting Holes



- When mounting the Panel Mount-type Enclosed Switch (ZC-Q55, ZC-Q2255, or ZC-Q2155) with screws on a side surface, remove the hexagonal nuts from the actuator.

Mounting Hole Dimensions



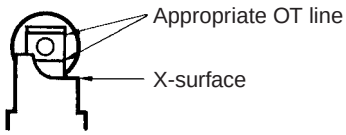
Tightening Torque

A loose screw may result in a malfunction. Be sure to tighten each screw to the proper tightening torque as shown below.

No.	Type	Torque
1	Terminal screw	0.78 to 1.18 N·m
2	Panel mounting screw	4.90 to 7.84 N·m
3	Side mounting screw	1.18 to 1.47 N·m

Operation

With the ZC-Q22(21)55, an appropriate OT line is marked on the plunger. Set the OT so that it is between the two X-surface lines.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C025-E1-11

Enclosed Switch
SHL

Subminiature Enclosed Switch (Measuring 48 x 17.5 x 45 mm) with High Sealing Property

- Built-in coil spring type basic switch housed in rigid zinc diecast alloy casting boasts long life and high precision.
- Requires nearly the same operating force as conventional basic precision switches (2.35 to 3.92 N).
- Molded terminal model is available.
- Operation indicator model is also available.
- Approved by EN, UL, CSA, and CCC (Chinese standard).

Model Number Structure

■ Model Number Legend

Standard Models

SHL-□55-□
1 2

1. Actuator

D: Plunger
Q: Panel mount plunger
Q22: Panel mount roller plunger
Q21: Panel mount crossroller plunger
W: Short hinge lever
W1: Hinge lever
W2: Short hinge roller lever
W21: Hinge roller lever
W3: One-way action short hinge roller lever
W31: One-way action hinge roller lever

2. Rated Current

None: Standard
01: Micro Load

Note: Refer to page 135 for *Molded Terminal Models.*

Ordering Information

■ List of Models

Actuator	Standard model	Micro voltage
Plunger	SHL-D55	SHL-D55-01
Panel mount plunger	SHL-Q55	SHL-Q55-01
Panel mount roller plunger	SHL-Q2255	SHL-Q2255-01
Panel mount crossroller plunger	SHL-Q2155	SHL-Q2155-01
Short hinge lever	SHL-W55	SHL-W55-01

Actuator	Standard model	Micro voltage
Hinge lever 	SHL-W155	SHL-W155-01
Short hinge roller lever 	SHL-W255	SHL-W255-01
Hinge roller lever 	SHL-W2155	SHL-W2155-01
One-way action short hinge roller lever 	SHL-W355	SHL-W355-01
One-way action hinge roller lever 	SHL-W3155	SHL-W3155-01

Specifications

■ Approved Standards

Agency	Standard	File No.
UL	UL508	E76675
CSA	CSA C22.2 No. 14	LR45746
TÜV Rheinland	EN60947-5-1	R9451332
CCC (CQC)	GB14048.5	2003010305072162

Note: Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL/CSA

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC 240 VAC	10 A	60 A 30 A	6 A 3 A	7,200 VA	720 VA

TÜV (EN60947-5-1), CCC (GB14048.5)

Model	Category and rating	I the
SHL-□55	AC-15 2 A/125 V DC-12 2 A/48 V	5 A 4 A
SHL-□55-01	AC-14 0.1 A/125 V DC-12 0.1 A/48 V	0.5 A 0.5 A
SHL-□55-L	AC-15 2 A/125 V	5 A
SHL-□55-01L	AC-14 0.1 A/125 V	0.5 A
SHL-□55-01L2	DC-12 0.1 A/12 V	0.5 A
SHL-□55-L3	DC-12 2 A/24 V	4 A
SHL-□55-01L3	DC-12 0.1 A/24 V	0.5 A
SHL-□55-L4	DC-12 2 A/24 V	4 A
SHL-□55-01L4	DC-12 0.1 A/24 V	0.5 A

Note: For details on the above models, refer to *"Molded Terminal Models" on page 135*.

■ General Ratings

Rated voltage	Non-inductive load				Inductive load				Inrush current	
	Resistive load		Lamp load		Inductive load		Motor load			
	NC	NO	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10 A		1.5 A		3 A		2.5 A		15 A max.	
250 VAC	10 A		1.5 A		2 A		1.5 A			
480 VAC	2 A		---		---		---			
8 VDC	10 A		2 A		5 A		2 A			
14 VDC	10 A		2 A		5 A		2 A			
30 VDC	5 A		1.5 A		1.5 A		1.5 A			
125 VDC	0.4 A		0.4 A		0.05 A		0.05 A			
250 VDC	0.2 A		0.2 A		0.03 A		0.03 A			

Note: 1. The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.

Micro Voltage/Current Load Model

Rated voltage	Non-inductive load	
	Resistive load	
	NC	NO
125 VAC	0.1 A	
8 VDC	0.1 A	
14 VDC	0.1 A	
30 VDC	0.1 A	

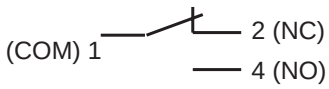
■ Characteristics (For SHL-W155)

Degree of protections (see note 3)	IP67 (EN60947-5-1)
Durability (see note 4)	Mechanical: 10,000,000 operations min. Electrical: 500,000 operations min.
Operating speed	0.1 mm to 0.5 m/s (hinge lever models)
Operating frequency	Mechanical: 120 operations/min Electrical: 30 operations/min
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	15 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity 2,000 VAC, 50/60 Hz for 1 min/Uimp at 2.5 kV (EN60947-5-1) between current-carrying metal part and ground, and between each terminal and non-current-carrying metal part
Rated insulation voltage (U_i)	150 V (EN60947-5-1)
Switching overvoltage	1,000 VAC max., 300 VDC max. (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Short-circuit protective device (SCPD)	10 A fuse type gI or gG (IEC269)
Conditional short-circuit current	100 A (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	5 A (EN60947-5-1)
Protection against electric shock	Class II (grounding not required with double insulation)
OFF reverse voltage	1,000 VAC max., 300 VDC max. (EN60947-5-1)
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min.
Ambient temperature	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight (see note 5)	Approx. 62 to 72 g

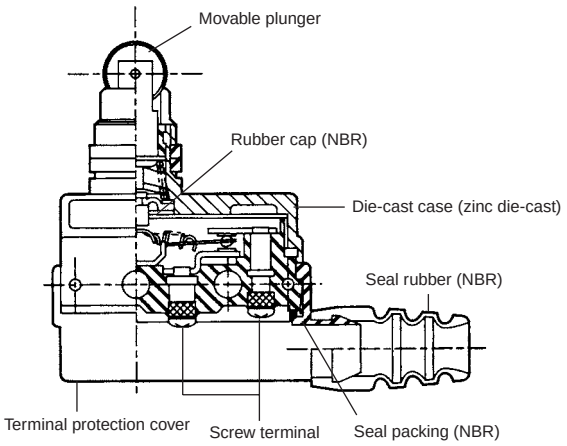
Note: 1. The above figures are for steady-state currents.
2. The above ratings may vary depending on the model. Contact your OMRON representative for further details.
3. The head section of the plunger type SHL-D(Q)□□ is excluded.
4. Durability values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.
5. The values are for the plunger-type models.

Connections

■ Contact Form



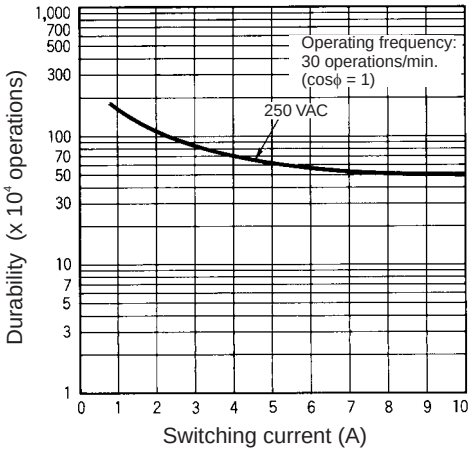
Nomenclature



Engineering Data

■ Electrical Durability

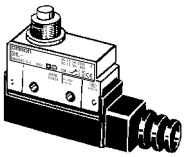
Ambient temperature: 5°C to 35°C
Ambient humidity: 40% to 50%



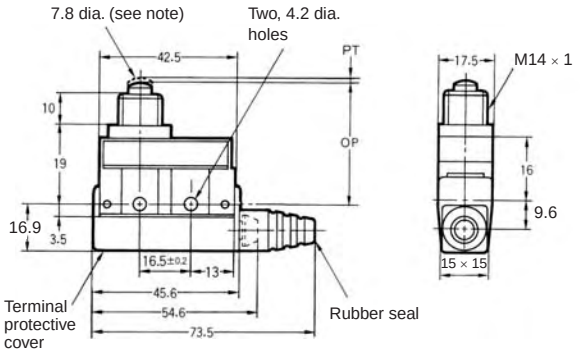
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Plunger
SHL-D55, SHL-D55-01

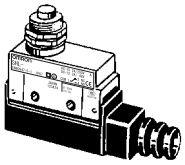


Note: Stainless steel pin plunger

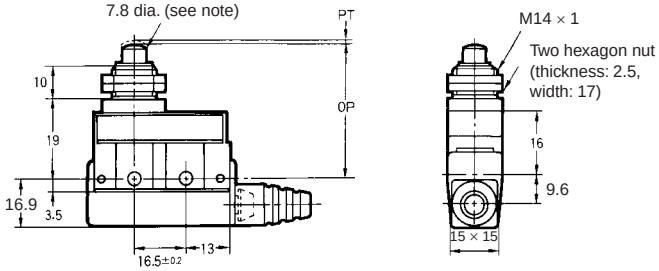


Model	SHL-D55 SHL-D55-01
OF max.	9.81 N
RF min.	1.96 N
PT max.	1.5 mm
OT min.	2 mm
MD max.	0.5 mm
OP	34±0.8 mm
FP max.	---

Panel Mount Plunger
SHL-Q55, SHL-Q55-01

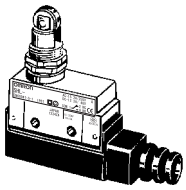


Note: Stainless steel pin plunger

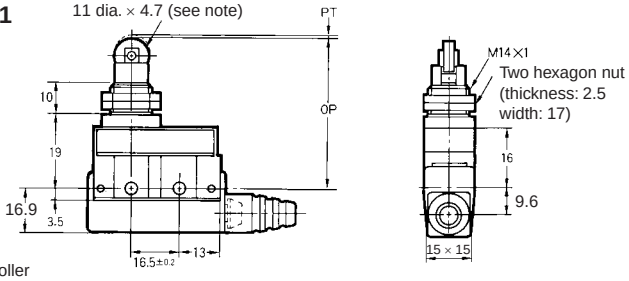


Model	SHL-Q55 SHL-Q55-01
OF max.	9.81 N
RF min.	1.96 N
PT max.	1.5 mm
OT min.	2 mm
MD max.	0.5 mm
OP	34±0.8 mm
FP max.	---

Panel Mount Roller Plunger
SHL-Q2255, SHL-Q2255-01

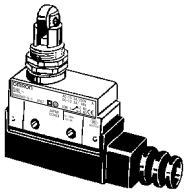


Note: Stainless sintered alloy roller

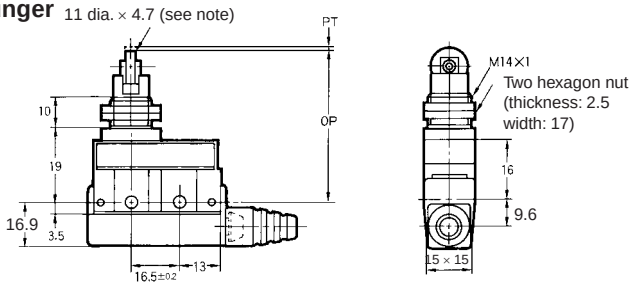


Model	SHL-Q2255 SHL-Q2255-01
OF max.	9.81 N
RF min.	1.96 N
PT max.	1.5 mm
OT min.	2 mm
MD max.	0.5 mm
OP	43±0.8 mm
FP max.	---

Panel Mount Crossroller Plunger
SHL-Q2155, SHL-Q2155-01

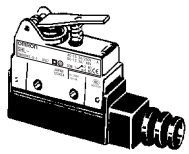


Note: Stainless sintered alloy roller

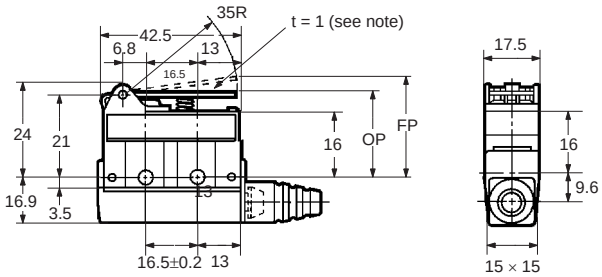


Model	SHL-Q2155 SHL-Q2155-01
OF max.	9.81 N
RF min.	1.96 N
PT max.	1.5 mm
OT min.	2 mm
MD max.	0.5 mm
OP	43±0.8 mm
FP max.	---

Short Hinge Lever
SHL-W55, SHL-W55-01

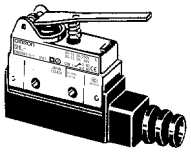


Note: Stainless steel lever

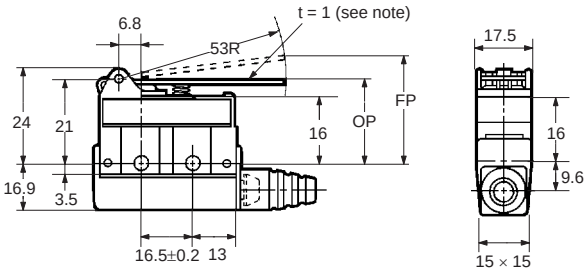


Model	SHL-W55 SHL-W55-01
OF max.	3.14 N
RF min.	0.78 N
PT max.	8 mm
OT min.	3 mm
MD max.	2.5 mm
OP	21.5±1 mm
FP max.	29.5 mm

Hinge Lever
SHL-W155, SHL-W155-01

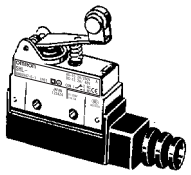


Note: Stainless steel lever

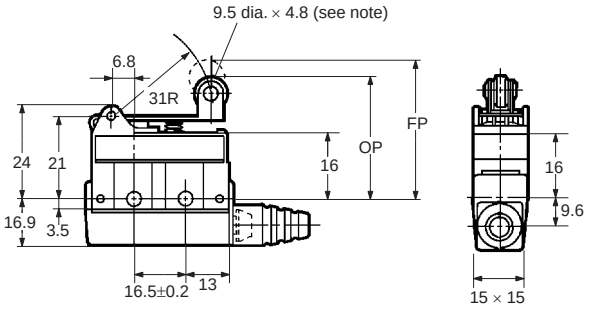


Model	SHL-W155 SHL-W155-01
OF max.	2.35 N
RF min.	0.44 N
PT max.	13 mm
OT min.	5 mm
MD max.	4 mm
OP	21.5±1 mm
FP max.	34.5 mm

Short Hinge Roller Lever
SHL-W255, SHL-W255-01

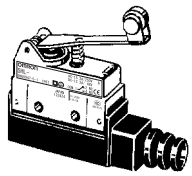


Note: Sintered stainless roller

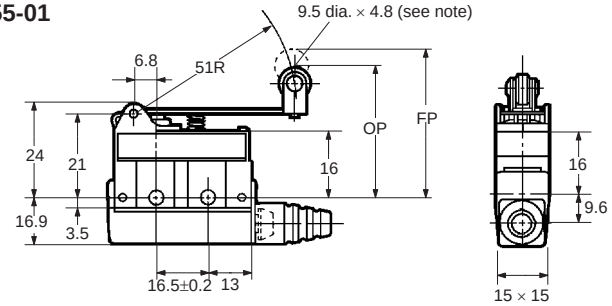


Model	SHL-W255 SHL-W255-01
OF max.	3.92 N
RF min.	0.78 N
PT max.	8 mm
OT min.	3 mm
MD max.	2.5 mm
OP	33±1 mm
FP max.	41 mm

Hinge Roller Lever
SHL-W2155, SHL-W2155-01

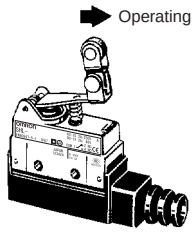


Note: Sintered stainless roller

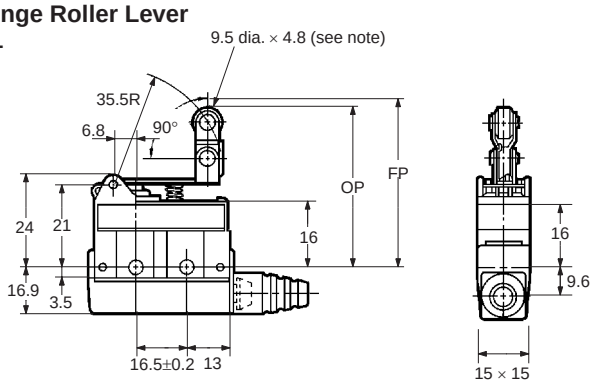


Model	SHL-W2155 SHL-W2155-01
OF max.	2.55 N
RF min.	0.49 N
PT max.	13 mm
OT min.	5.5 mm
MD max.	4 mm
OP	33.5±1 mm
FP max.	46.5 mm

One-way Action Short Hinge Roller Lever
SHL-W355, SHL-W355-01



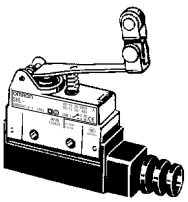
Operating direction



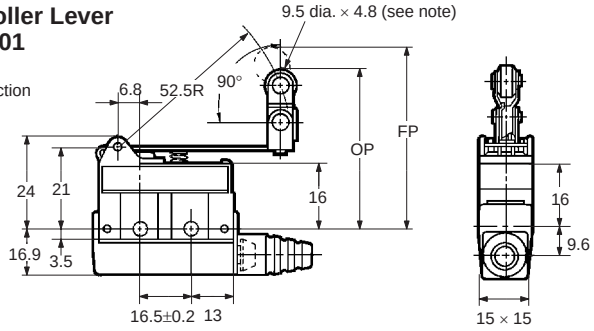
Note: Stainless sintered roller

Model	SHL-W355 SHL-W355-01
OF max.	3.92 N
RF min.	0.78 N
PT max.	8 mm
OT min.	3 mm
MD max.	2.5 mm
OP	44.5±1 mm
FP max.	52.5 mm

One-way Action Hinge Roller Lever
SHL-W3155, SHL-W3155-01



Operating direction



Note: Stainless sintered roller

Model	SHL-W3155 SHL-W3155-01
OF max.	2.55 N
RF min.	0.49 N
PT max.	13 mm
OT min.	5.5 mm
MD max.	4 mm
OP	44.5±1 mm
FP max.	57.5 mm

Molded Terminal Models

■ Model Number Legend

Molded Terminal Models

SHL-□55-□□M□
1 2 3 4

Items 1 (Actuator) and 2 (Rated Current) are the same as those in *Standard Models*.

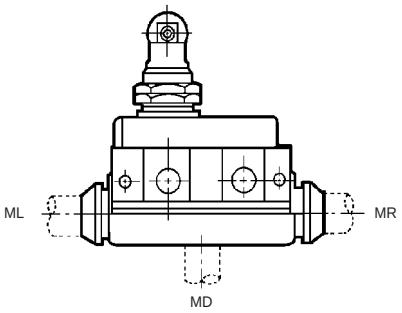
3. Operation Indicator

None: Not provided
L2: LED: 12 V
L3: LED: 24 V
L4: LED: 24 V

4. Location of Lead Outlet

R: Right-hand
L: Left-hand
D: Underside

Use of the molded terminal model is recommended in locations subject to excessive dust, oil drips, or moisture.
All types of SHL Switches can be fabricated into a molded terminal version. In this case, the molded terminal model will have the same dimensions and operating characteristics as the basic model from which the molded terminal model is fabricated.



Suffix by Location of Lead Outlet

Location of lead outlet	Model
Right-hand	SHL-□-MR
Left-hand	SHL-□-ML
Underside	SHL-□-MD

Note: Three leads (COM, NO, and NC) are provided for terminal connections.

Example:
Basic type: SHL-Q2255
Location of lead outlet: Right-hand
When placing your order for the above Switch specify the model number as SHL-Q2255-MR

Lead Supplies

Leads	Nominal cross-sectional area	No. of conductors/ cond. dia.	Finished outside diameter	Terminal connections	Standard length
VCTF (Vinyl cabtire cable)	0.75 mm^2	30/0.18 dia.	3-core 7 dia.	Black: COM White: NO Red: NC	3 m

■ Operation Indicator-equipped Models

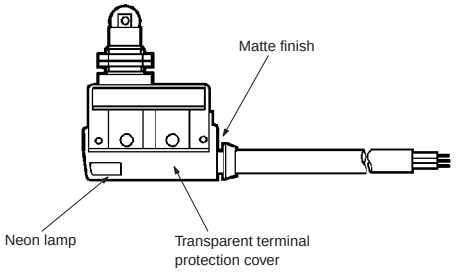
UL, CSA and/or EN (IEC) approved models are available.

The molded terminal model may be equipped with an operation indicator (neon lamp or LED) upon request to facilitate maintenance and inspection.

The operation indicator is designed to illuminate when the Switch is not operating. (Because of the molded terminal model, any change to the Switch wiring cannot be made.)

AC Operation

A neon lamp indicator is provided.
The operating voltage is 90 to 250 VAC.

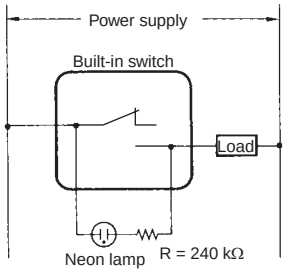


Operating characteristics are the same as the basic model from which the operation indicator equipped model is fabricated.

Dimension are the same as the standard model.

Example:
Basic type: SHL-Q2255-01MR
When placing your order for the molded terminal model with an neon lamp operation indicator, specify the model number as SHL-Q2255-01LMR.

Contact Circuit



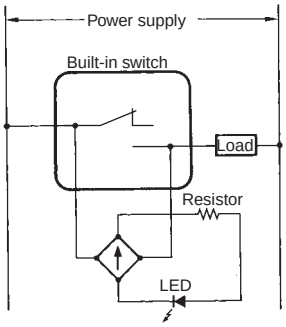
DC Operation

LED indicator is provided.
As a rectifier stack is incorporated, into the unit and no directionality exists for connection of + and –, this type can also be operated on AC.

Voltage ratings of LED indicators are as shown in the table below.

Example:
Basic type: SHL-Q2255-01MR
When placing your order for the molded terminal with an LED indicator rated at 24 V, specify the model number as SHL-Q2255-01L3MR.

Contact Circuit



Type	Voltage rating	Lamp current	Internal resistance
L2	12 V	Approx. 2.4 mA	4.3 kΩ
L3	24 V	Approx. 2 mA	10 kΩ
L4	24 V	Approx. 1.2 mA	18 kΩ

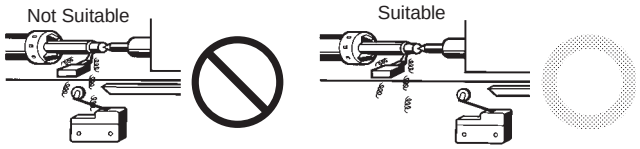
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



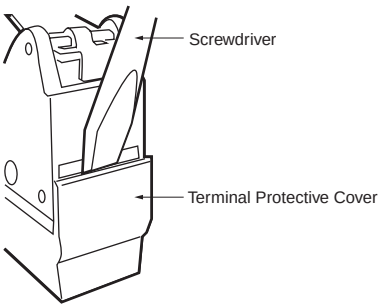
- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Connections

Be sure to connect a fuse with a breaking current 1.5 to 2 times the rated current to the Limit Switch in series in order to protect the Limit Switch from damage due to short-circuiting.
When using the Limit Switch under the EN ratings, use a gI or gG 10-A fuse that conforms to IEC269.

Handling

When detaching the Terminal Protective Cover, insert a screwdriver and apply a force in the opening direction. Do not use excess force to remove the cover. Doing so may cause deformation in the fitting section and reduce the holding force.



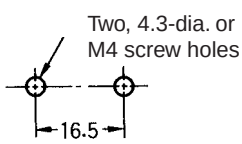
When mounting the Terminal Protective Cover to the case, align the cover on the case and then press the cover down to mount it firmly. If the cover is pressed down in an inclined position, rubber packing will deform and thus affect the sealing capability.

Mounting

Secure the Switch with two M4 screws and washers. The tightening torque applied to each terminal must be 1.18 to 1.37 N·m. Tighten the screws to the specified torque. An excessive tightening torque may damage the Switch and cause a malfunction.

When mounting the panel mount-type Switch with screws on a side surface, remove the hexagonal nuts from the actuator.

Mounting Holes



When mounting the panel mount type (SHL-Q55, SHL-Q2255, or SHL-Q2155) on a panel, tighten the hexagonal nuts of the actuator to a torque less than 7.84 N·m.

Tightening Torque

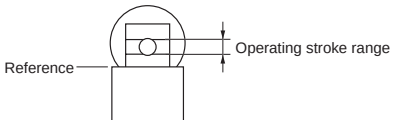
A loose screw may result in a malfunction. Be sure to tighten each screw to the proper tightening torque as shown below.

No.	Type	Torque
1	Terminal screw (M3 screw)	0.24 to 0.44 N·m
2	Panel mounting screw (M4 screw)	1.18 to 1.37 N·m

When wiring, use M3 round solderless terminals and apply insulation shielding to the connections. Tighten the terminals screws to 0.24 to 0.44 N·m.

Operating Stroke

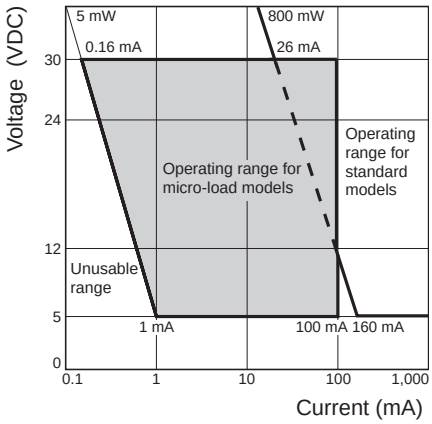
Ensure that the operating stroke for roller plunger models is within the set position display.



Micro Load Applicable Ranges

When using a Limit Switch for opening or closing micro-load circuit (zones 1 through 3), contact failure may occur if a Limit Switch with ordinary contact specifications is used. Therefore, when using Limit Switches in the micro-load range, use ones with contact specifications that are suited to each zone.

Use the SHL-□-01 micro-load models within the zones (1 through 3) shown in the following diagram.



The above diagram is for standard conditions (5°C to 35°C, 40% to 70%). Since the values vary depending on the operating environment conditions, contact your OMRON representative for further details.

Others

The standard seal rubber for the lead wire outlet is one that allows 6- to 8-dia. cables. The appropriate nominal cross-section of the lead wire is 0.75 mm^2. (When the sealing capability is required over a long period of time, use mold specifications.)

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C026-E1-11

Small Sealed Switch
D4E-□N

Slim and Compact Switch with Better Seal and Ensuring Longer Service Life than D4E

- Flat springs with an improved lever ratio of the built-in switch ensure smooth snap action and long life expectancy.
- Protection cover protects the built-in switch from dust and oil. Plunger incorporates a tough seal cap that lasts for a long time.
- One touch connector eliminates need for tedious wiring operations and reduces downtime for wiring and maintenance (models with standard, easy-to-use screw terminals are also available).
- Minute load model with gold cladding is optimal for electronic control.
- Molded terminal types as well as molded terminal types with operating indicator lamps are available for screw terminal systems.
- No difference in mounting pitch and characteristics between D4E-□N and D4E models.
- Approved by EN, UL, CSA, and CCC (Chinese standard).

Model Number Structure

■ Model Number Legend

D4E-□□□□□N
1 2 3 4

1. Rated Current
- 1: 5 A at 125 VAC (1 A at 125 VAC/30 VDC for model with a connector)
- 2: 0.1 A at 125 VAC (0.1 A at 125 VAC/30 VDC for model with a connector)

2. Actuator
- A: Roller plunger
- B: Crossroller plunger
- C: Plunger
- D: Sealed roller plunger
- E: Sealed crossroller plunger
- F: Sealed plunger
- G: Roller lever
- H: One-way action roller lever

3. Terminals
- 00: AC connector
- 10: DC connector
- 20: Screw terminals without a cable
- 21: Screw terminals with a cable (right-hand)
- 22: Screw terminals with a cable (left-hand)
- 23: Molded terminals with a cable (right-hand)
- 24: Molded terminals with a cable (left-hand) (Cable is S-FLEX VCTF 3 m)

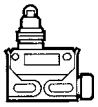
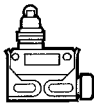
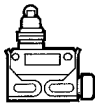
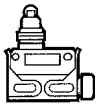
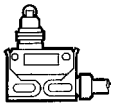
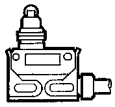
4. Operation Indicator
- None: Without operation indicator
- L: Neon lamp (250 VAC)
- L2: LED (24 VDC)

Note: 1. Only the molded terminal models can be equipped with an operation indicator.

2. Desired Switches may not be manufactured depending on the combination between molds and indicators. Contact our sales representative for further information.

Ordering Information

■ List of Models

Actuator	One-touch connector type		Screw terminal type			
	General-purpose	Micro load	General-purpose without cable	Micro load without cable	General-purpose with cable	Micro load with cable
						
Roller plunger 	D4E-1A□0N	D4E-2A□0N	D4E-1A20N (see note 2)	D4E-2A20N	D4E-1A21N	D4E-2A21N
Crossroller plunger 	D4E-1B□0N	D4E-2B□0N	D4E-1B20N (see note 2)	D4E-2B20N	D4E-1B21N	D4E-2B21N
Plunger 	D4E-1C□0N	D4E-2C□0N	D4E-1C20N (see note 2)	D4E-2C20N	D4E-1C21N	D4E-2C21N
Sealed roller plunger 	D4E-1D□0N	D4E-2D□0N	D4E-1D20N (see note 2)	D4E-2D20N	D4E-1D21N	D4E-2D21N
Sealed crossroller plunger 	D4E-1E□0N	---	D4E-1E20N (see note 2)	D4E-2E20N	D4E-1E21N	D4E-2E21N
Sealed plunger 	D4E-1F□0N	D4E-2F□0N	D4E-1F20N (see note 2)	D4E-2F20N	D4E-1F21N	D4E-2F21N
Roller lever 	D4E-1G□0N	D4E-2G□0N	D4E-1G20N (see note 2)	D4E-2G20N	D4E-1G21N	D4E-2G21N
One-way action roller lever 	D4E-1H□0N	D4E-2H□0N	D4E-1H20N (see note 2)	D4E-2H20N	D4E-1H21N	D4E-2H21N

Note: 1. When ordering, specify the current type by replacing the blank box of the model number with 0 for AC connector or 1 for DC connector.

2. Approved by UL and CSA.

3. For the plunger and lever actuator models, the NC and NO terminal indicators are reversed.

Accessories (Order Separately)

Plug

Model	Current	Type	No. of conductors	Cable length	Applicable models
XS2F-A421-D90-A	AC	Straight	4	2 m	D4E-□□00N
XS2F-A421-G90-A				5 m	
XS2F-D421-D80A	DC			2 m	D4E-□□10N
XS2F-D421-G80-A				5 m	

Specifications

■ Approved Standards

Agency	Standard	File No.	Approved models
UL	UL508	E76675	D4E-□□20N Switches only except for Indicator-equipped Switches
CSA	CSA C22.2 No. 14	LR45746	D4E-□□20N Switches only except for Indicator-equipped Switches
TÜV Rheinland	EN60947-5-1	R9551015	All models in the table on page 139 (Ask your OMRON representative about other models.)
CCC (CQC)	GB14048.5	2003010305086795	Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL, CSA

A300

Voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 V	10 A	60 A	6 A	7,200 VA	720 VA
240 V		30 A	3 A		

TÜV (EN60947-5-1), CCC (GB14048.5)

D4E- 1 G 23 L N
I II III IV

Model				Applicable category and ratings	Thermal current (I_{the})	Indicator
I	II	III	IV			
1	□	00		AC-14 0.5 A/125 VAC	5 A	---
1	□	10		DC-12 0.5 A/30 VDC	5 A	---
1	□	20, 21, 22		AC-15 2A/250 VAC DC-12 2A/48 VDC	5 A	---
1	□	23, 24	L	AC-15 2A/250 VAC	5 A	Neon lamp
1	□	23, 24	L1	DC-12 2A/12 VDC	5 A	LED
1	□	23, 24	L2	DC-12 2A/24 VDC	5 A	LED
1	□	23, 24	L3	DC-12 2A/48 VDC	5 A	LED
2	□	00		AC-14 0.1A/125 VAC	0.5 A	---
2	□	10		DC-12 0.1A/30 VDC	0.5 A	---
2	□	20, 21, 22		AC-14 0.1A/125 VAC DC-12 0.1A/48 VDC	0.5 A	---
2	□	23, 24	L	AC-14 0.1A/125 VAC	0.5 A	Neon lamp
2	□	23, 24	L1	DC-12 0.1A/12 VDC	0.5 A	LED
2	□	23, 24	L2	DC-12 0.1A/24 VDC	0.5 A	LED
2	□	23, 24	L3	DC-12 0.1A/48 VDC	0.5 A	LED

Note: 1. □: Actuator variation of item II

2. AC-14 0.5 A/125 VAC means as follows:
Applicable category: AC-14
Rated operating current (I_e): 0.5 A
Rated operating voltage (U_e): 125 VAC

■ General Ratings

Rated voltage	Standard load								Micro load	
	Non-inductive load				Inductive load				Non-inductive load	
	Resistive load		Lamp load		Inductive load		Motor load		Resistive load	
	NC	NO	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	5 (1) A		1.5 (1) A		3 (1) A		2 (1) A	1 (1) A	0.1 A	
250 VAC	5 (1) A		1.5 (1) A		3 (1) A		1 A	0.5 A	---	
8 VDC	5 (1) A		---		1.5 (1) A		---		0.1 A	
14 VDC	5 (1) A		---		1.5 (1) A		---		0.1 A	
30 VDC	5 (1) A		---		1.5 (1) A		---		0.1 A	
125 VDC	0.5 A		---		0.05 A		---		---	
250 VDC	0.25 A		---		0.03 A		---		---	

Inrush current	NC	10 A max.
	NO	10 A max.

Note: 1. The above current ratings are for a standard current and the values in parentheses are for models with a connector.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.

■ Characteristics

Degree of protection	IP67
Durability (see note 3)	Mechanical: 10,000,000 operations min. Electrical: 500,000 operations min. (5 A at 250 VAC, resistive load) 5,000,000 operations min. (10 mA at 24 VDC, resistive load)
Operating speed	0.1 mm to 0.5 m/sec
Operating frequency	Mechanical: 120 operations/min Electrical: 30 operations/min
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	15 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of same polarity 1,500 VAC, 50/60 Hz for 1 min/Uimp at 2.5 kV (EN60947-5-1) between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part
Rated insulation voltage (Ui)	250 VAC
Switching overvoltage	1,000 VAC max. (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Short-circuit protective device (SCPD)	10 A fuse (type gG or gI, IEC269 approved)
Conditional short-circuit current	100 A (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	5 A (EN60947-5-1)
Protection against electric shock	Class II (grounding not required with double insulation)
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min.
Ambient temperature	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 86 g (in case of roller plunger)

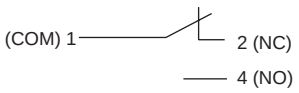
Note: 1. The above values are initial values.
2. The above ratings may vary depending on the model. Contact your OMRON representative for further details.
3. Durability values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

Connections

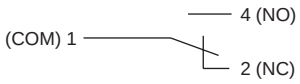
■ Contact Form

Screw Terminal Type

Plunger

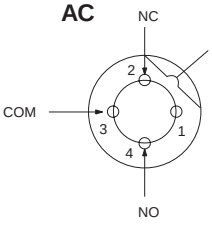


Lever

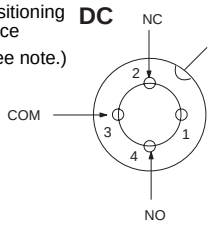


Connector Type

AC

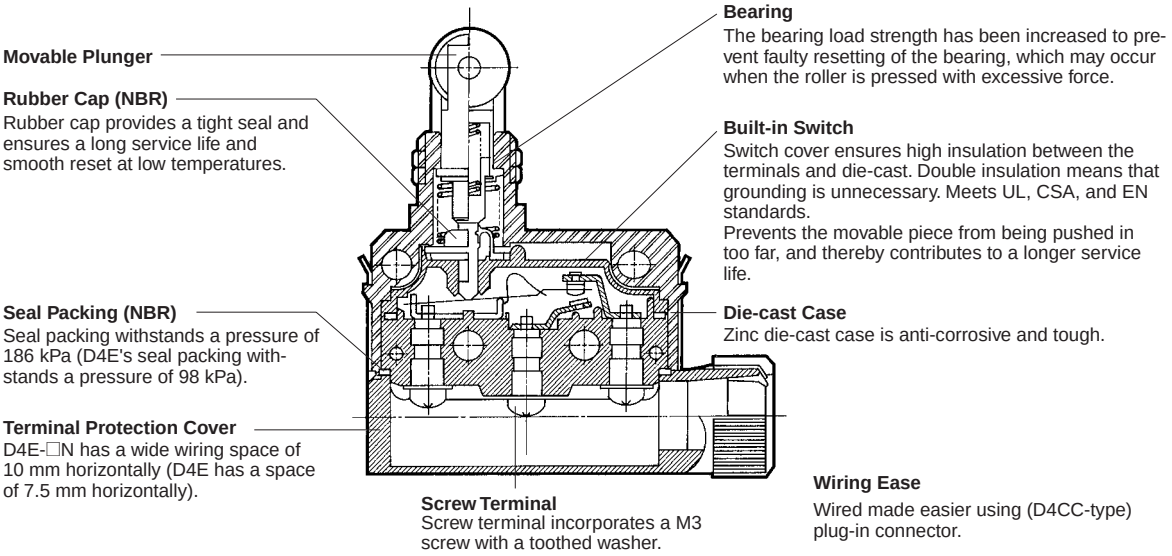


DC



Note: The position of the positioning piece is not always the same. If using an L-shaped connector causes problems in application, use a straight connector.

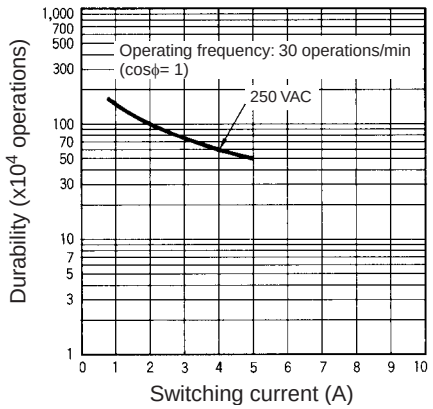
Nomenclature



Engineering Data

Electrical Durability (cosϕ=1)

Operating temperature: 5°C to 30°C
Operating humidity: 40% to 70%.

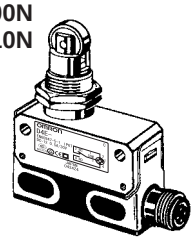


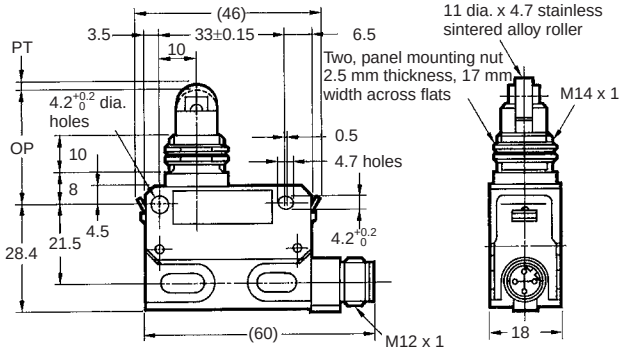
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
3. A 3-m lead wire cable equivalent to the 3-conductor VCTF S-FLEX cable (0.75 mm^2, 7 mm in dia.) is provided.
4. A 5.8- to 7.6-dia. cable can be applied to the seal rubber for the lead wire outlet.

Roller Plunger

D4E-1A00N
D4E-1A10N
D4E-2A00N
D4E-2A10N



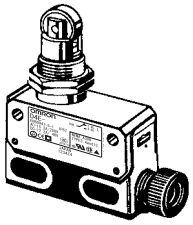


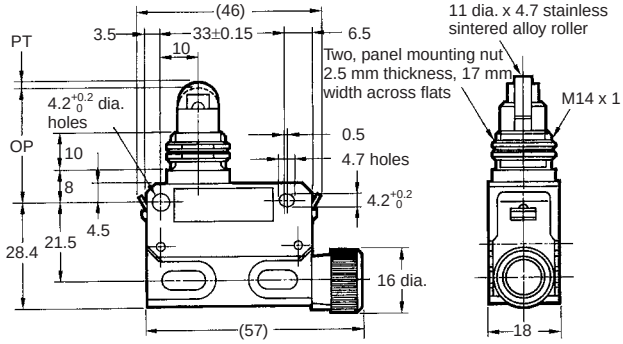
Model	D4E-1A□□N D4E-2A□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	31.4±0.8 mm

Note: The values given in parentheses are reference values.

Roller Plunger

D4E-1A20N (See note 4.)
D4E-2A20N (See note 4.)
D4E-1A21N (See note 3.)
D4E-2A21N (See note 3.)



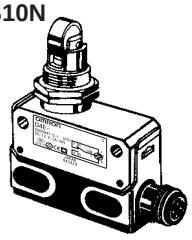


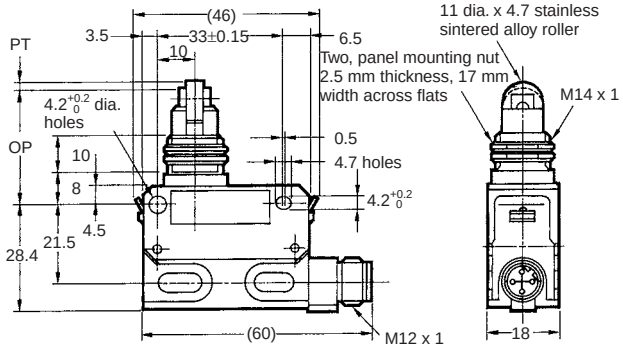
Model	D4E-1A□□N D4E-2A□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	31.4±0.8 mm

Note: The values given in parentheses are reference values.

Cross Roller Plunger

D4E-1B00N
D4E-1B10N
D4E-2B00N
D4E-2B10N



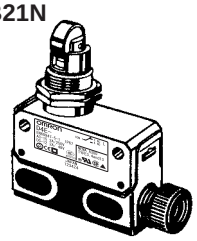


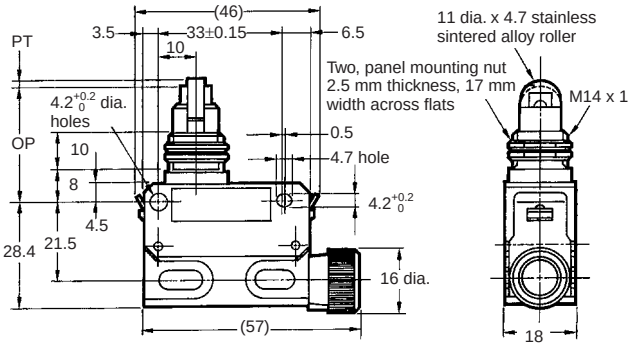
Model	D4E-1B□□N D4E-2B□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	31.4±0.8 mm

Note: The values given in parentheses are reference values.

Cross Roller Plunger

D4E-1B20N
D4E-2B20N
D4E-1B21N
D4E-2B21N



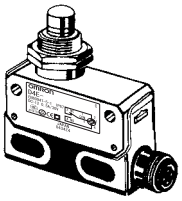


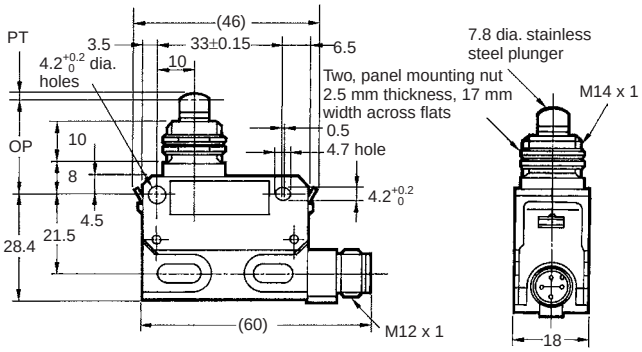
Model	D4E-1B□□N D4E-2B□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	31.4±0.8 mm

Note: The values given in parentheses are reference values.

Plunger

D4E-1C00N
D4E-1C10N
D4E-2C00N
D4E-2C10N



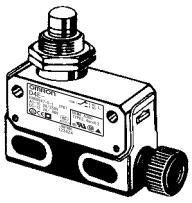


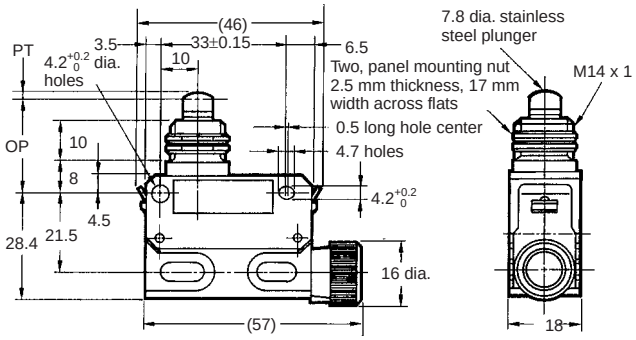
Model	D4E-1C□□N D4E-2C□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	25.4±0.8 mm

Note: The values given in parentheses are reference values.

Plunger

D4E-1C20N (See note 4.)
D4E-2C20N (See note 4.)
D4E-1C21N (See note 3.)
D4E-2C21N (See note 3.)



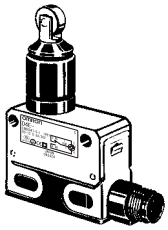


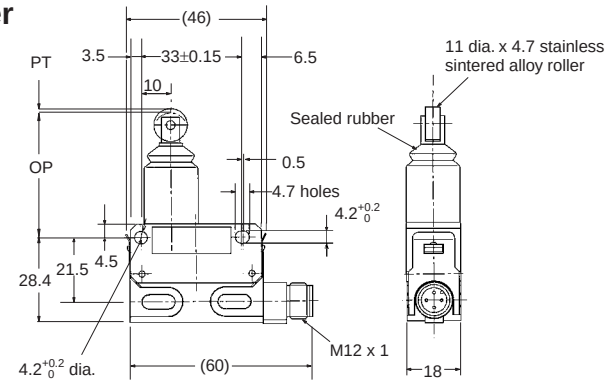
Model	D4E-1C□□N D4E-2C□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	25.4±0.8 mm

Note: The values given in parentheses are reference values.

Sealed Roller Plunger

D4E-1D00N
D4E-1D10N
D4E-2D00N
D4E-2D10N



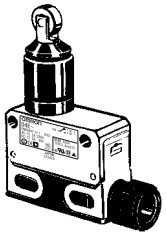


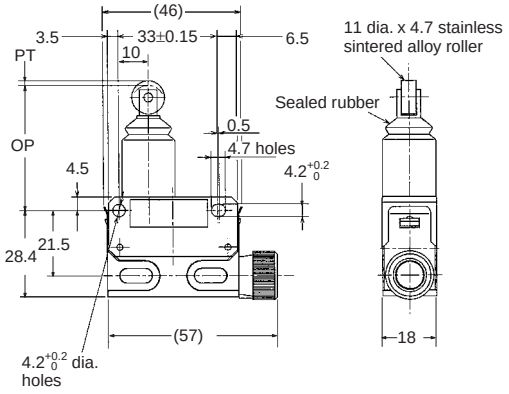
Model	D4E-1D□□N D4E-2D□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	41.3±0.8 mm

Note: The values given in parentheses are reference values.

Sealed Roller Plunger

D4E-1D20N (See note 4.)
D4E-2D20N (See note 4.)
D4E-1D21N (See note 3.)
D4E-2D21N (See note 3.)



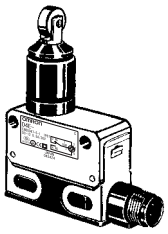


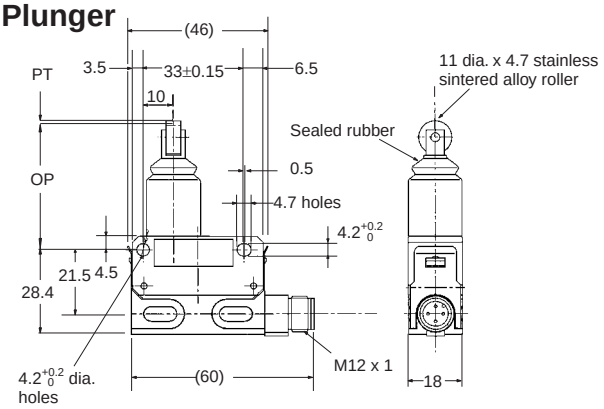
Model	D4E-1D□□N D4E-2D□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	41.3±0.8 mm

Note: The values given in parentheses are reference values.

Sealed Cross Roller Plunger

D4E-1E00N
D4E-1E10N



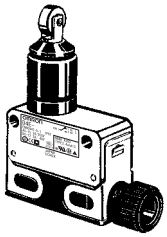


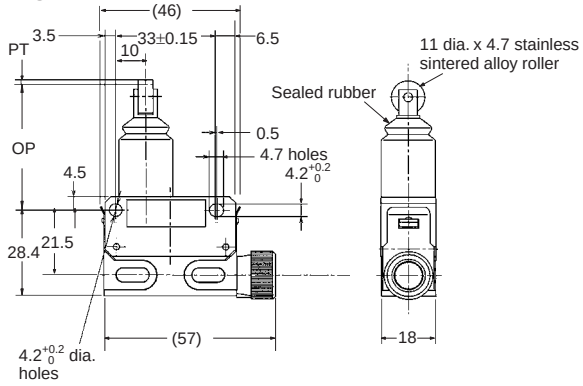
Model	D4E-1E□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	41.3±0.8 mm

Note: The values given in parentheses are reference values.

Sealed Cross Roller Plunger

D4E-1E20N (See note 4.)
D4E-2E20N (See note 4.)
D4E-1E21N (See note 3.)
D4E-2E21N (See note 3.)



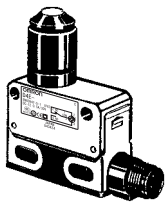


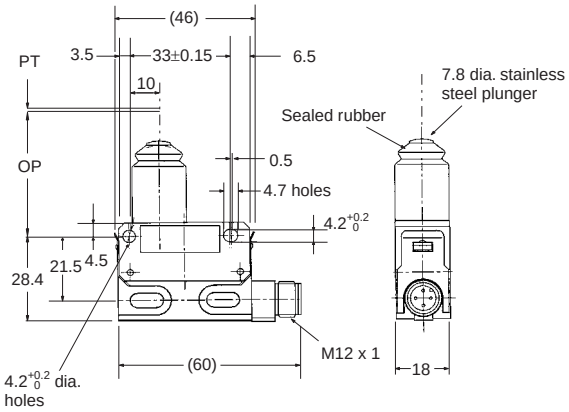
Model	D4E-1E□□N D4E-2E□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	41.3±0.8 mm

Note: The values given in parentheses are reference values.

Sealed Plunger

D4E-1F00N
D4E-1F10N
D4E-2F00N
D4E-2F10N



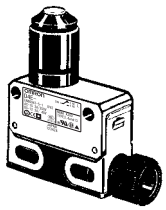


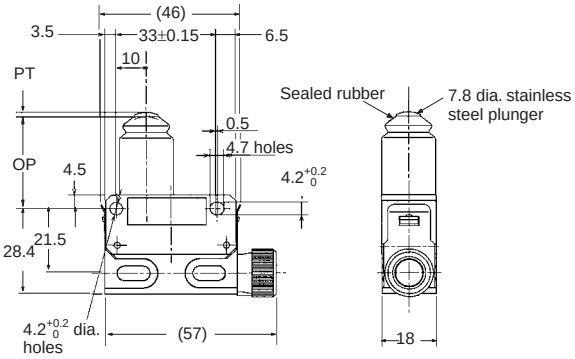
Model	D4E-1F□□N D4E-2F□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	30±0.8 mm

Note: The values given in parentheses are reference values.

Sealed Plunger

D4E-1F20N (See note 4.)
D4E-2F20N (See note 4.)
D4E-1F21N (See note 3.)
D4E-2F21N (See note 3.)



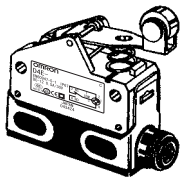


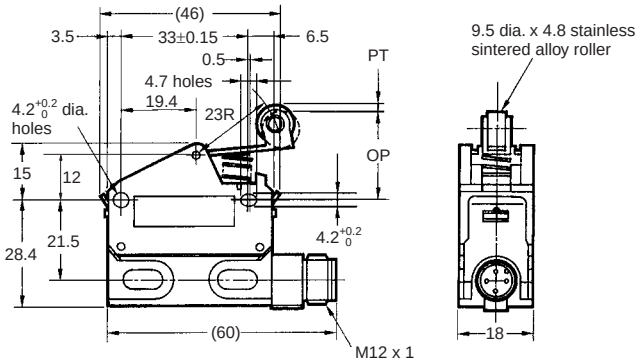
Model	D4E-1F□□N D4E-2F□□N
OF max.	11.77 N
RF min.	4.90 N
PT max.	1.5 mm
OT min.	3 mm
MD (reference value)	(0.1 mm)
OP	30±0.8 mm

Note: The values given in parentheses are reference values.

Roller Lever

D4E-1G00N
D4E-1G10N
D4E-2G00N
D4E-2G10N



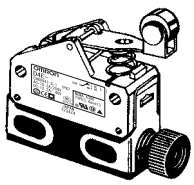


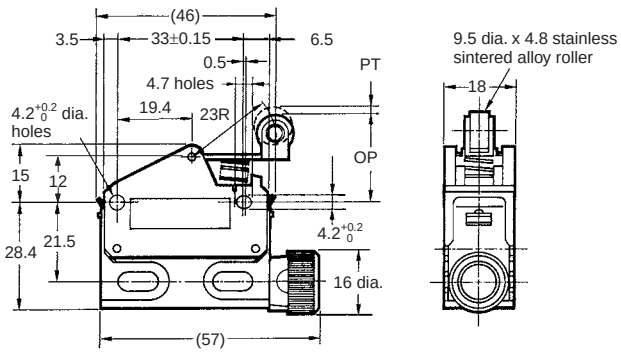
Model	D4E-1G□□N D4E-2G□□N
OF max.	3.92 N
RF min.	0.78 N
PT max.	2 mm
OT min.	4 mm
MD (reference value)	(0.3 mm)
OP	23.1±0.8 mm

Note: The values given in parentheses are reference values.

Roller Lever

D4E-1G20N (See note 4.)
D4E-2G20N (See note 4.)
D4E-1G21N (See note 3.)
D4E-2G21N (See note 3.)



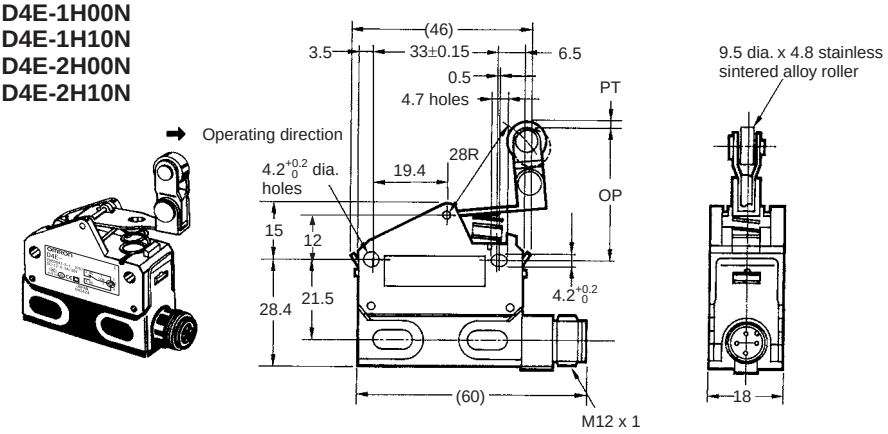


Model	D4E-1G□□N D4E-2G□□N
OF max.	3.92 N
RF min.	0.78 N
PT max.	2 mm
OT min.	4 mm
MD (reference value)	(0.3 mm)
OP	23.1±0.8 mm

Note: The values given in parentheses are reference values.

One-way Action Roller Lever

D4E-1H00N
D4E-1H10N
D4E-2H00N
D4E-2H10N

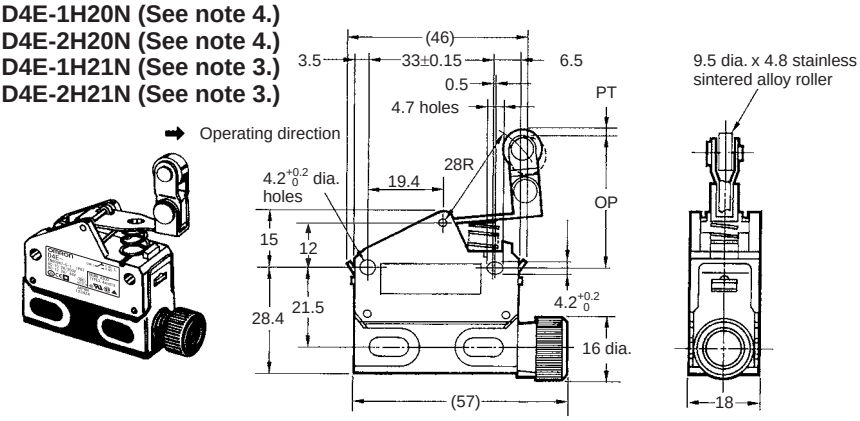


Model	D4E-1H□□N D4E-2H□□N
OF max.	3.92 N
RF min.	0.78 N
PT max.	2 mm
OT min.	4 mm
MD (reference value)	(0.3 mm)
OP	34.3±0.8 mm

Note: The values given in parentheses are reference values.

One-way Action Roller Lever

D4E-1H20N (See note 4.)
D4E-2H20N (See note 4.)
D4E-1H21N (See note 3.)
D4E-2H21N (See note 3.)



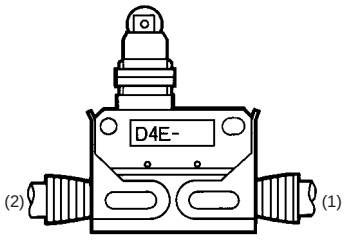
Model	D4E-1H□□N D4E-2H□□N
OF max.	3.92 N
RF min.	0.78 N
PT max.	2 mm
OT min.	4 mm
MD (reference value)	(0.3 mm)
OP	34.3±0.8 mm

Note: The values given in parentheses are reference values.

Molded Terminal Models

■ Molded Terminal Models

The molded-terminal model is available with right-hand, left-hand and underside leads and is recommended for use where the Switch is exposed to dust, oil or moisture. It can be used like a screw-terminal model (with a cable), and the dimensions and operating characteristics are the same as for standard models.



Example:
Standard type: D4E-1A20N
Location of lead output: Right-hand → D4E-1A23N

Suffix by Location of Lead Outlet

Location of lead output	Suffix for pre-wired terminal
	COM, NC, NO
(1) Right-hand	D4E-□□23N
(2) Left-hand	D4E-□□24N

Lead Supplies

Leads	Nominal cross-sectional area	Finished outside diameter	Terminal connections	Standard length
V.C.T.F. S-FLEX (vinyl cabtire coat)	0.75 mm^2	3 conductors 7 mm dia.	Black: COM White: NO Red: NC	3 m

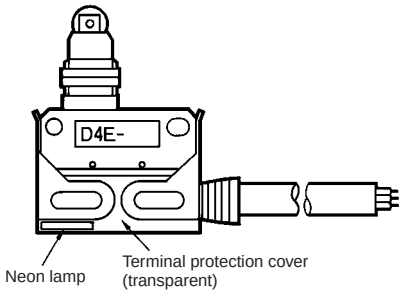
■ Operation of Indicator-equipped Models

The molded terminal model may be equipped with an operation indicator (neon lamp or LED) upon request to facilitate maintenance and inspection.

The operation indicator is designed to illuminate when the Switch is not operating. (Because of the molded terminal model, any change to the Switch wiring cannot be made.)

AC Operation

A neon lamp indicator is provided.
The operating voltage is 90 to 250 VAC.

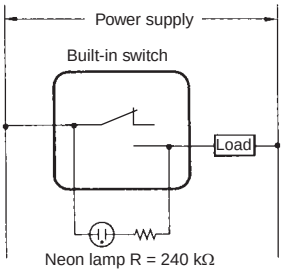


There is no difference in operating characteristics between D4E AC Models and corresponding D4E Standard Models.

There is no difference in dimensions between D4E AC Models and D4E Standard Models.

Example:
Basic type: D4E-1A23N
When placing your order for the molded terminal model with an neon lamp operation indicator, specify the model number as D4E-1A23LN.

Internal Circuit

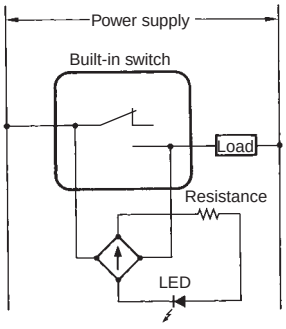


DC Operation

LED indicator is provided.
As a rectifier stack is incorporated, into the unit and no directionality exists for connection of + and –, this type can also be operated on AC.

Voltage ratings of LED indicators are as shown in the table below.

Internal Circuit



Type	Voltage rating	Lamp current	Internal resistance
L2	24 V	Approx. 1.2 mA	18 kΩ

Example:
When ordering a D4E DC Model, add the following suffix to the model number.

Basic Model: The model number of the D4E-1A23N with a built-in 24-V LED indicator is D4E-1A23L2N.

Precautions

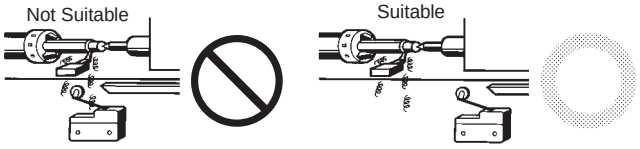
Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.

Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



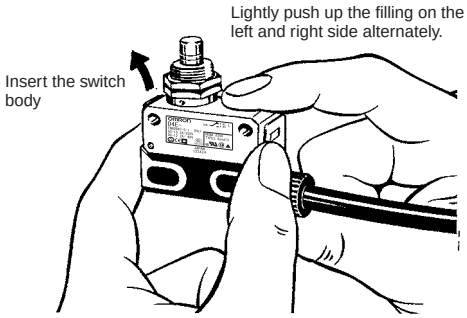
Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.

The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

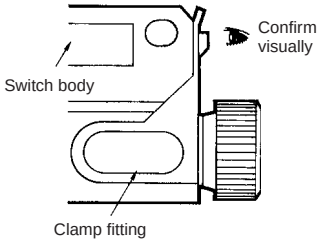
Do not solder the screw terminals.

Sealing materials may deteriorate when used outdoors or when exposed to cutting oil, solvents, or chemicals. Check this on actual equipment and, if deterioration is foreseen, consult your OMRON representative in advance.

If the one-touch connector is to be mounted onto the switch body, lightly push up the fitting so that the switch body can then be inserted into the clamp.



Be sure that the clamp is inserted to the full depth, because the Switch will not function properly if one of the clamps is improperly inserted.



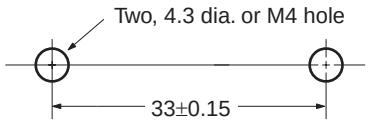
If the clamp is properly inserted up to the full depth, it will not slide out easily. Be sure to carefully confirm all the above items.

Be sure to connect a fuse with a breaking current 1.5 to 2 times the rated current to the Limit Switch in series in order to protect the Limit Switch from damage due to short-circuiting.
When using the Limit under the EN ratings, use a gI or gG 10-A fuse that conforms to IEC269.

Mounting

Secure the Switch with two M4 screws and washers. The tightening torque applied to each terminal must be 1.18 to 1.37 N·m. Tighten the screws to the specified torque. An excessive tightening torque may damage the Switch and cause a malfunction.

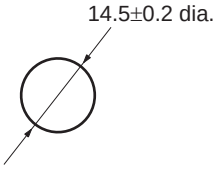
Mounting Holes



When mounting the panel mount-type Switch with screws on a side surface, remove the hexagonal nuts from the actuator.

When mounting the panel mount type on a panel, tighten the hexagonal nuts of the actuator to a torque less than 7.85 N·m.

Mounting Hole



Operating method, shape of cam or dog, operating frequency, and the overtravel (OT) have significant effect on the service life and precision of the Limit Switch. Make sure that the shape of the cam is smooth enough.

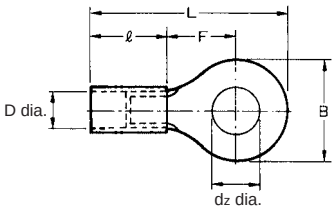
Check that OT has a sufficient margin. The actual OT should be rated OT x 0.7 to 1.

Do not change the operating position by remodeling the actuator.

Wiring

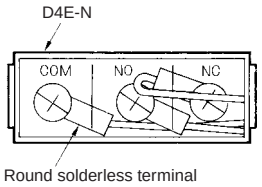
When wiring screw terminals, M3-size round solderless terminals with an insulation tube is recommended. The conductor size should be 0.75 mm^2 and cable diameter should be 7 mm.

Refer to the following when wiring.



dz dia.:	3.2
D dia.:	1.9
B:	5.2
L:	16.4
F:	5.8
ℓ:	8.0 (mm)

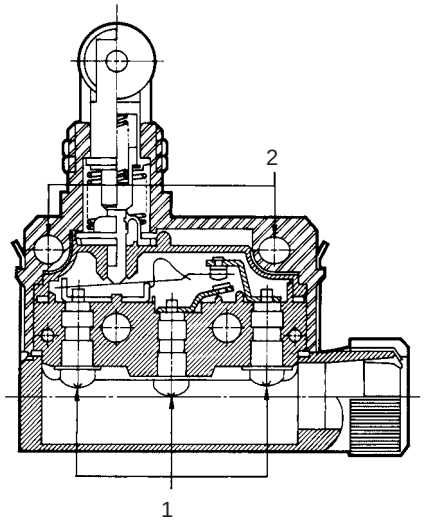
Wiring Method



Tightening Torque

A loose screw may result in a malfunction. Be sure to tighten each screw to the proper tightening torque as shown below.

No.	Type	Torque
1	Terminal screw (M3)	0.24 to 0.44 N·m
2	Switch mounting screw (M4)	1.18 to 1.37 N·m



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C028-E1-07

Enclosed Switch
D4MC

Economical, High Utility Enclosed Switch

- High precision and long life (10,000,000 mechanical operations) through employment of the moving spring used in OMRON Z Basic Switch.
- Sealed with gasket diaphragm to provide high sealing property without use of any adhesive or pin.
- Suitable for applications demanding higher mechanical strength, dustproof and drip-proof properties than those on basic switches.
- Panel mount versions have the same operating position as Z Basic Switch.
- Resin molded terminal versions are available.
- Approved by UL, CSA, and CCC (Chinese standard).

Model Number Structure

■ Model Number Legend

D4MC- ☐
1

1. Actuator
5000: Panel mount plunger
5020: Panel mount roller plunger
5040: Panel mount crossroller plunger
1020: Short hinge lever
1000: Hinge lever
2000: Hinge roller lever
2020: Short hinge roller lever
3030: One-way action short hinge roller lever

Ordering Information

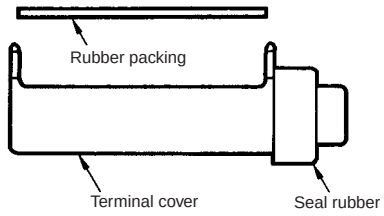
■ List of Models

Actuator	Model
Panel mount plunger 	D4MC-5000
Panel mount roller plunger 	D4MC-5020
Panel mount crossroller plunger 	D4MC-5040
Short hinge lever 	D4MC-1020
Hinge lever 	D4MC-1000
Hinge roller lever 	D4MC-2000
Short hinge roller lever 	D4MC-2020
One-way action short hinge roller lever 	D4MC-3030

Note: Use molded terminal models (refer to page 158) when using the Switch under one of the following conditions:
a) dusty, b) high amount of dripping oil, or c) high humidity.
Models are available with the lead outlet in one of three locations: right-hand, left-hand, and underside.

■ Terminal Protective Cover, Seal Rubber, and Rubber Packing

(The Switch is equipped with these 3 items as a standard.)



- ZC Terminal Cover
  (Product code: ZC55-0002H)
- ZC Seal Rubber
  (Product code: SC-1404C)
- ZC Rubber Packing
  (Product code: ZC55-0003F)

Specifications

■ Approved Standards (Except Molded Terminal Models)

Agency	Standard	File No.
UL	508	E76675
CSA	C22.2 No. 14	E45258
CCC (CQC)	GB14048.5	2003010303077627

Note: Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL/CSA

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

EN60947-1 and EN60947-5-1

250 V, 10 A (AC12) (Tested by ASTA)

CCC (GB14048.5)

Applicable category and ratings
AC-12 10 A/250 VAC

■ General Ratings

Rated voltage	Non-inductive load				Inductive load			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10 A		3 A	1.5 A	10 A		5 A	2.5 A
250 VAC	10 A		2.5 A	1.25 A	10 A		3 A	1.5 A
480 VAC	3 A		1.5 A	0.75 A	2.5 A		1.5 A	0.75 A
8 VDC	10 A		3 A	1.5 A	6 A		5 A	2.5 A
14 VDC	10 A		3 A	1.5 A	6 A		5 A	2.5 A
30 VDC	6 A		3 A	1.5 A	5 A		5 A	2.5 A
125 VDC	0.5 A		0.4 A	0.4 A	0.05 A		0.05 A	0.05 A
250 VDC	0.25 A		0.2 A	0.2 A	0.03 A		0.03 A	0.03 A

Inrush current	NC	30 A max.
	NO	15 A max.

Note: 1. The above figures are for steady-state currents.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp load has an inrush current of 10 times the steady-state current.
4. Motor load has an inrush current of 6 times the steady-state current.
5. The above ratings were tested under the following conditions.
Ambient temperature: 20±2°C
Ambient humidity: 65±5%
Operating frequency: 20 operations/min

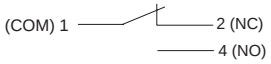
■ Characteristics

Degree of protection	IP67
Durability	Mechanical: 10,000,000 operations min. Electrical: 500,000 operations min.
Operating speed	0.05 mm/s to 0.5 m/s (for plunger models)
Operating frequency	Mechanical: 120 operations/min Electrical: 20 operations/min
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	15 mΩ max. (initial value)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity 2,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying part
Rated insulation voltage (U_i)	1,000 VAC
Pollution degree (operating environment)	3 (IEC947-5-1)
Protection against electric shock	Class II
PTI (tracking characteristics)	175
Switch category	D (IEC335)
Rated operating current (I_e)	10 A
Rated operating voltage (U_e)	250 VAC
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note)
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 100 m/s^2 min. (for plunger models) (see note)
Ambient temperature	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 71 g (at panel mount plunger)

Note: Less than 1 ms under a free state at the operating limits.

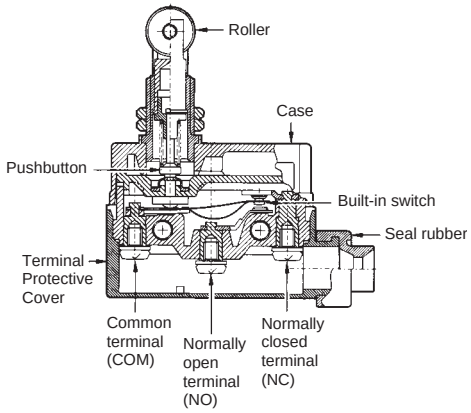
Connections

■ Contact Form



Nomenclature

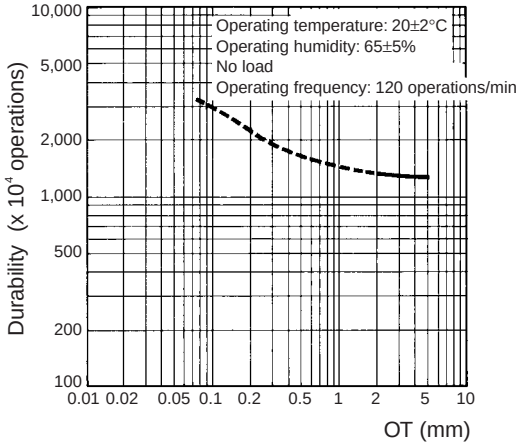
Changing the Terminal Protective Cover around allows the cable to be pulled out from either the right or the left.



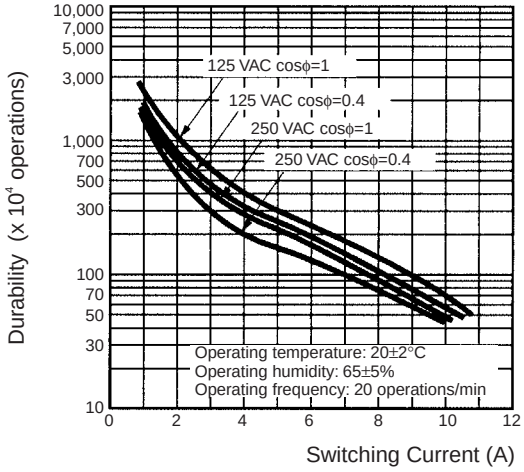
Note: M4 binding head screws (with toothed washers) are used as the terminal screws.

Engineering Data

■ Mechanical Durability (D4MC-5000)



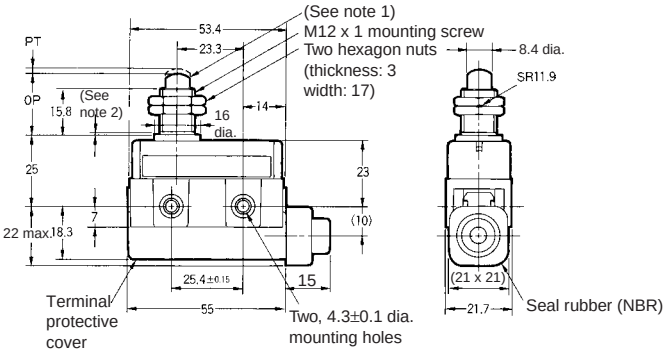
■ Electrical Durability



Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

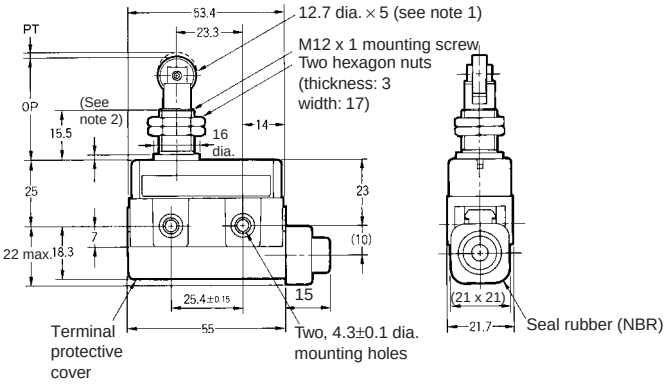
Panel Mount Plunger
D4MC-5000



Model	D4MC-5000
OF max.	5.88 N
RF min.	0.98 N
PT max.	1.6 mm
OT min.	5 mm
MD max.	0.2 mm
OP	21.8± 1.2 mm
FP max.	---

Note: 1. Stainless steel plunger
2. The length of the imperfect threads is 1.5 mm maximum.
3. Do not use the M12 mounting screw and the case mounting hole at the same time.

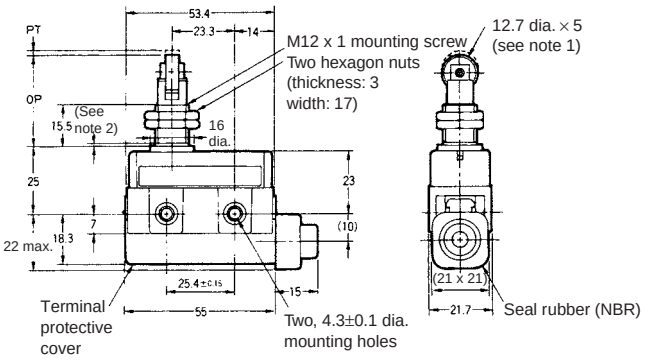
Panel Mount Roller Plunger
D4MC-5020



Model	D4MC-5020
OF max.	5.88 N
RF min.	0.98 N
PT max.	1.6 mm
OT min.	5 mm
MD max.	0.2 mm
OP	33.4±1.2 mm
FP max.	---

Note: 1. Stainless steel roller
2. The length of the imperfect threads is 1.5 mm maximum.
3. Do not use the M12 mounting screw and the case mounting hole at the same time.

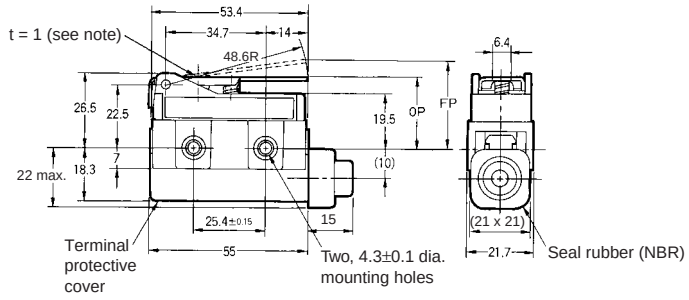
Panel Mount Crossroller Plunger
D4MC-5040



Model	D4MC-5040
OF max.	5.88 N
RF min.	0.98 N
PT max.	1.6 mm
OT min.	5 mm
MD max.	0.2 mm
OP	33.4±1.2 mm
FP max.	---

Note: 1. Stainless steel roller
2. The length of the imperfect threads is 1.5 mm maximum.
3. Do not use the M12 mounting screw and the case mounting hole at the same time.

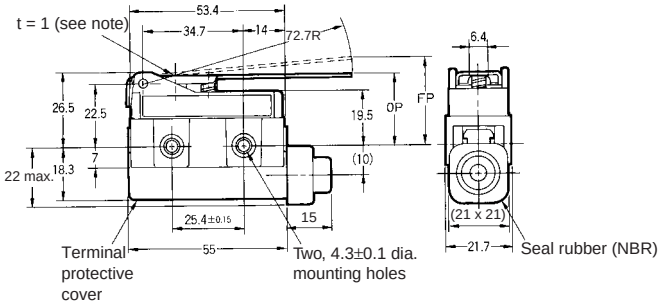
Short Hinge Lever
D4MC-1020



Note: Stainless steel lever

Model	D4MC-1020
OF max.	2.55 N
RF min.	0.34 N
PT max.	---
OT min.	2.5 mm
MD max.	1.7 mm
OP	25±1 mm
FP max.	33 mm

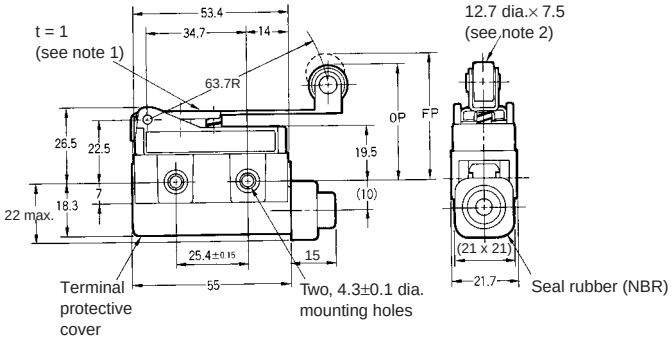
Hinge Lever
D4MC-1000



Note: Stainless steel lever

Model	D4MC-1000
OF max.	1.67 N
RF min.	0.25 N
PT max.	---
OT min.	4 mm
MD max.	3 mm
OP	25±1 mm
FP max.	36 mm

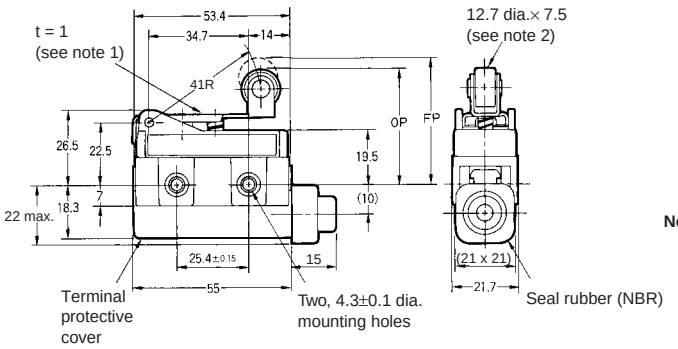
Hinge Roller Lever
D4MC-2000



Note: **1.** Stainless steel lever
2. Plastic roller

Model	D4MC-2000
OF max.	1.96 N
RF min.	0.39 N
PT max.	---
OT min.	5 mm
MD max.	3 mm
OP	40±1 mm
FP max.	51 mm

Short Hinge Roller Lever
D4MC-2020

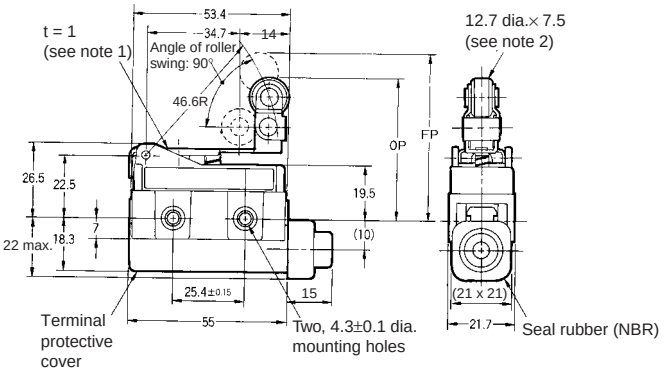


Note: 1. Stainless steel lever
2. Plastic roller

Model	D4MC-2020
OF max.	2.94 N
RF min.	0.39 N
PT max.	---
OT min.	2 mm
MD max.	1.5 mm
OP	40±1 mm
FP max.	47 mm

One-way Action Short Hinge Roller Lever

D4MC-3030



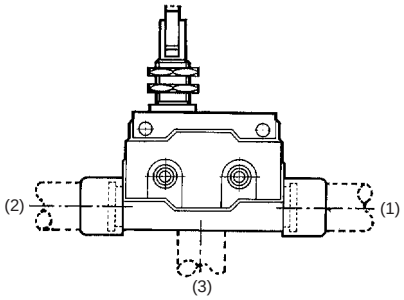
Note: 1. Stainless steel lever
2. Plastic roller

Model	D4MC-3030
OF max.	2.94 N
RF min.	0.39 N
PT max.	---
OT min.	2 mm
MD max.	1.5 mm
OP	50±1 mm
FP max.	57.2 mm

Molded Terminal Models

■ Molded Terminal Models (Not Approved by UL, CSA, or EN)

The molded terminal model is available with right-hand, left-hand and underside leads and is recommended for use where the Switch is exposed to dust, oil, or moisture.



When placing your order for the Switch specify the required length of V.C.T. cable in addition to the model number of the Switch

Example:
Standard type: D4MC-5020
Location of lead outlet: Underside
Length of lead: 1 m (V.C.T. lead)
When placing your order for the above Switch specify the model number as D4MC-5023 VCT 1M

Suffix by Location of Lead Outlet

Location of lead outlet	Model
	COM, NC, and NO
Right-hand	D4MC-□□□1
Left-hand	D4MC-□□□2
Underside	D4MC-□□□3

Leads Supplied

Leads	Nominal cross-sectional area	Finished outside diameter	Terminal connections	Standard length
V.C.T. (Vinyl cabtire cable)	1.25 mm^2	3 core:10.5 mm dia.	Black: COM White: NO Red: NC	1, 3 m

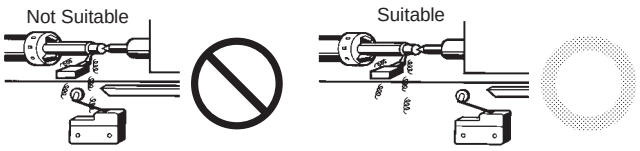
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



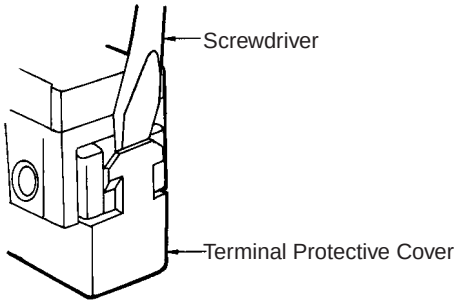
- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Operating

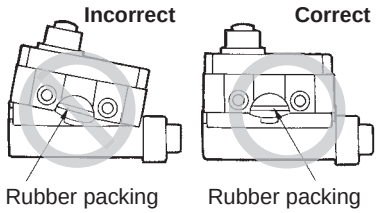
Excessive dog angle, operating speed, or overtravel (OT) may damage the actuator. Check that OT has a sufficient margin. The actual OT should be rated OT x 0.7 to 1.

Handling

- Do not expose the Switch to water exceeding 60°C or use it in steam.
- Do not use the Switch in oil or water.
- An 8.5- to 10.5-dia. cable can be applied as seal rubber for the lead wire outlet. (Use two- or three-core cable of VCT1.25 mm^2.)
- When detaching the Terminal Protective Cover, insert a screwdriver and apply a force in the opening direction. Do not use excess force to remove the cover. Doing so may cause deformation in the fitting section and reduce the holding force.



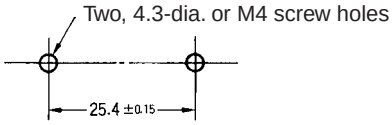
When mounting the Terminal Protective Cover to the case, align the cover on the case and then press the cover down to mount it firmly. If the cover is pressed down in an inclined position, rubber packing will deform and thus affect the sealing capability.



Mounting

When mounting the Switch with screws on a side surface, fasten the Switch with M4 screws and use washers, spring washers, etc., to ensure secure mounting.

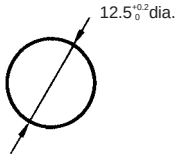
Mounting Holes



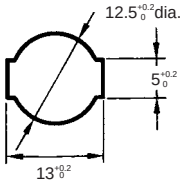
- When mounting the Panel Mount-type Switch (D4MC-5000, D4MC-5020, or D4MC-5040) with screws on a side surface, remove the hexagonal nuts from the actuator.
- When mounting the panel mount type on a panel, be careful not to tighten to an excessive torque. Tightening the screws to a torque exceeding 4.91 N·m will cause the plunger to fail.

Mounting Hole Dimensions

D4MC-5000



D4MC-5020, D4MC5040



Correct Tightening Torque

A loose screw may cause malfunctions. Be sure to tighten each screw to the proper tightening torque as shown in the table.

No.	Type	Torque
1	Terminal screw	0.78 to 1.18 N·m
2	Panel mounting screw	2.94 to 4.92 N·m
3	Side mounting screw	1.18 to 1.47 N·m

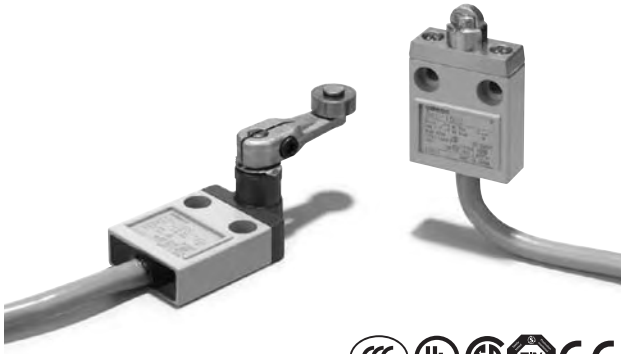
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C027-E1-10

Enclosed Switch
D4C

Sealed, Compact, and Slim-bodied Switch Offers Choice of Many Actuators

- Liquid- and dust-resistance conforms to IEC IP67 standard.
- Triple-sealed construction:
  Plunger section sealed via nitrile rubber packing seal and diaphragm; switch section sealed via nitrile rubber cap; cable entrance sealed via encapsulating material.
- Standard cable (S-FLEX VCTF) in 3- or 5-meter lengths offers high flexibility with outstanding oil and extreme temperature resistance.
- Low temperature models are available.
- Approved by EN, UL, CSA, and CCC (Chinese standard).



Model Number Structure

■ Model Number Legend

Standard Models

D4C-□□□
1 2 3

1. Rated Current
- 1: 5 A at 250 VAC, 4 A at 30 VDC
- 2: 5 A at 125 VAC (with LED indicator)
- 3: 4 A 30 VDC (with LED indicator)
- 4: 0.1 A at 125 VAC, 0.1 A at 30 VDC
- 5: 0.1 A at 125 VAC (with LED indicator)
- 6: 0.1 A at 30 VDC (with LED indicator)

2. Cable Specifications
- 2: VCTF oil-resistant cable (3 m)
- 3: VCTF oil-resistant cable (5 m)
- 4: VCTF (3 m)
- 5: VCTF (5 m)
- 6: SJT(O) (3 m)
- 7: SJT(O) (5 m)

3. Actuator
- 01: Pin plunger
- 02: Roller plunger
- 03: Crossroller plunger
- 20: Roller lever
- 24: Roller lever (high-sensitivity model)
- 31: Sealed pin plunger
- 32: Sealed roller plunger
- 33: Sealed crossroller
- 50: Plastic rod
- 60: Center roller lever

Note: Some combinations of the above may not be supported.

Pre-wired Models (Use VCTF Oil-resistant Cable)

D4C-□0□□-□□□□□□
1 2 3 4

1. Operation Indicator Lamp
- 1: 1 A at 125 VAC, 1 A at 30 VDC (Without operation indicator)
- 2: 1 A at 125 VAC (with operation indicator)
- 3: 1 A at 30 VDC (with operation indicator)

2. Actuator
- 01: Pin plunger
- 02: Roller plunger
- 31: Sealed plunger
- 32: Sealed roller plunger
- 24: Roller lever (high-sensitivity model)

3. Wiring Specifications
- DK1EJ: Pre-wired models (3 conductors: DC specification, NC wiring)
- AK1EJ: Pre-wired models (3 conductors: AC specification, NC wiring)
- M1J: Connector models for ASI devices (2 conductors: NO wiring)

4. Cable length
- 03: 0.3 m

Wiring Specifications

Internal switch	Connector
COM	3
NC	2
NO	4

Note: Since the above wiring specifications are different from those for the D4CC, be careful not to mistake them.

Weather-resistant Models

D4C-□□□-P
1 2 3

1. Rated Current
- 1: 5 A at 250 VAC, 4 A at 30 VDC
- 2: 5 A at 125 VAC (with LED indicator)
- 3: 4 A at 30 VDC (with LED indicator)
- 4: 0.1 A at 125 VAC, 0.1 A at 30 VDC

2. Cable Specifications
- 2: VCTF oil-resistant cable (3 m)
- 3: VCTF oil-resistant cable (5 m)

3. Actuator
- 20: Roller lever
- 24: Roller lever (high-sensitivity model)
- 27: Variable roller lever
- 29: Variable rod lever

Ordering Information

■ List of Models

Standard Models

Switches with No Operation Indicator

Actuator	Ratings: Cable length (m)	Standard: 250 VAC, 5 A; 30 VDC 4 A			Microload: 125 VAC, 0.1 A; 30 VDC 0.1 A	
		VCTF oil-resistance cable (See note 1.)	VCTF cable (See note 5.)	SJT(O) cable (See note 4.)	VCTF oil-resistance cable (See note 1.)	VCTF cable (See note 5.)
Pin plunger 	3	D4C-1201	D4C-1401	D4C-1601	D4C-4201	D4C-4401
	5	D4C-1301	D4C-1501	D4C-1701	D4C-4301	D4C-4501
Roller plunger 	3	D4C-1202	D4C-1402	D4C-1602	D4C-4202	D4C-4402
	5	D4C-1302	D4C-1502	D4C-1702	D4C-4302	D4C-4502
Crossroller plunger 	3	D4C-1203	D4C-1403	D4C-1603	D4C-4203	D4C-4403
	5	D4C-1303	D4C-1503	D4C-1703	D4C-4303	D4C-4503
Roller lever 	3	D4C-1220	D4C-1420	D4C-1620	D4C-4220	D4C-4420
	5	D4C-1320	D4C-1520	D4C-1720	D4C-4320	D4C-4520
Roller lever, high-sensitivity 	3	D4C-1224	D4C-1424	D4C-1624	D4C-4224	D4C-4424
	5	D4C-1324	D4C-1524	D4C-1724	D4C-4324	D4C-4524
Sealed pin plunger 	3	D4C-1231	D4C-1431	D4C-1631	D4C-4231	D4C-4431
	5	D4C-1331	D4C-1531	D4C-1731	D4C-4331	D4C-4531
Sealed roller plunger 	3	D4C-1232	D4C-1432	D4C-1632	D4C-4232	D4C-4432
	5	D4C-1332	D4C-1532	D4C-1732	D4C-4332	D4C-4532
Sealed crossroller plunger 	3	D4C-1233	D4C-1433	D4C-1633	D4C-4233	D4C-4433
	5	D4C-1333	D4C-1533	D4C-1733	D4C-4333	D4C-4533
Plastic rod 	3	D4C-1250	D4C-1450	D4C-1650	D4C-4250	D4C-4450
	5	D4C-1350	D4C-1550	D4C-1750	D4C-4350	D4C-4550
Center roller lever 	3	D4C-1260	D4C-1460	D4C-1660	D4C-4260	D4C-4460
	5	D4C-1360	D4C-1560	D4C-1760	D4C-4360	D4C-4560

Note 1. Models are available separately with resistance to viscous oils (oil drain holes are also available), but only with Plunger Models. Add “-M” to the model number (example: D4C-1202 would be D4C-1202-M).

2. Oil-resistant vinyl cabtire cables; approved by EN and IEC.

3. Ordinary vinyl cabtire cables.

4. Switches with SJT(O) Cables (cables approved by UL and CSA) are approved by UL and CSA.

5. Switches with variable roller levers are also available. Ask your nearest OMRON representative for details.

Standard Switches with Operation Indicator (Red)

Actuator	Ratings: Cable length (m)	125 VAC, 0.1 A: VCTF oil-resistance cable (See note 1.)	125 VAC, 0.1 A: VCTF cable (See note 2.)	30 VDC 0.1 A: VCTF oil-resistance cable (See note 1.)	30 VDC 0.1 A: VCTF cable (See note 2.)
Pin plunger	3	D4C-2201	D4C-2401	D4C-3201	D4C-3401
	5	D4C-2301	D4C-2501	D4C-3301	D4C-3501
Roller plunger	3	D4C-2202	D4C-2402	D4C-3202	D4C-3402
	5	D4C-2302	D4C-2502	D4C-3302	D4C-3502
Crossroller plunger	3	D4C-2203	D4C-2403	D4C-3203	D4C-3403
	5	D4C-2303	D4C-2503	D4C-3303	D4C-3503
Roller lever	3	D4C-2220	D4C-2420	D4C-3220	D4C-3420
	5	D4C-2320	D4C-2520	D4C-3320	D4C-3520
Roller lever, high-sensitivity	3	D4C-2224	D4C-2424	D4C-3224	D4C-3424
	5	D4C-2324	D4C-2524	D4C-3324	D4C-3524
Sealed pin plunger	3	D4C-2231	D4C-2431	D4C-3231	D4C-3431
	5	D4C-2331	D4C-2531	D4C-3331	D4C-3531
Sealed roller plunger	3	D4C-2232	D4C-2432	D4C-3232	D4C-3432
	5	D4C-2332	D4C-2532	D4C-3332	D4C-3532
Sealed crossroller plunger	3	D4C-2233	D4C-2433	D4C-3233	D4C-3433
	5	D4C-2333	D4C-2533	D4C-3333	D4C-3533
Plastic rod	3	D4C-2250	D4C-2450	D4C-3250	D4C-3450
	5	D4C-2350	D4C-2550	D4C-3350	D4C-3550
Center roller lever	3	D4C-2260	D4C-2460	D4C-3260	D4C-3460
	5	D4C-2360	D4C-2560	D4C-3360	D4C-3560

Note 1. Oil-resistant vinyl cabtire cables; approved by EN and IEC.

2. Ordinary vinyl cabtire cables.

3. Switches with SJT(O) Cables (cables approved by UL and CSA) are approved by UL and CSA.

4. Ask your nearest OMRON representative for information on Switching with approved international standards.

Micro-load Switches with Operation Indicator

Actuator	Ratings	125 VAC, 0.1 A	30 VDC 0.1 A
	Cable	VCTF oil-resistance cable (See note 1.)	VCTF oil-resistance cable (See note 1.)
	Cable length (m)		
Pin plunger 	3	D4C-5201	D4C-6201
	5	D4C-5301	D4C-6301
Roller plunger 	3	D4C-5202	D4C-6202
	5	D4C-5302	D4C-6302
Crossroller plunger 	3	D4C-5203	D4C-6203
	5	D4C-5303	D4C-6303
Roller lever 	3	D4C-5220	D4C-6220
	5	D4C-5320	D4C-6320
Roller lever, high-sensitivity 	3	D4C-5224	D4C-6224
	5	D4C-5324	D4C-6324
Sealed pin plunger 	3	---	D4C-6231
	5	---	D4C-6331
Sealed roller plunger 	3	D4C-5232	D4C-6232
	5	D4C-5332	D4C-6332
Sealed crossroller plunger 	3	---	D4C-6233
	5	---	D4C-6333
Plastic rod 	3	D4C-5250	D4C-6250
	5	D4C-5350	D4C-6350

Note 1. Oil-resistant vinyl cabtire cables; approved by EN and IEC.

2. Ask your nearest OMRON representative for information on Switching with approved international standards.

Pre-wired Models (Use VCTF Oil-resistant Cable)

Actuator	1 A at 125 VAC without operation indicator	1 A at 125 VAC with operation indicator	1 A at 30 VDC without operation indicator	1 A at 30 VDC with operation indicator
Pin plunger 	D4C-1001-AK1EJ□	D4C-2001-AK1EJ□	D4C-1001-DK1EJ□	D4C-3001-DK1EJ□
Roller plunger 	D4C-1002-AK1EJ□	D4C-2002-AK1EJ□	D4C-1002-DK1EJ□	D4C-3002-DK1EJ□
Sealed plunger 	D4C-1031-AK1EJ□	D4C-2031-AK1EJ□	D4C-1031-DK1EJ□	D4C-3031-DK1EJ□
Sealed roller plunger 	D4C-1032-AK1EJ□	D4C-2032-AK1EJ□	D4C-1032-DK1EJ□	D4C-3032-DK1EJ□
Roller lever (high-sensitivity model) 	D4C-1024-AK1EJ□	D4C-2024-AK1EJ□	D4C-1024-DK1EJ□	D4C-3024-DK1EJ□

Note 1. The □ contains the length of the cable.
For example: 30 cm → D4C-1001-AK1EJ03

2. M1J models are also available. Contact your OMRON sales representative for further information.

3. Of the above model numbers, some with special specifications are not registered.

Weather-resistant Models

Actuator		5 A at 250 VAC 4 A at 30 VDC without operation indicator	0.1 A at 125 VAC 0.1 A at 30 VDC without operation indicator	5 A at 125 VAC with operation indicator	4 A at 30 VDC with operation indicator
Roller lever	3 m	D4C-1220-P	D4C-4220-P	D4C-2220-P	D4C-3220-P
	5 m	D4C-1320-P	---	---	---
Roller lever (high-sensitivity model)	3 m	D4C-1224-P	D4C-4224-P	D4C-2224-P	D4C-3224-P
	5 m	D4C-1324-P	D4C-4324-P	D4C-2324-P	D4C-3324-P
Variable roller lever	3 m	D4C-1227-P	D4C-4227-P	D4C-2227-P	D4C-3227-P
	5 m	D4C-1327-P	D4C-4327-P	D4C-2327-P	D4C-3327-P
Variable rod lever	3 m	D4C-1229-P	D4C-4229-P	---	D4C-3229-P
	5 m	D4C-1329-P	---	D4C-2329-P	D4C-3329-P

Note: Silicon rubber is used to increase resistance to the environment. Silicon rubber, however, can generate silicon gas. (This can occur at room temperature, but the amount of silicon gas generated increases at higher temperatures.) Silicon gas will react as a result of arc energy and form silicon oxide (SiO_2). If silicon oxide accumulates on the contacts, contact interference can occur and can interfere with the device. Before using a Switch, test it under actual application conditions (including the environment and operating frequency) to confirm that no problems will occur in actual.

Individual Parts (Head/Actuator)

Actuator type	Head (with actuator)	Actuator
Pin plunger	D4C-0001	-
Roller plunger	D4C-0002	-
Crossroller plunger	D4C-0003	-
Roller lever	D4C-0020	WL-1A100
Environment-resistant roller lever	D4C-0020-P	WL-1A100P1
Roller lever	D4C-0024	WL-1A100
Variable roller lever	D4C-0027	HL-1HPA320
Variable rod lever	D4C-0029	HL-1HPA500
Sealed pin plunger	D4C-0031	-
Sealed roller plunger	D4C-0032	-
Sealed crossroller plunger	D4C-0033	-
Plastic rod	D4C-0050	-
Center roller lever	D4C-0060	-

Note 1: The model numbers for heads are of the form D4C-00□□, with the numbers in the squares indicating the type of actuator.

2. Actuators for plunger models, plastic rod models, and center roller lever models cannot be ordered individually. They must be ordered together with the head.

3. Consult your OMRON representative for details on cold-resistant specifications.

Mounting Plates

The WL model incorporated by equipment can be replaced with the D4C together with the Mounting Plate without changing the position of the dog or cam.

List of Replaceable Models

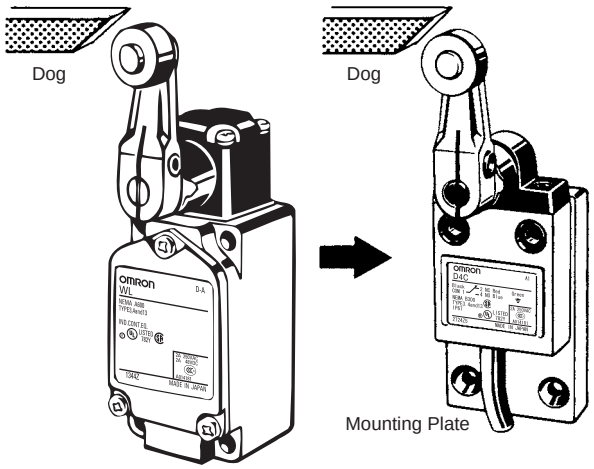
Contact your OMRON representative for the period required for delivery.

WL model (Actuator)	D4C model (Actuator)	Plate
WLD/WL01D (Top plunger)	→D4C-□□01 (Plunger)	D4C-P001
WLD2/WL01D2 (Top-roller plunger)	→D4C-□□02 (Roller plunger)	D4C-P002
WLCA2/WL01CA2 (Roller lever)	→D4C-□□20 (Roller lever)	D4C-P020

Note: The WL01□ is for micro loads.

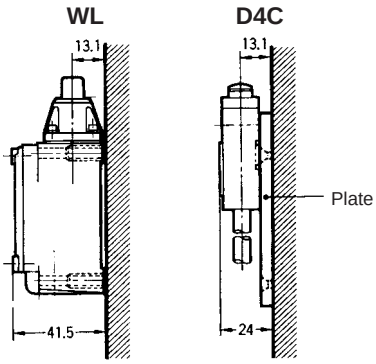
Application Example

Note: The position of the dog remains unchanged.



Remarks

There is no difference in mounting pitch between the Mounting Plate and the WL. The mounting depth of the D4C with the Mounting Plate attached is, however, shorter than that of the panel-mounted WL.



Specifications

■ Approved Standards

Agency	Standard	File No.
TÜV Product Service	EN60947-5-1	B03 08 39656 056 (see note 1) B03 08 39656 057 (see note 2)
UL	UL508	E76675 (see note 3)
CSA	CSA C22.2 No. 14	LR45746 (see note 3)
CCC (CQC)	GB14048.5	2003010305077626 (see note 4)

Note 1: Models with VCTF oil-resistant cables only.
2. Pre-wired models only.
3. SJT(0)-cable models only.
4. Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL/CSA

B300 (D4C-16□□, -17□□), B150 (D4C-26□□, -27□□)

NEMA B300 (D4C-16□□, -17□□)

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	5 A	30 A	3 A	3,600 VA	360 VA
240 VAC		15 A	1.5 A	3,600 VA	360 VA

NEMA B150 (D4C-26□□, -27□□)

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	5 A	30 A	3 A	3,600 VA	360 VA

TÜV (EN60947-5-1), CCC (GB14048.5)

Model	Applicable category and ratings	I the
D4C-1□□□	AC-15 2 A/250 VAC DC-12 2 A/30 VDC	5 A 4 A
D4C-2□□□	AC-15 2 A/125 VAC	5 A
D4C-3□□□	DC-12 2 A/30 VDC	4 A
D4C-4□□□	AC-14 0.1 A/125 VAC DC-12 0.1 A/30 VDC	0.5 A 0.5 A
D4C-5□□□	AC-14 0.1 A/125 VAC	0.5 A
D4C-6□□□	DC-12 0.1 A/30 VDC	0.5 A

■ General Ratings

Model	Rated voltage	Non-inductive load				Inductive load				Inrush current	
		Resistive load		Lamp load		Inductive load		Motor load			
		NC	NO	NC	NO	NC	NO	NC	NO	NC	NO
D4C-1□□□	125 VAC	5 A	5 A	1.5 A	0.7 A	3 A	3 A	2.5 A	1.3 A	20 A max.	10 A max.
	250 VAC	5 A	5 A	1 A	0.5 A	2 A	2 A	1.5 A	0.8 A		
	8 VDC	5 A	5 A	2 A	2 A	5 A	4 A	3 A	3 A		
	14 VDC	5 A	5 A	2 A	2 A	4 A	4 A	3 A	3 A		
	30 VDC	4 A	4 A	2 A	2 A	3 A	3 A	3 A	3 A		
	125 VDC	0.4 A	0.4 A	0.05 A	0.05 A	0.4 A	0.4 A	0.05 A	0.05 A		
	250 VDC	0.2 A	0.2 A	0.03 A	0.03 A	0.2 A	0.2 A	0.03 A	0.03 A		
D4C-2□□□	125 VAC	5 A	5 A	1.5 A	0.7 A	3 A	3 A	2.5 A	1.3 A		
	125 VDC	0.4 A	0.4 A	0.05 A	0.05 A	0.4 A	0.4 A	0.05 A	0.05 A		
D4C-3□□□	30 VDC	4 A	4 A	2 A	2 A	3 A	3 A	3 A	3 A		
D4C-4□□□	125 VAC	0.1 A	0.1 A	---		---					
	8 VDC	0.1 A	0.1 A								
	14 VDC	0.1 A	0.1 A								
	30 VDC	0.1 A	0.1 A								
D4C-5□□□	125 VAC	0.1 A	0.1 A	---		---					
D4C-6□□□	30 VDC	0.1 A	0.1 A	---		---					

Ratings for Pre-wired Models

Rated voltage	Non-inductive load				Inductive load				Inrush current	
	Resistive load		Lamp load		Inductive load		Motor load			
	NC	NO	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	1	1	1	0.7	1	1	1	1	20 A max.	10 A max.
30 VDC	1	1	1	1	1	1	1	1		

Note 1. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).

2. Lamp loads have an inrush current of 10 times the steady-state current.

3. Motor loads have an inrush current of 6 times the steady-state current.

■ Characteristics

Degree of protection	IP67
Durability (see note 2)	Mechanical: 10,000,000 operations min. (see note 4) Electrical: 200,000 operations min. (5A at 250 VAC, resistive load) (see note 3)
Operating speed	0.1 mm to 0.5 m/s (in case of plunger) 1 mm to 1 m/s (in case of roller lever)
Operating frequency	Mechanical: 120 operations/min Electrical: 30 operations/min
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial)	250 mΩ max. (initial value with 2-m VCTF cable) 300 mΩ max. (initial value with 3-m VCTF cable) 400 mΩ max. (initial value with 5-m VCTF cable)
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of the same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal part and ground, and between each terminal and non-current-carrying metal part, Uimp: 2.5 kV (EN60947-5-1)
Rated insulation voltage (U_i)	300 V (EN60947-5-1)
Switching overvoltage	1,000 VAC, 300 VDC max. (EN60947-5-1)
Pollution degree (operating environment)	3 (IEC60947-5-1)
Short-circuit protective device (SCPD)	10 A fuse type gI or gG (IEC269)
Conditional short-circuit current	100 A (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	5 A, 4 A, 0.5 A (EN60947-5-1)
Protection against electric shock	Class I (with grounding wire)
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note 5)
Shock resistance	Destruction: Approx. 1,000 m/s^2 min. Malfunction: Approx. 500 m/s^2 min. (see note 5)
Ambient temperature (see note)	Operating: –10°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight (D4C-1202)	With 3-m VCTF cable: 360 g; With 5-m VCTF cable: 540 g

Note 1. The above figures are initial values.

2. The values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

3. Prewired Connector Models: 1,000,000 operations min. (DC specifications, switching current: 0.1 A)

4. Outdoor specifications: 500,000 operations min.

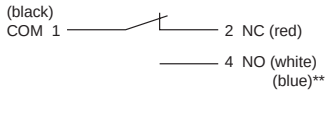
5. Excluding Plastic Rods.

Connections

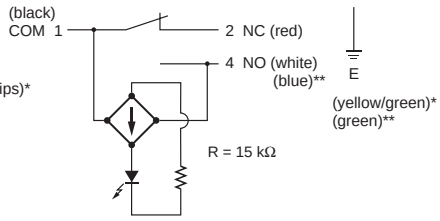
■ Contact Form

Standard Models/Weather-resistant Models

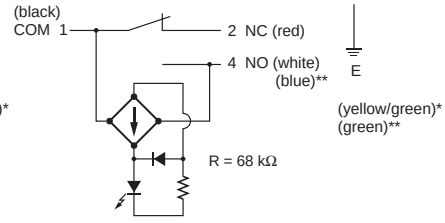
Without Operation Indicator



With 24 VDC LED Operation Indicator (Lit when Not Actuated)



With 100 VAC LED Operation Indicator (Lit when Not Actuated)



* Yellow/green: VCTF oil-resistant cable
Green: VCTF cable

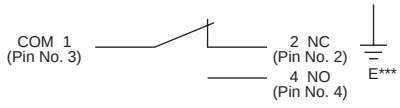
** SJT(O) cable approved by UL and CSA.

Note 1. "Lit when operated" means that when the actuator is turned or pushed and the Limit Switch contact leaves the NC side, the indicator lights.

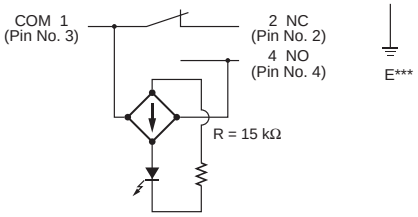
2. "Lit when not in operation" means that when the actuator is in the free position, the indicator is lit, and when the actuator is turned or pushed and the contact comes into contact with the NO side, the indicator turns OFF.

Pre-wired Models (-AK1EJ□, -DK1EJ□)

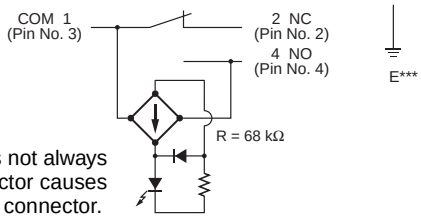
Without Operation Indicator



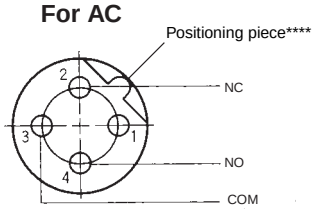
With 24 VDC LED Operation Indicator (Lit when Not Actuated)



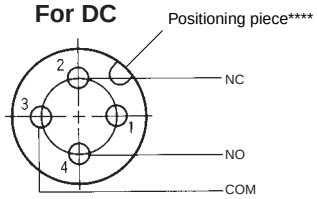
With 100 VAC LED Operation Indicator (Lit when Not Actuated)



For AC



For DC

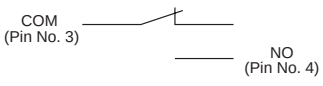


*** E (ground) is not grounded.

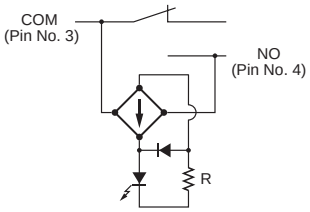
**** The position of the positioning piece is not always the same. If using an L-shaped connector causes problems in application, use a straight connector.

Connector Models for ASI Devices (-M1J)

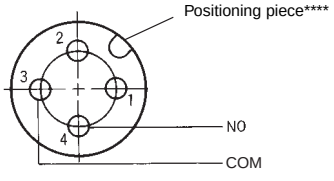
Without Operation Indicator



With Operation Indicator (Lit when Not Actuated)



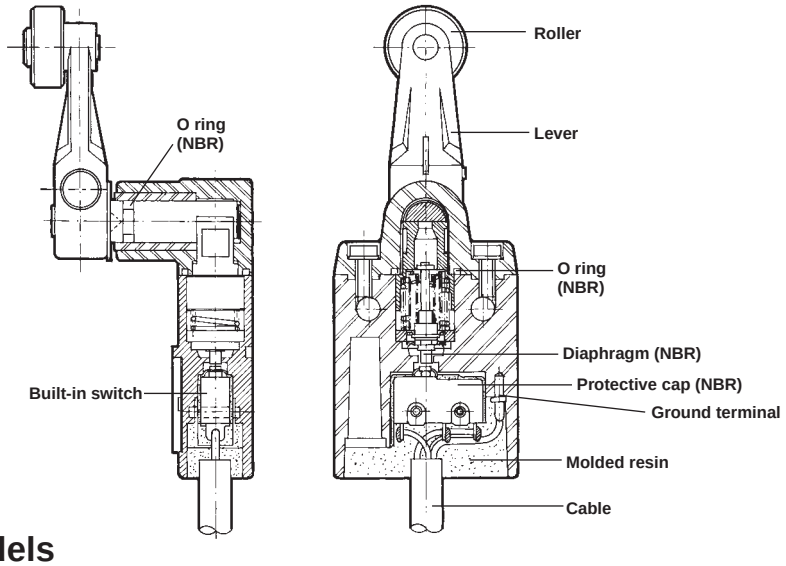
For DC



Nomenclature

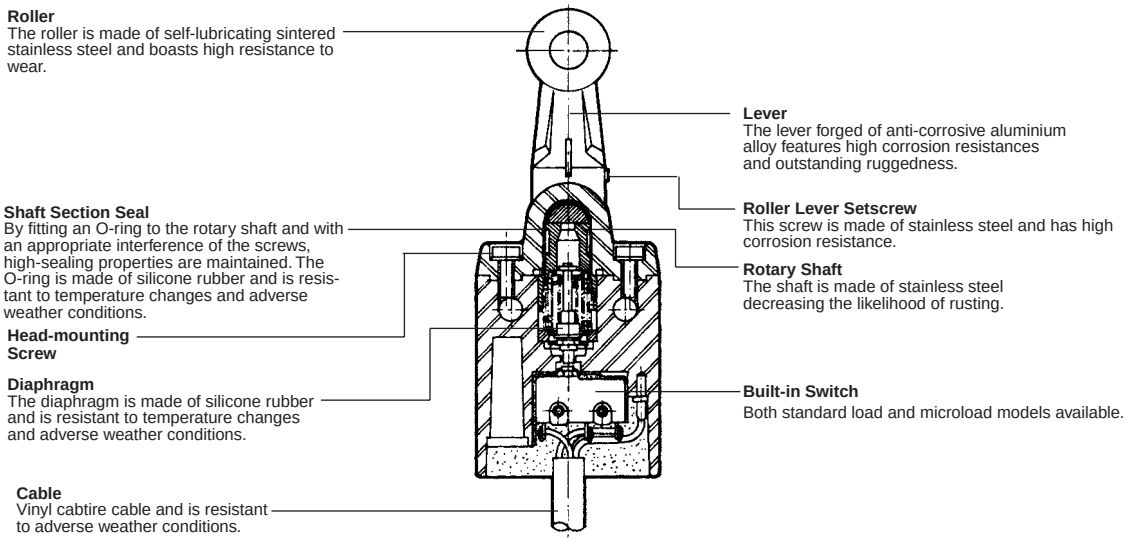
Standard Models

Roller Lever Models Without Indicator



Weather-resistant Models

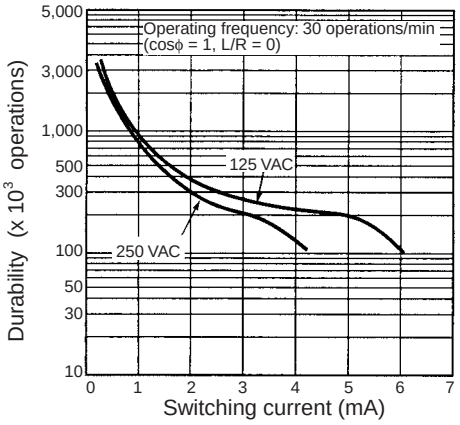
Roller Lever Models Without Indicator



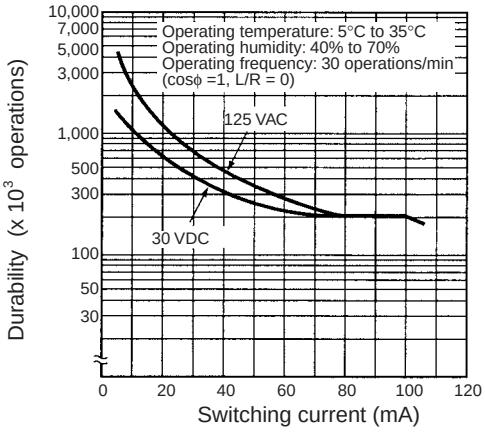
Engineering Data

■ Electrical Durability

D4C-1□□□, -2□□□, -3□□□



D4C-4□□□, -5□□□, -6□□□



■ Leakage Current for LED-indicator Models

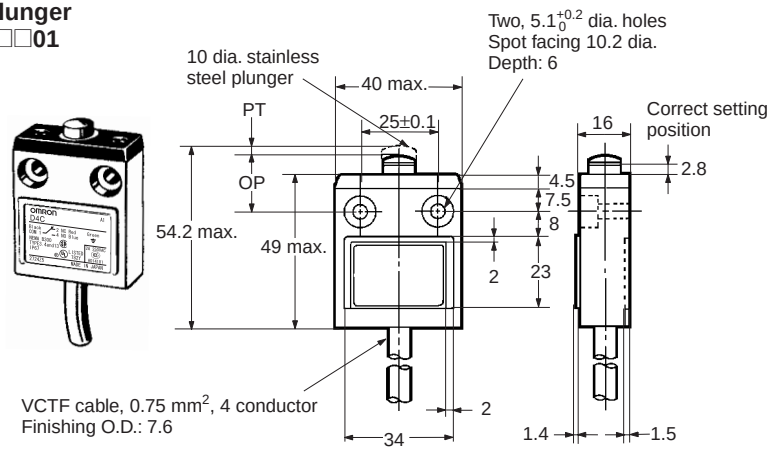
Model	Voltage	Leakage current	Resistance
D4C-2□□□	125 VAC	1.7 mA	68 kΩ
D4C-3□□□	30 VDC	1.7 mA	15 kΩ
D4C-5□□□	125 VAC	1.7 mA	68 kΩ
D4C-6□□□	30 VDC	1.7 mA	15 kΩ

Dimensions

Note 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

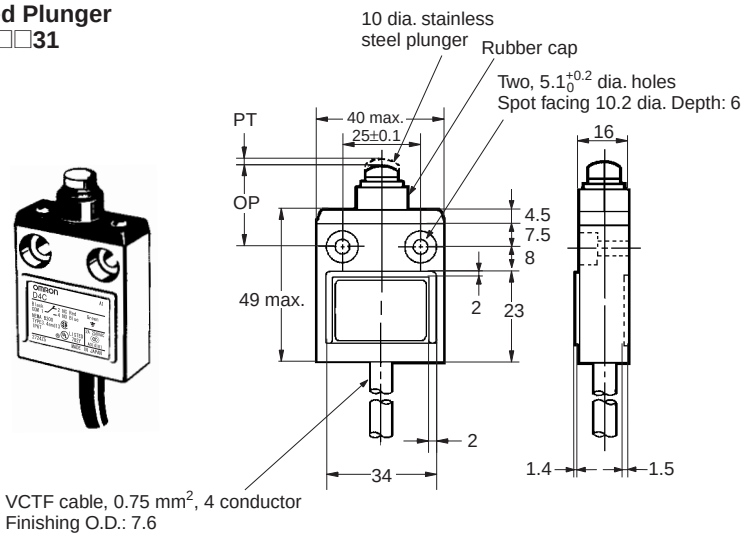
Standard Models

Pin Plunger
D4C-□□01



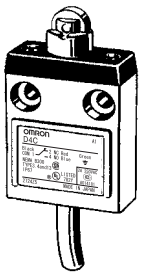
Model	D4C-□□01
OF max.	11.77 N
RF min.	4.41 N
PT max.	1.8 mm
OT min.	3 mm
MD max.	0.2 mm
OP	15.7±1 mm
TT	(5) mm

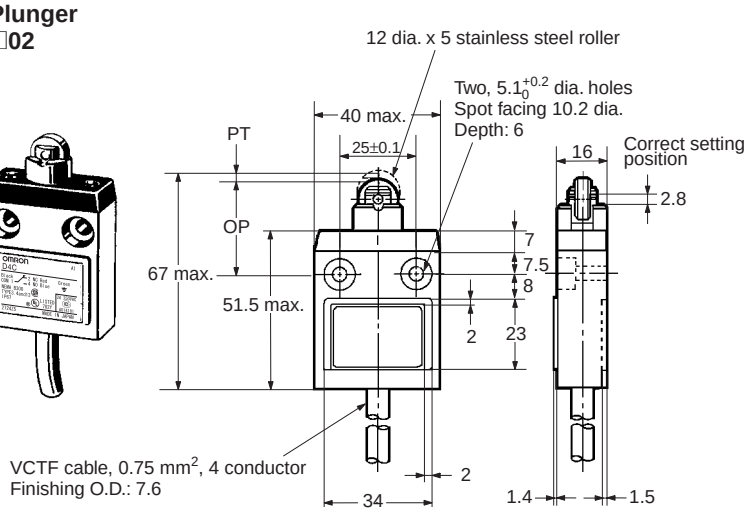
Sealed Plunger
D4C-□□31



Model	D4C-□□31
OF max.	17.65 N
RF min.	4.41 N
PT max.	1.8 mm
OT min.	3 mm
MD max.	0.2 mm
OP	24.9±1 mm
TT	(5) mm

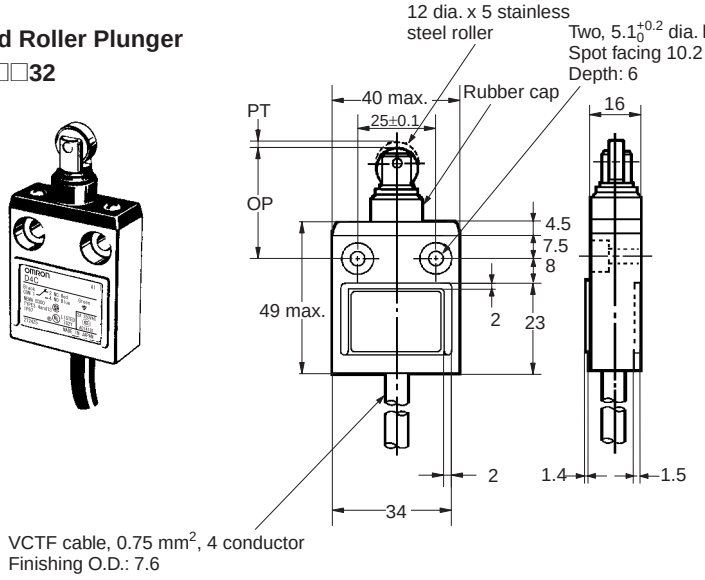
Roller Plunger
D4C-□□02





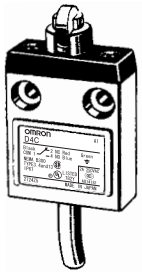
Model	D4C-□□02
OF max.	11.77 N
RF min.	4.41 N
PT max.	1.8 mm
OT min.	3 mm
MD max.	0.2 mm
OP	28.5±1 mm
TT	(5) mm

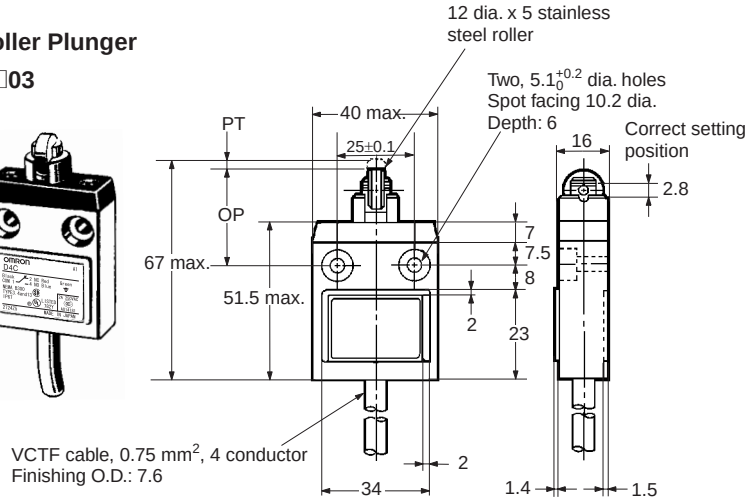
Sealed Roller Plunger
D4C-□□32



Model	D4C-□□32
OF max.	17.65 N
RF min.	4.41 N
PT max.	1.8 mm
OT min.	3 mm
MD max.	0.2 mm
OP	34.3±1 mm
TT	(5) mm

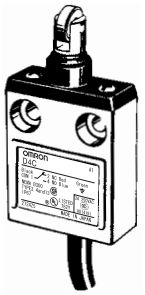
Crossroller Plunger
D4C-□□03

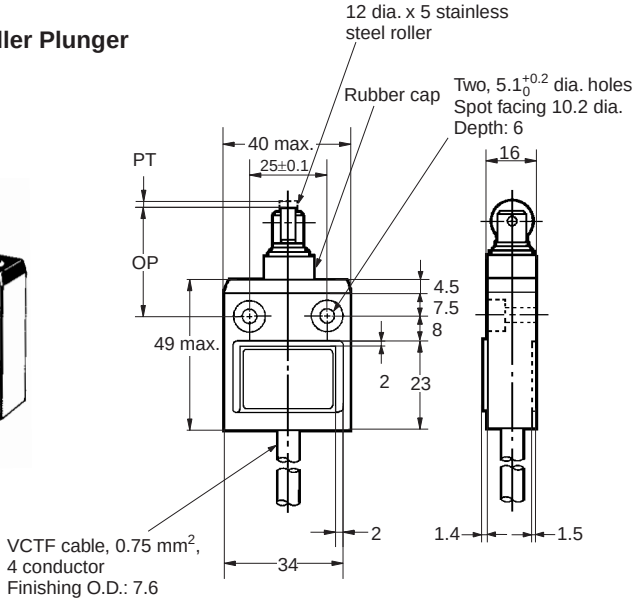




Model	D4C-□□03
OF max.	6.86 N
RF min.	2.45 N
PT max.	1.8 mm
OT min.	3 mm
MD max.	0.2 mm
OP	28.5±1 mm
TT	(5) mm

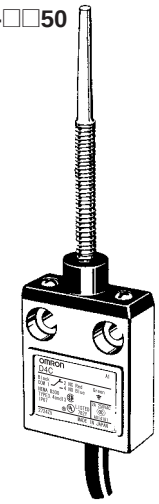
Sealed Crossroller Plunger
D4C-□□33

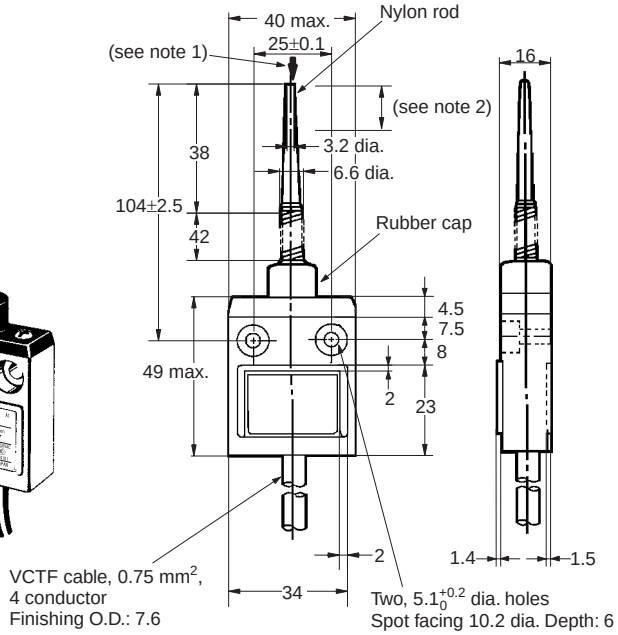




Model	D4C-□□33
OF max.	17.65 N
RF min.	4.41 N
PT max.	1.8 mm
OT min.	3 mm
MD max.	0.2 mm
OP	34.3±1 mm
TT	(5) mm

Coil Spring
D4C-□□50





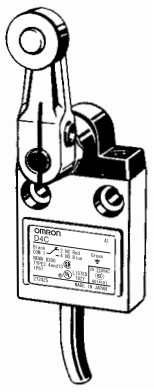
Model	D4C-□□50
OF max.	1.47 N
RF min.	---
PT max.	15°
OT min.	---
MD max.	---
OP	---
TT	---

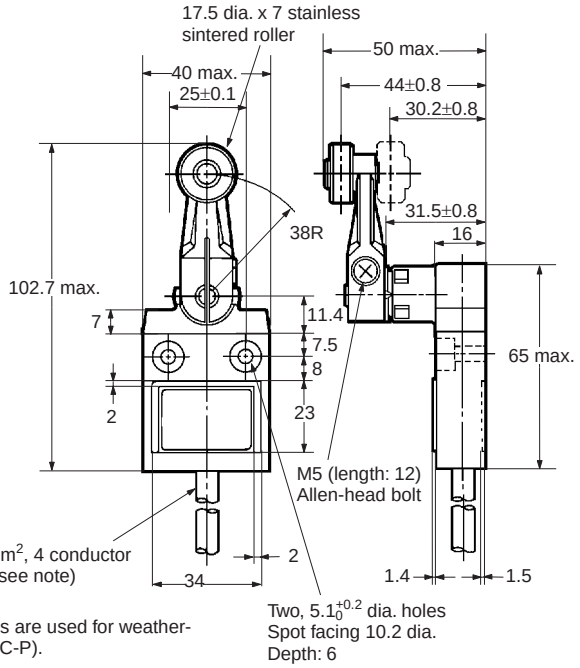
Note 1: Operation is possible in any direction except in parallel to the axis.

2. The ideal range for operation is between the tip of the rod and 1/3 of the length of the actuator.

Roller Lever

D4C-□□20
D4C-□□20-P



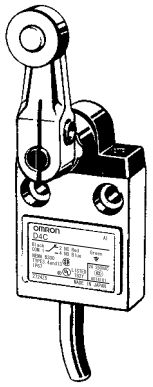


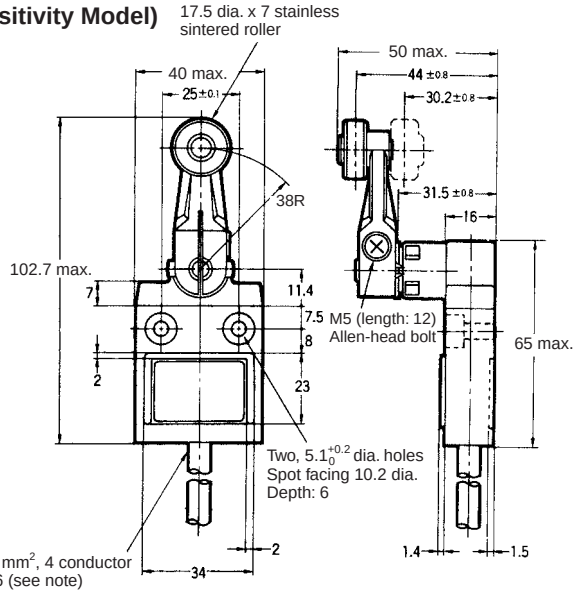
Note: S-FLEX VCTF Cables are used for weather-resistant models (D4C-P).

Model	D4C-□□20 D4C-□□20-P
OF max.	5.69 N
RF min.	1.47 N
PT max.	25°
OT min.	40°
MD max.	3°
OP	---
TT	(70°)

Roller Lever (High-Sensitivity Model)

D4C-□□24
D4C-□□24-P



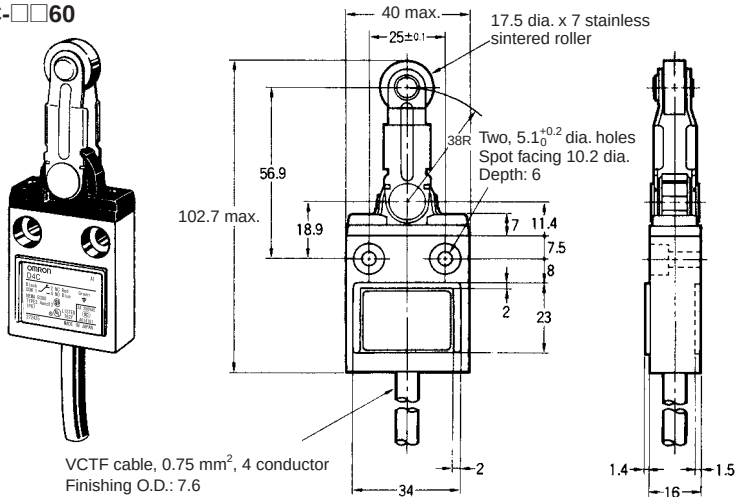


Note: S-FLEX VCTF Cables are used for weather-resistant models (D4C-P).

Model	D4C-□□24 D4C-□□24-P
OF max.	5.69 N
RF min.	1.47 N
PT max.	10±3°
OT min.	50°
MD max.	3°
OP	---
TT	(70°)

Center Roller Lever Plunger

D4C-□□60

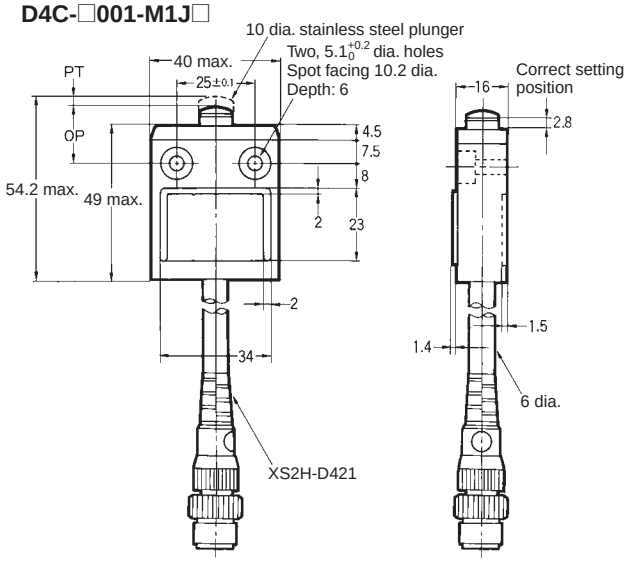


Model	D4C-□□60
OF max.	6.67 N
RF min.	1.47 N
PT max.	10±3°
OT min.	50°
MD max.	3°
OP	---
TT	---

Pre-wired Models

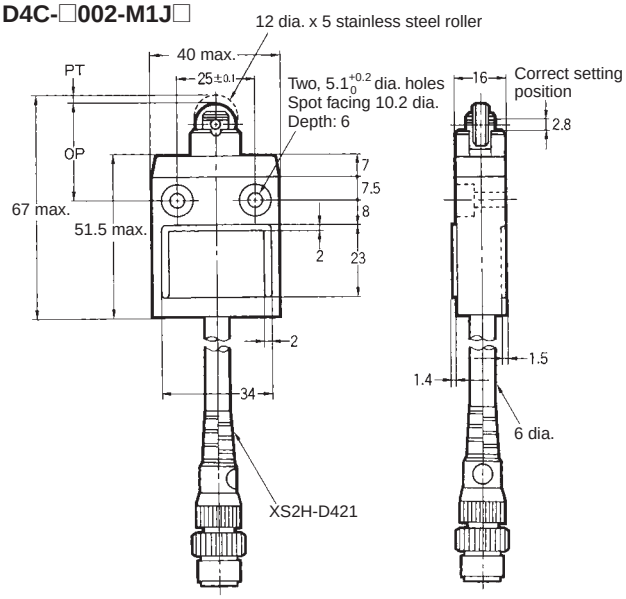
Pin Plunger

D4C-□001-□K1EJ□
D4C-□001-M1J□



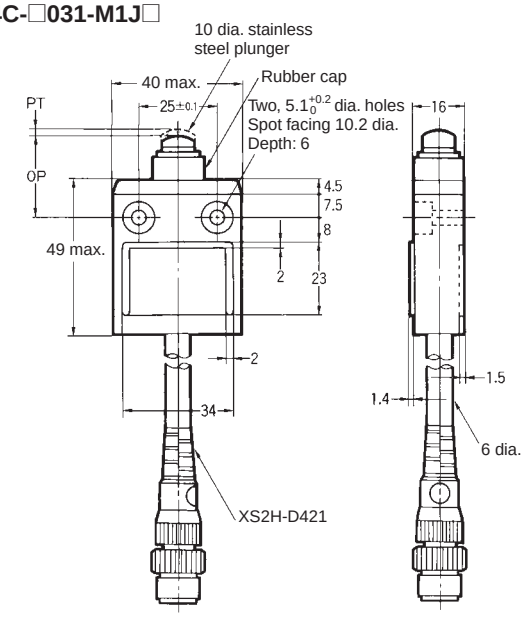
Roller Plunger

D4C-□002-□K1EJ□
D4C-□002-M1J□



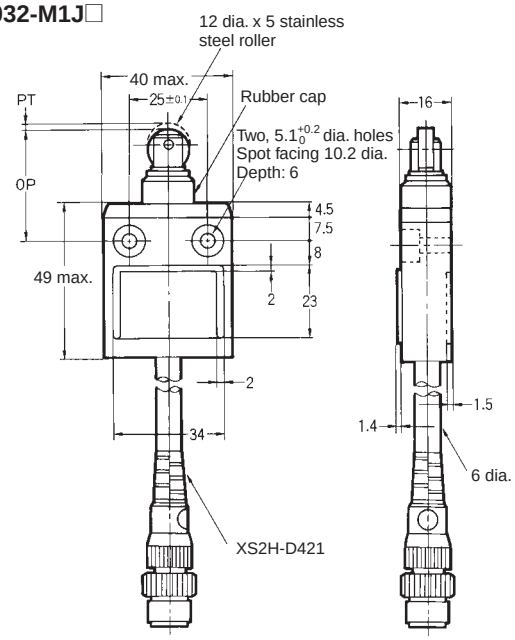
Sealed Pin Plunger

D4C-□031-□K1EJ□
D4C-□031-M1J□



Sealed Roller Plunger

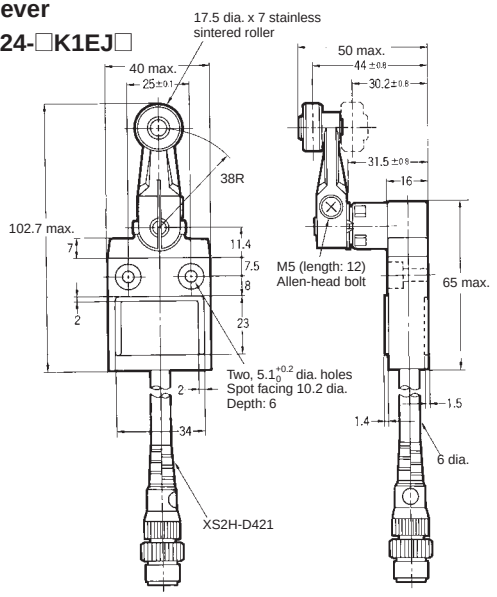
D4C-□032-□K1EJ□
D4C-□032-M1J□



Model	D4C-□001-□K1EJ□	D4C-□002-□K1EJ□	D4C-□031-□K1EJ□	D4C-□032-□K1EJ□
OF max.	11.77 N	11.77 N	17.65 N	17.65 N
RF min.	4.41 N	4.41 N	4.41 N	4.41 N
PT max.	1.8 mm	1.8 mm	1.8 mm	1.8 mm
OT min.	3 mm	3 mm	3 mm	3 mm
MD max.	0.2 mm	0.2 mm	0.2 mm	0.2 mm
OP	15.7±1 mm	28.5±1 mm	24.9±1 mm	34.3±1 mm

Note: Specifications are the same for -M1J Switches.

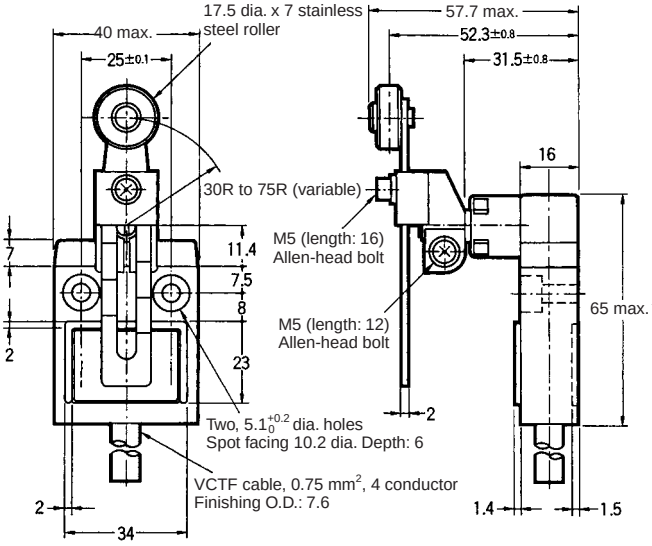
Roller Lever
D4C-□024-□K1EJ□



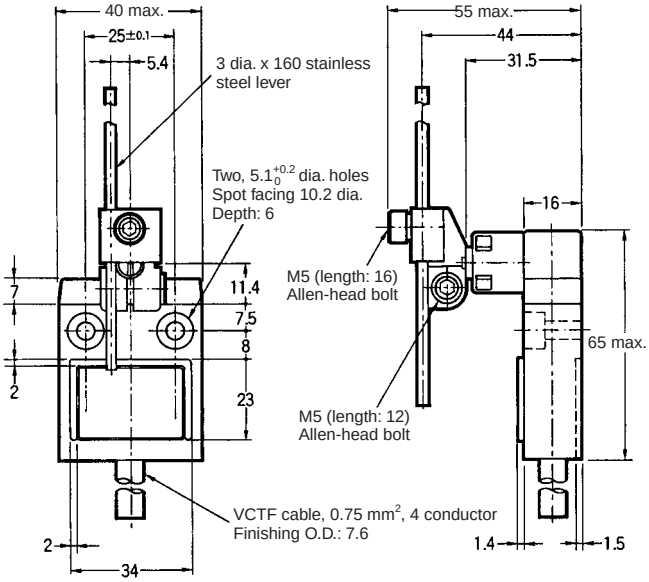
Model	D4C-□□24 -□K1EJ□
OF max.	5.69 N
RF min.	1.47 N
PT max.	10±3°
OT min.	50°
MD max.	3°
OP	---

Weather-resistant Models

Adjustable Roller Lever
D4C-□□27-P



Adjustable Rod Lever
D4C-□□29-P

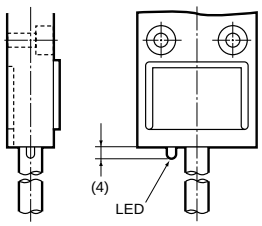


Model	D4C-□□27-P	D4C-□□29-P (see note)
OF max.	5.69 N	5.69 N
RF min.	1.47 N	1.47 N
PT max.	25°	25°
OT min.	40°	40°
MD max.	3°	3°

Note: Operation characteristics for the D4C-□□27-P and D4C-□□29-P are for a lever length of 38 mm.

Models with LED Indicator

The dimensions of the LED indicator for models equipped with one are shown below.



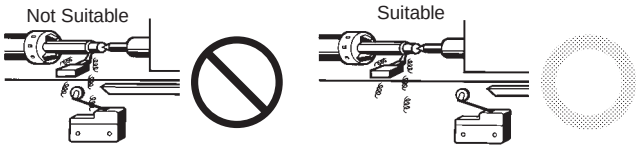
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.

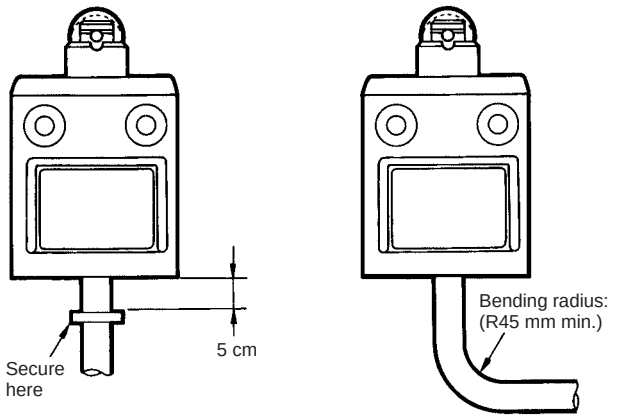


- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Handling

The bottom of the Switch at the cable outlet is resin-molded. Secure the cable at a point 5 cm from the Switch bottom to prevent exertion of excess force on the cable.

When bending the cable, provide a bending radius of 45 mm min. so as not to damage the cable insulation or sheath. Excessive bending may cause fire or leakage current.



Connections

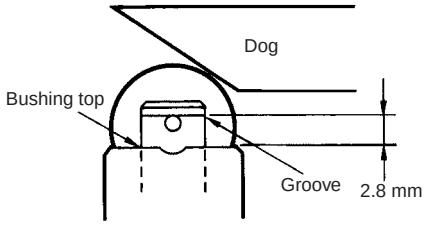
Be sure to connect a fuse with a breaking current 1.5 to 2 times larger than the rated current to the Limit Switch in series in order to protect the Limit Switch from damage due to short-circuiting.

When using the Limit Switch for the EN ratings, use the gI or gG 10-A fuse.

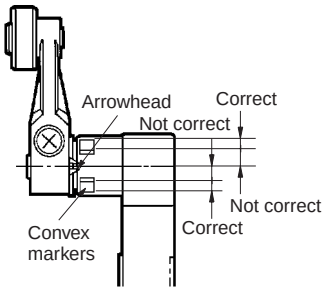
Operation

Operation method, shapes of cam and dog, operating frequency, and overtravel have a significant effect on the service life and precision of a Limit Switch. For this reason, the dog angle must be 30° max., the surface roughness of the dog must be 6.3S min. and hardness must be Hv400 to 500.

To allow the plunger-type actuator to travel properly, adjust the dog and cam to the proper setting positions. The proper position is where the plunger groove fits the bushing top.



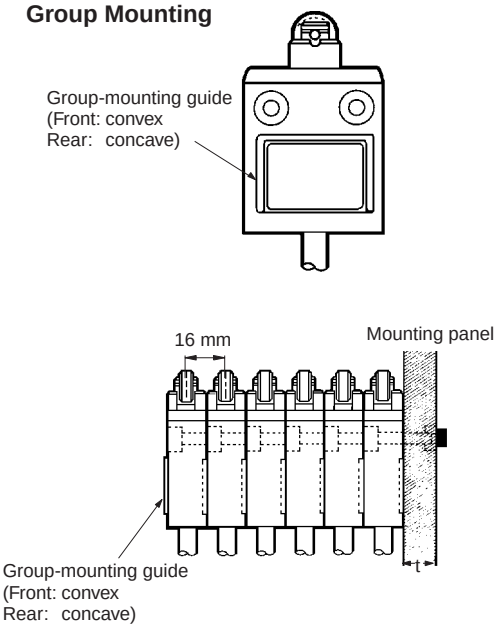
To allow the roller lever-type actuator to travel properly, adjust the dog and cam so that the arrow head is positioned between the two convex markers as shown below.



Mounting

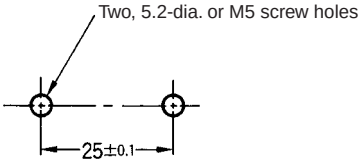
A maximum of 6 Switches may be group-mounted. In this case, pay attention to the mounting direction so that the convex part of the group-mounting guide on one Switch fits into the concave part of the guide on the other Switch as shown in the figure below. For group mounting, the mounting panel must have a thickness (t) of 6 mm min.

Group Mounting



If the mounting panel is warped or has protruding parts, a malfunction may result. Make sure that the mounting panel is not warped and has even surfaces.

Mounting Holes



Use a Switch with a rubber cap when using the plunger type in an environment where malfunction is possible due to environmental conditions such as dust or cutting chips which may not allow resetting.

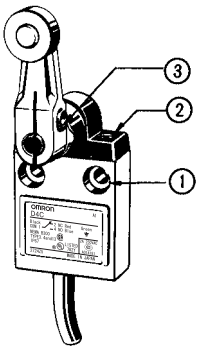
Do not expose the Switch to water exceeding 70°C or use it in steam.

When the D4C is used in a circuit of a device to be exported to Europe, classified as Overvoltage Class III as specified in IEC664, provide a contact protection circuit.

Tighten each screw to a torque according to the following table.

No.	Type	Torque
1	M5 Allen-head bolt	4.90 to 5.88 N·m
2	M3.5 head mounting screw	0.78 to 0.88 N·m
3	M5 Allen-head bolt	4.90 to 5.88 N·m

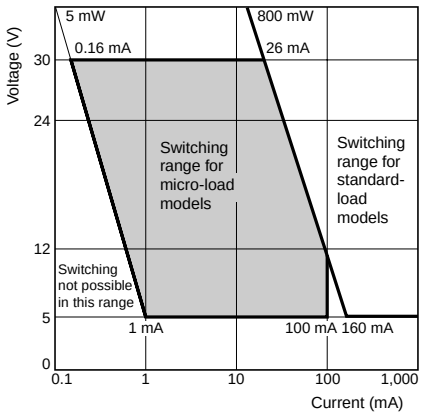
Note: By removing the two screws from the head, the head direction can be rotated 180°. After changing the head direction, re-tighten to the torque specified above. Be careful not to allow any foreign substance to enter the Switch.



Micro-load Models (D4C-4, -5, -6)

Switching Range

Micro-load models can be used for switching in the range shown below.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C032-E1-10 In the interest of product improvement, specifications are subject to change without notice.

Miniature Limit Switch
D4CC

Many Models Including Roller Lever Switches are Only 16-mm Thick with Connector

- New center roller lever models that enable ganged mounting of up to 6 Switches.
- Cable connectors for easy Switch replacement.
- Triple-seal construction for plungers to provide IEC IP67 degree of protection.
- Operation indicators available for easy monitoring (standard indicator is lit when Switch is not operating).

Model Number Structure

■ Model Number Legend

D4CC-□0□□
1 2

1. Rated Load

(These codes are different from suffix codes of the D4C)

1: 1 A at 125 VAC
2: 1 A at 125 VAC (with LED indicator)
3: 1 A at 30 VDC
4: 1 A at 30 VDC (with LED indicator)

2. Actuator

01: Pin plunger
02: Roller plunger
03: Crossroller plunger
24: Roller lever
31: Sealed pin plunger
32: Sealed roller plunger
33: Sealed crossroller plunger
50: Plastic rod
60: Center roller lever

Ordering Information

■ List of Models

Limit Switches

Actuator	1 A at 125 VAC		1 A at 30 VDC	
	Without indicator	With indicator	Without indicator	With indicator
Pin plunger 	D4CC-1001	D4CC-2001	D4CC-3001	D4CC-4001
Roller plunger 	D4CC-1002	D4CC-2002	D4CC-3002	D4CC-4002
Crossroller plunger 	D4CC-1003	D4CC-2003	D4CC-3003	D4CC-4003
High-sensitivity roller lever 	D4CC-1024	D4CC-2024	D4CC-3024	D4CC-4024
Sealed pin plunger 	D4CC-1031	D4CC-2031	D4CC-3031	D4CC-4031
Sealed roller plunger 	D4CC-1032	D4CC-2032	D4CC-3032	D4CC-4032
Sealed crossroller plunger 	D4CC-1033	D4CC-2033	D4CC-3033	D4CC-4033
Plastic rod 	D4CC-1050	D4CC-2050	D4CC-3050	D4CC-4050
Center roller lever 	D4CC-1060	D4CC-2060	D4CC-3060	D4CC-4060

Note: 1. The meaning of suffix codes in the D4CC model numbers is different from that in the D4C model numbers.

2. Refer to the following table for cable plugs.

Accessories (Order Separately)

Plugs

Type	Appearance	No. of conductors	Cable length	Model
VAC	Straight 	4	1 m	XS2F-A421-C90-A
			2 m	XS2F-A421-D90-A
			5 m	XS2F-A421-G90-A
			10 m	XS2F-A421-J90-A
VDC			1 m	XS2F-D421-C80-A
			2 m	XS2F-D421-D80-A
			5 m	XS2F-D421-G80-A
			10 m	XS2F-D421-J80-A

Note: Please contact your local OMRON sales office for details.

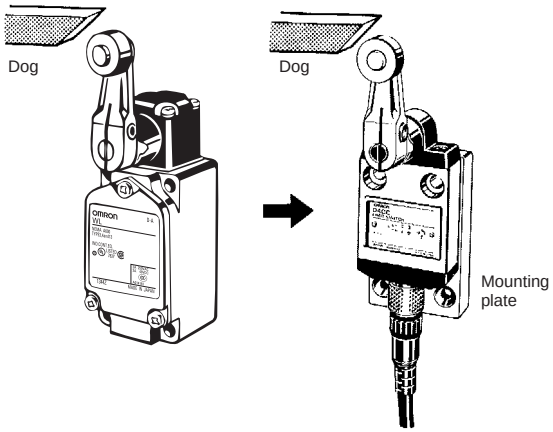
Special Mounting Plate

It is possible to replace an WL Limit Switch with a D4CC Limit Switch mounted on this plate without changing the position of the dog or cam.

The following is the conversion table:

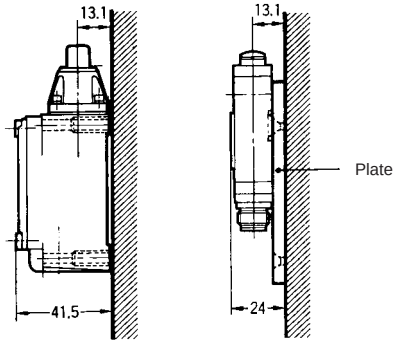
WL	D4CC	Plate model
Top plunger: WLD	Plunger: D4CC-□001	D4C-P001
Top roller plunger: WLD2	Roller plunger: D4CC-□002	D4C-P002
Roller lever: WLG2	Roller lever: D4CC-□024	D4C-P020

Example



Remarks

There is no difference in mounting pitch between the Mounting Plate and the WL. The mounting depth of the D4CC with the Mounting Plate attached is, however, shorter than that of the panel-mounted WL.



Specifications

■ Approved Standards

Agency	Standard	File No.
UL	UL508	E76675
CSA	CSA C22.2 No. 14	LR45746

Note: Ask your OMRON representative for information on approved models.

■ Approved Standard Ratings

UL-CSA

D4CC-1, D4CC-2
D150

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	1.0 A	3.6 A	0.6 A	432 VA	72 VA

■ General Ratings

Rated voltage	Non-inductive load				Inductive load			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	1 A	1 A	1 A	0.7 A	1 A	1 A	1 A	1 A
30 VDC	1 A	1 A	1 A	1 A	1 A	1 A	1 A	1 A

Note: 1. The above current ratings are for steady-state current.
2. Inductive loads have a power factor of 0.4 min. (AC) and a time constant of 7 ms max. (DC).
3. Lamp loads have an inrush current of 10 times the steady-state current.
4. Motor loads have an inrush current of 6 times the steady-state current.

D4CC-3, D4CC-4, 1 A at 30 VDC

Inrush current	NC	5 A max.
	NO	2.5 A max.

■ Characteristics

Degree of protection	IP67
Durability (see note 2)	Mechanical: 10,000,000 operations min. Electrical: 200,000 operations min. (1 A at 125 VAC, resistive load)
Operating speed	Plunger: 0.1 mm to 0.5 m/s Roller lever: 1 mm to 1 m/s
Operating frequency	Mechanical: 120 operations/min Electrical: 30 operations/min
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance (initial)	100 mΩ max.
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between terminals of same polarity 1,500 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note 3)
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 500 m/s^2 min.
Ambient temperature	Operating: –10°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 120 g (in the case of D4CC-1002)

Note: 1. The above figures are initial values.

2. The values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

3. Excluding plastic rod models.

Leakage Current (for Switches with Indicators)

The leakage current and resistance of Switches with indicators are as follows:

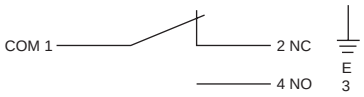
Item	D4CC-2□□□	D4CC-4□□□
Voltage	125 VAC	30 VDC
Leakage current	1.0 mA	1.0 mA
Resistive value	150 kΩ	30 kΩ

Connections

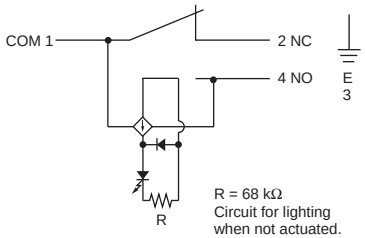
■ Contact Form

AC Switches (D4CC-10□□, 20□□)

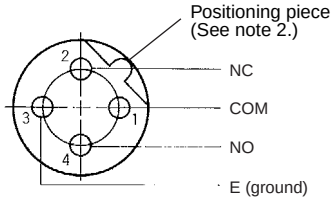
Without Operation Indicator



With Operation Indicator (Lit when Not Actuated)



R = 68 kΩ
Circuit for lighting when not actuated.



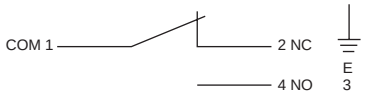
Note: The indicators of these models are lit when the Switches are not actuated. When the Switches are actuated, the indicators are off.

Note: 1. "Lit when not actuated" means that when the actuator is in the free position, the indicator is lit, and when the actuator is turned or pushed and the contact comes into contact with the NO side, the indicator turns OFF.

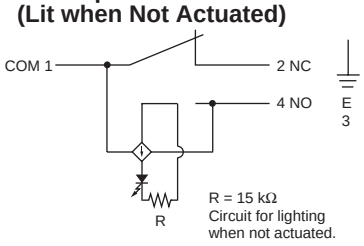
2. The position of the positioning piece is not always the same. If using an L-shaped connector causes problems in application, use a straight connector.

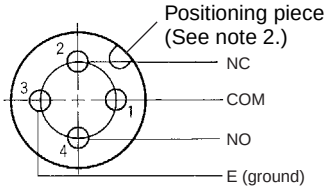
DC Switches (D4CC-30□□, 40□□)

Without Operation Indicator



With Operation Indicator (Lit when Not Actuated)





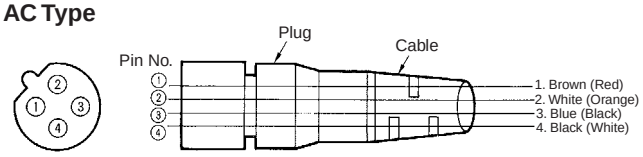
Note: The indicators of these models are lit when the Switches are not actuated. When the Switches are actuated, the indicator are off.

Note: 1. "Lights when not in operation" means that when the actuator is in the free position, the indicator is lit, and when the actuator is turned or pushed and the contact comes into contact with the NO side, the indicator turns OFF.

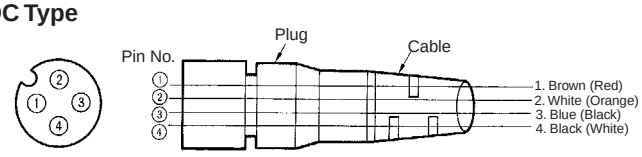
2. The position of the positioning piece is not always the same. If using an L-shaped connector causes problems in application, use a straight connector.

Plugs

AC Type

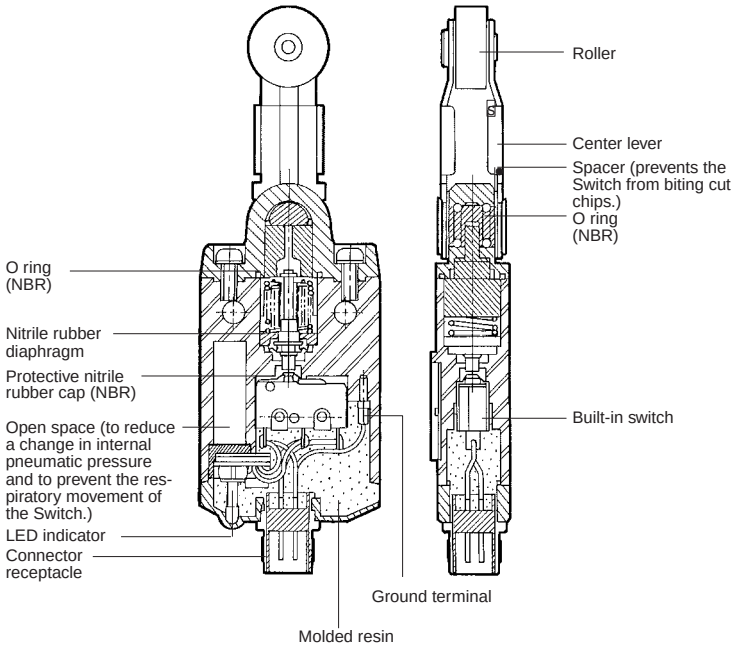


DC Type



Note: Colors in parentheses are the previous wire colors. Wire colors have been changed accompanying changes in standards.

Nomenclature



Dimensions

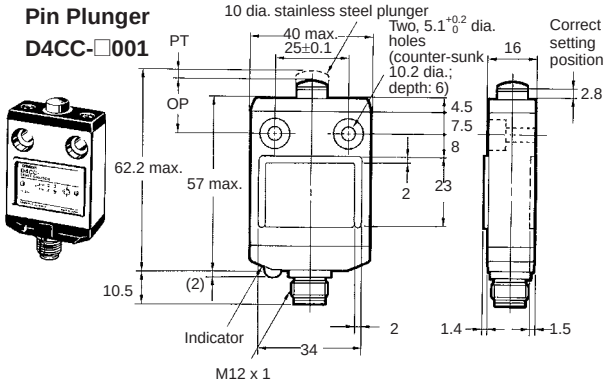
Note: 1. All units are in millimeters unless otherwise indicated.

2. The □ in each model number is replaced with the code expressing the rated load of the model. Refer to *Model Number Legend.*

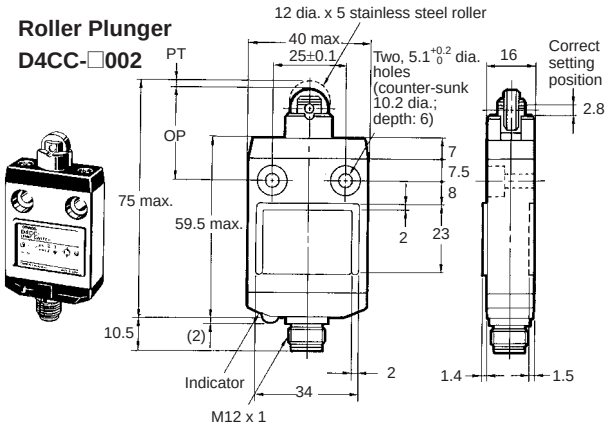
3. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Limit Switches

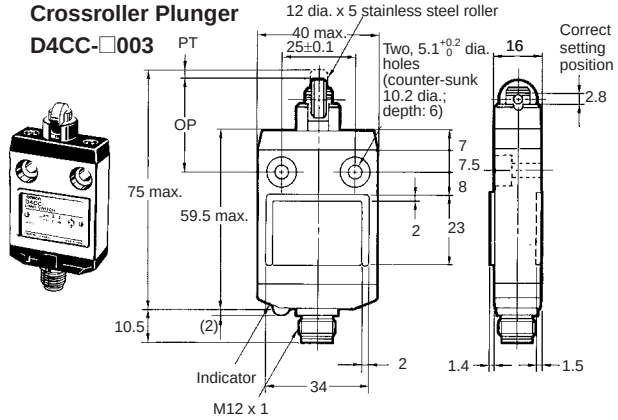
Pin Plunger
D4CC-□001



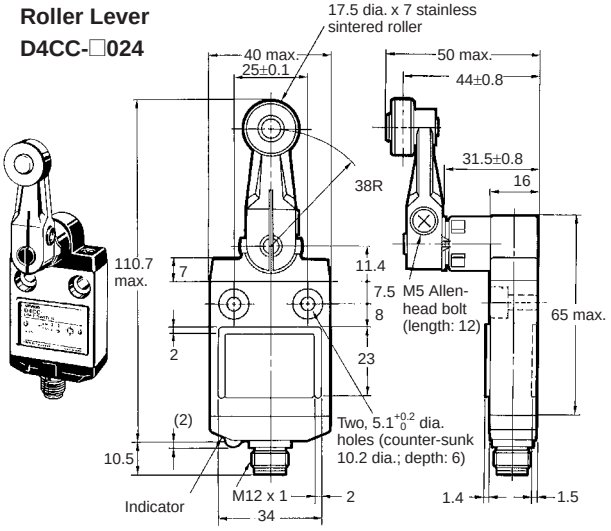
Roller Plunger
D4CC-□002



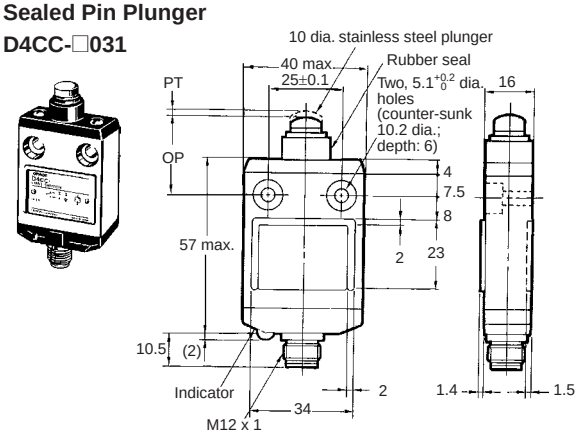
Crossroller Plunger
D4CC-□003



Roller Lever
D4CC-□024

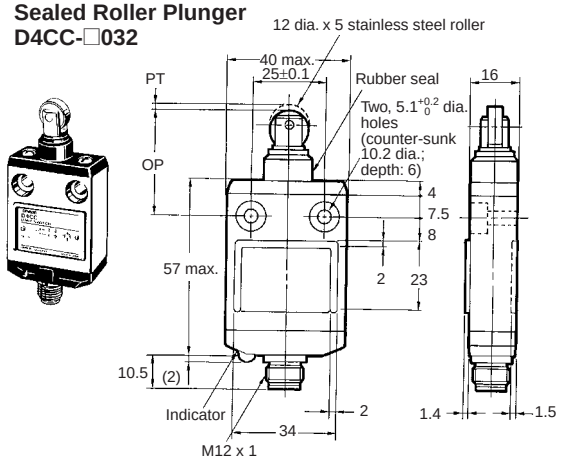


Sealed Pin Plunger
D4CC-□031

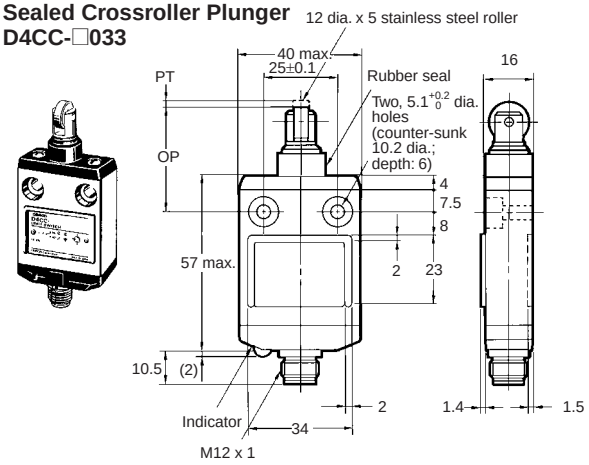


Model	D4CC-□001	D4CC-□002	D4CC-□003	D4CC-□024	D4CC-□031
OF max.	11.77 N	11.77 N	11.77 N	5.69 N	17.65 N
RF min.	4.41 N	4.41 N	4.41 N	1.47 N	4.41 N
PT max.	1.8 mm	1.8 mm	1.8 mm	10±3°	1.8 mm
OT min.	3 mm	3 mm	3 mm	50°	3 mm
MD max.	0.2 mm	0.2 mm	0.2 mm	3°	0.2 mm
OP	15.7±1 mm	28.5±1 mm	28.5±1 mm	---	24.9±1 mm
TT (reference value)	---	---	---	---	(5) mm

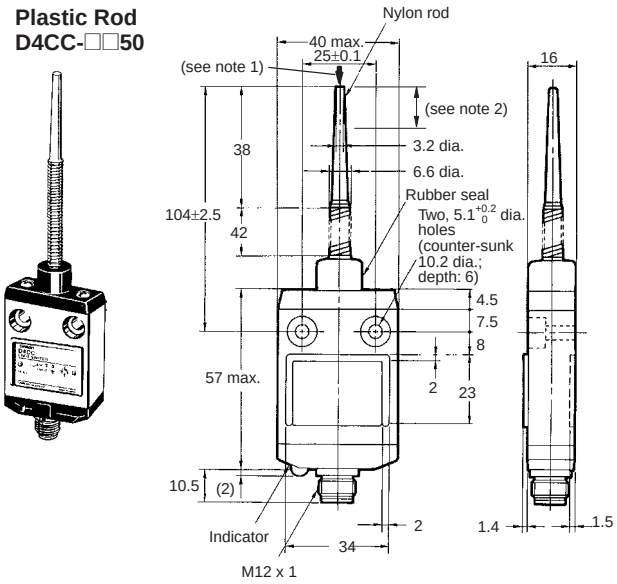
Sealed Roller Plunger
D4CC-□032



Sealed Crossroller Plunger
D4CC-□033



Plastic Rod
D4CC-□□50

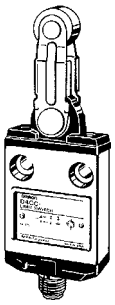


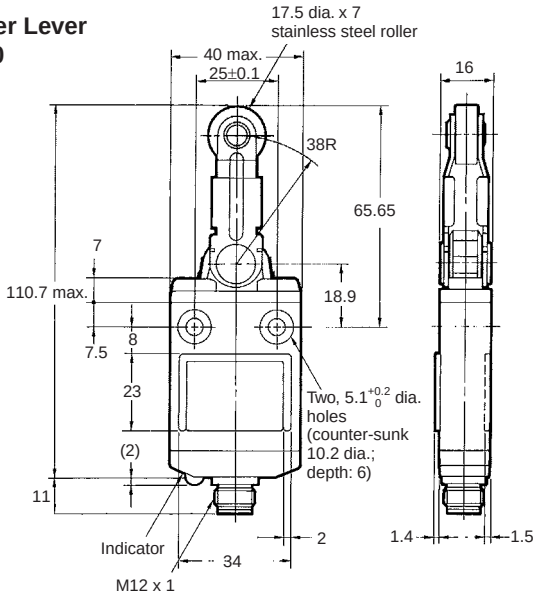
Note: 1. Operation is possible in any direction except parallel to the axis ↓.

2. The ideal range for operation is between the tip of the rod and 1/3 of the length of the actuator.

Model	D4CC-□032	D4CC-□033	D4CC-□050
OF max.	17.65 N	17.65 N	1.47 N
RF min.	4.41 N	4.41 N	---
PT max.	1.8 mm	1.8 mm	15°
OT min.	3 mm	3 mm	---
MD max.	0.2 mm	0.2 mm	---
OP	34.3±1 mm	34.3±1 mm	---
TT (reference value)	(5) mm	(5) mm	---

Center Roller Lever
D4CC-□□60

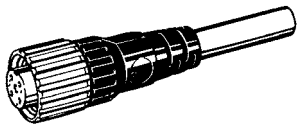




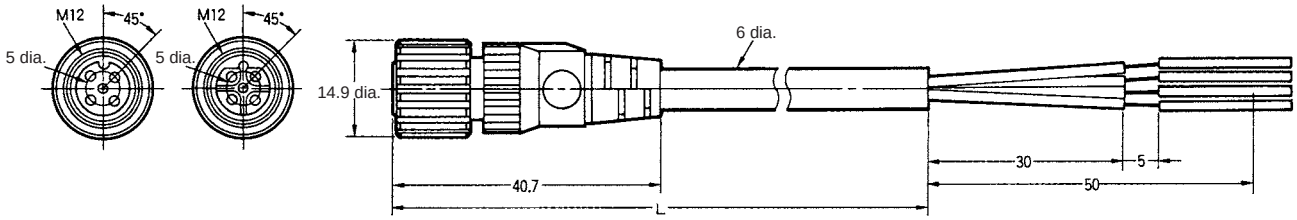
Model	D4CC-□060
OF max.	6.67 N
RF min.	1.47 N
PT max.	10±3°
OT min.	50°
MD max.	3°

Plugs

XS2F-D421-□80-A (DC)
XS2F-A421-□90-A (AC)
(Straight Type)



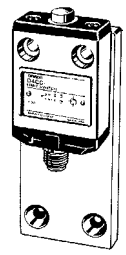
Model	Cable length (L)
XS2F-D421-C□-A	1 m
XS2F-D421-D□-A	2 m
XS2F-D421-G□-A	5 m
XS2F-D421-J□-A	10 m

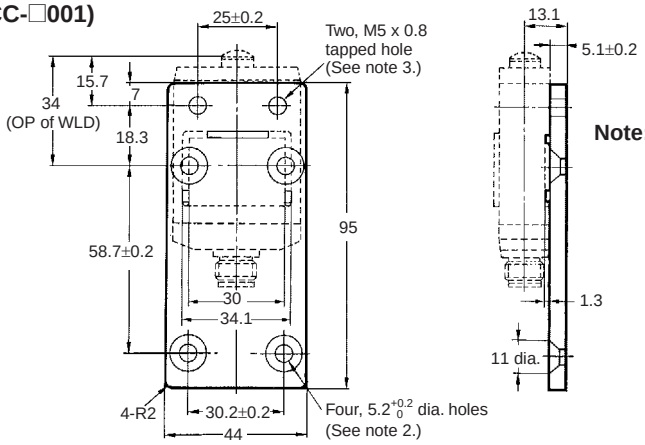


Special Mounting Plates

(Limit Switches are not attached to the Plates.)

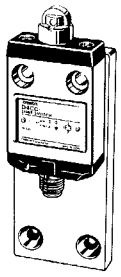
D4C-P001 (For D4CC-□001)

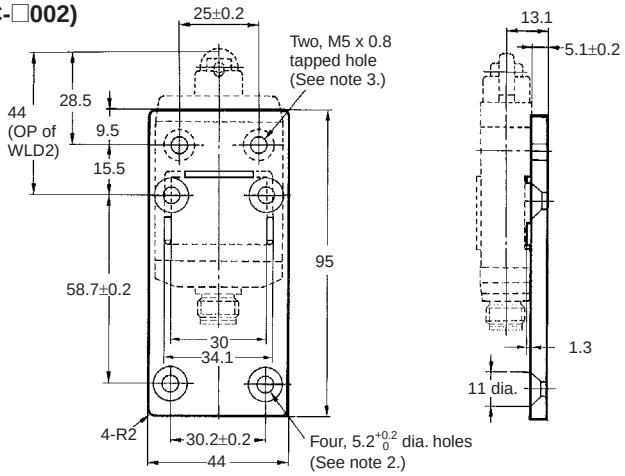




Note: 1. Four hexagonal flat head bolts (M5 x 0.8, length: 10) and two Allen-head bolts (M5 x 0.8, length: 15) are included.
2. All the holes with $5.2^{+0.2}_{0}$ dia. must be used with M5 x 10 Allen-head bolts.
3. All the M5-tapped holes must be used with M5 hexagonal flat head bolts.

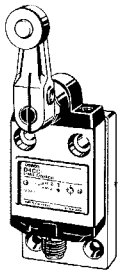
D4C-P002 (For D4CC-□002)

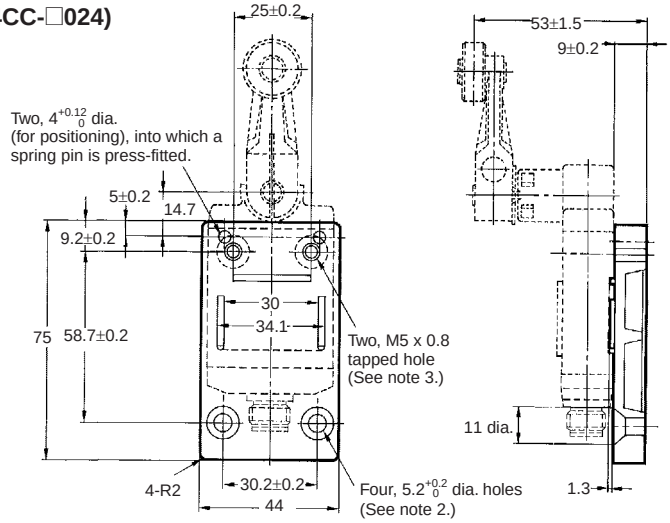




Note: 1. Four hexagonal flat head bolts (M5 x 0.8, length: 10) and two Allen-head bolts (M5 x 0.8, length: 15) are included.
2. All the holes with $5.2^{+0.2}_{0}$ dia. must be used with M5 x 10 Allen-head bolts.
3. All the M5-tapped holes must be used with M5 hexagonal flat head bolts.

D4C-P020 (For D4CC-□024)





Note: 1. Four hexagonal flat head bolts (M5 x 0.8, length: 10), two Allen-head bolts (M5 x 0.8, length: 15), and two spring pins (4 x 14) are included.
2. All the holes with $5.2^{+0.2}_{0}$ dia. must be used with M5 x 10 Allen-head bolts.
3. All the M5-tapped holes must be used with M5 hexagonal flat head bolts.

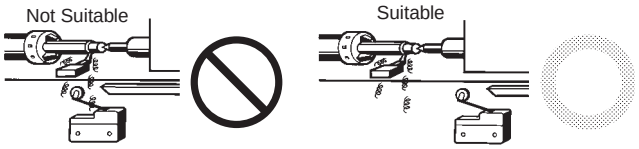
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.

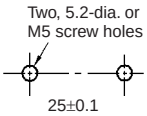


- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Mounting

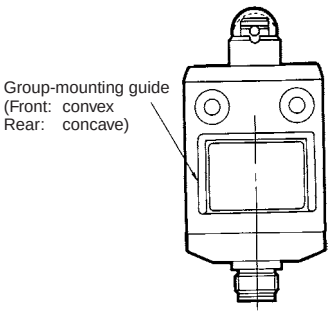
Make sure that the plate to which the D4CC is mounted is flat. If the plate is warped or has protruding parts, the D4CC may not malfunction.

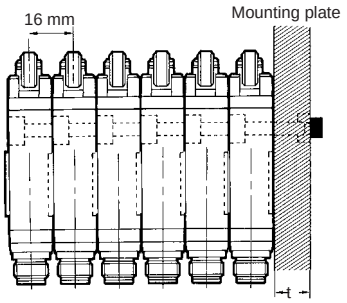
Mounting Holes



A maximum of 6 Switches may be group-mounted. In this case, pay attention to the mounting direction so that the convex part of the group-mounting guide on one Switch fits into the concave part of the guide on the other Switch as shown in the figure below. For group mounting, the mounting panel must have a thickness (t) of 6 mm min.

Group Mounting



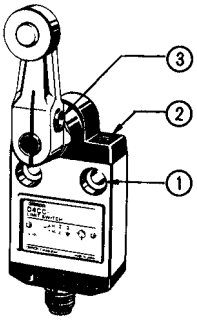


Tightening Torque

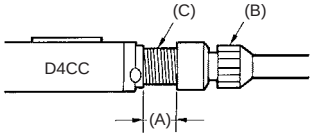
Be sure to tighten each screw to the proper tightening torque as shown in the table.

No.	Type	Torque
1	M5 Allen-head bolt	4.90 to 5.88 N·m
2	M3.5 head mounting screw	0.78 to 0.88 N·m
3	M5 Allen-head bolt	4.90 to 5.88 N·m

Note: By removing the two screws from the head, the head direction can be rotated 180°. After changing the head direction, re-tighten to the torque specified above. Be careful not to allow any foreign substance to enter the Switch.

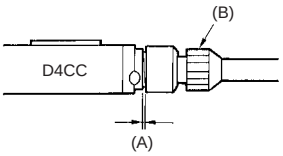


Plug Tightening



Connect the plug connector (B) to the connector threads (C) of the D4CC. Then firmly turn the plug connector by hand so that the connector threaded portion (C) will be completely covered by the plug connector (B) so that space (A) will be almost 0. Do not use any tools, such as pliers, to tighten the plug connector, otherwise the plug connector may become damaged. Make sure, however, that the plug connector is tightened securely, otherwise the rated degree of protection of the D4CC may not be maintained. Furthermore, the plug connector may be loosened by vibration.

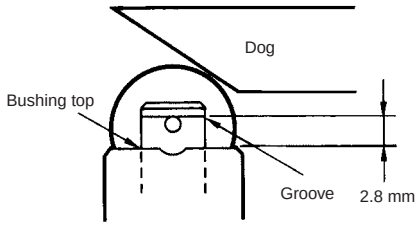
Properly Tightened Connector



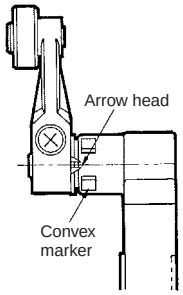
Operation

Operation method, shapes of cam and dog, operating frequency, and overtravel have a significant effect on the service life and precision of a Limit Switch. For this reason, the dog angle must be 30° max., the surface roughness of the dog must be 6.3S min. and hardness must be Hv400 to 500.

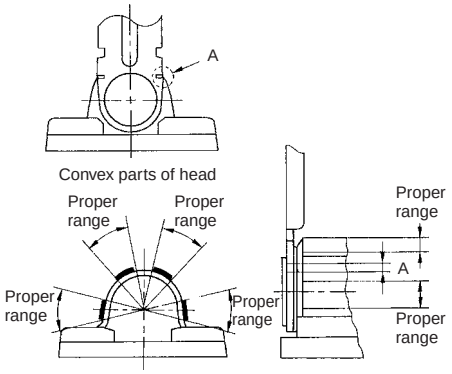
To allow the plunger-type actuator to travel properly, adjust the dog and cam to the proper setting positions. The proper position is where the plunger groove fits the bushing top.



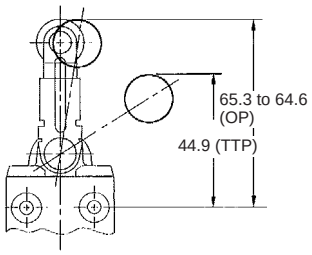
To allow the roller lever-type actuator to travel properly, adjust the dog and cam so that the arrow head is positioned between the two convex markers as shown below.



Properly adjust the stroke of the center roller lever along with the dog or cam so that the concave part (A) of the head is located between the convex parts of the head as shown below when the center roller lever is pressed by the dog or cam.



Refer to the following to adjust the stroke of the lever based on the mounting hole level.



Others

If failures, such as reset failures, in the plunger model are possible, use a model that has a rubber cap.
Do not expose the Switch to water exceeding 70°C or use it in steam.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C116-E1-04

Multiple Limit Switch
VB

A New Monoblock Multiple Limit Switch Incorporating a Head Box with a Tough Head and Ensuring High Sealing Performance and a Mechanical Durability of 5,000,000 Operations

- Used for the sequential control of a variety of engineering machines and belt conveyor lines.
- Built-in oil filter shuts out oil and water.
- Approved by EN, IEC, and CCC (Chinese standard). (Ground terminal models only.)
- Ground terminal models bear the CE mark.

Model Number Structure

■ Model Number Legend

VB-□□□□□□
1 2 3 4 5 6

1. Number of Plungers
- 2: 2 plungers
- 3: 3 plungers
- 4: 4 plungers
- 5: 5 plungers
- 6: 6 plungers

2. Actuator
- 1: Bevel plunger
- 2: Roller plunger

3. Switch Box
- 1: Flange switch box with two conduit holes on the side
- 2: Flange switch box with four conduit holes
- 4: Non-flange switch box with two conduit holes on the side
- 5: Non-flange switch box with four conduit holes

4. Scraper
- 1: NBR scraper
- 2: FPM scraper

5. Contact
- None: 10 A (standard)
- A: 0.1 A (micro load)

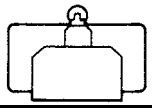
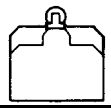
6. Ground Terminal
- None: Without ground terminal
- E: With ground terminal

Replaceable Switch Unit

Rating	Model
Standard load model	VB-S101N

Ordering Information

■ List of Models

Actuator	Conduit	Model	
		With flange 	Without flange 
Roller plunger (with a 6.8-dia. roller) 	Two on the side	VB-2211	VB-2241
		VB-3211	VB-3241
		VB-4211	VB-4241
		VB-5211	VB-5241
		VB-6211	VB-6241
	Four	VB-2221	VB-2251
		VB-3221	VB-3251
		VB-4221	VB-4251
		VB-5221	VB-5251
		VB-6221	VB-6251
Bevel plunger 	Two on the side	VB-2111	VB-2141
		VB-3111	VB-3141
		VB-4111	VB-4141
		VB-5111	VB-5141
		VB-6111	---
	Four	VB-2121	VB-2151
		VB-3121	VB-3151
		VB-4121	VB-4151
		VB-5121	---
		VB-6121	---

Note: 1. Other than the above models, minute load models switching 0.1 A are available. When ordering a minute load model, add the suffix A to the model number (i.e., VB-2211A for example).

2. SC connectors can be connected to VB models.

3. Models with ground terminals are also available. When ordering a ground terminal model, add the suffix E to the model number (i.e., VB-2211E for example).

4. Since the actuator is incorporated into the monoblock switch, the actuator cannot be replaced.

Specifications

■ Approved Standards

Agency	Standards	File No.	Approved models
TÜV Rheinland	EN60947-5-1 (IEC947-5-1)	R9551017	Only models with ground terminals
CCC (CQC)	GB14048.5	2003010305077628	Ask your OMRON representative for information on approved models.

Note: Ground terminal models only.

■ Approved Standard Ratings

TÜV (EN60947-5-1) (Only Ground Terminal Models are Approved)

Standard Load

Applicable category and ratings
AC-15 2 A/250 VAC
DC-12 2 A/48 VDC

Micro Load

Applicable category and ratings
AC-14 0.1 A/125 VAC
DC-12 0.1 A/30 VDC

CCC (GB14048.5)

Applicable category and ratings
AC-15 2 A/250 VAC

■ General Ratings

Standard Load

Rated voltage	Resistive load		Inrush current	Inrush current
	NC	NO	NC	NO
125 VAC	10 A		24 A max.	
250 VAC	10 A			
125 VDC	0.6 A			
250 VDC	0.3 A			

Note: The above currents are steady-state currents.

Micro Load Ratings

Rated voltage	Resistive load
125 VAC	0.1 A
8 VDC	0.1 A
30 VDC	0.1 A

■ Characteristics

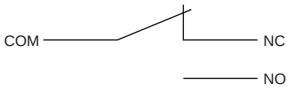
Degree of protection	IP67
Durability (See note 2.)	Mechanical: 5,000,000 operations min. Electrical: 300,000 operations min. (10 A at 250 VAC, resistive load)
Operating speed	0.1 mm to 0.5 m/s
Operating frequency	Mechanical: 120 operations min. Electrical: 30 operations min.
Rated frequency	50/60 Hz (AC)
Insulation resistance	100 MΩ min. (at 500 VDC)
Contact resistance	15 mΩ max. (initial value)
Dielectric strength	1,000 VAC/U_{imp} 4,000 VAC between terminals of same polarity 1,500 VAC/U_{imp} 4,000 VAC between current-carrying metal parts and ground 1,500 VAC/U_{imp} 4,000 VAC between each terminal and non-current-carrying metal part U_{imp} 4 kV (EN60947-5-1) between terminals of different polarity
Rated insulation voltage (U_i)	300 VAC (EN60947-5-1)
Switching overvoltage	1,000 V max. (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Short-circuit protective device (SCPD)	10 A fuse type gG or gI (IEC269)
Conditional short-circuit current	100 A (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	5 A, 0.5 A (EN60947-5-1)
Protection against electric shock	Insulation class I (Use the grounding terminal or ground on the machine side.)
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Destruction: 1,000 m/s^2 min. Malfunction: 200 m/s^2 min.
Ambient temperature	Operating: –10°C to 80°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Approx. 580 g (in the case of VB-4211)

Note: 1. The above values are initial values.

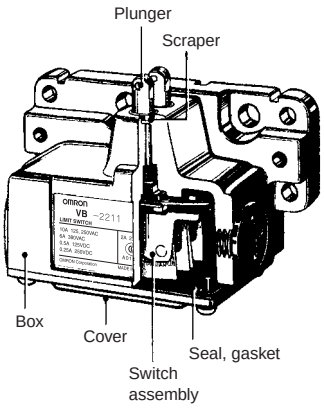
2. The values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

Connections

■ Contact Form



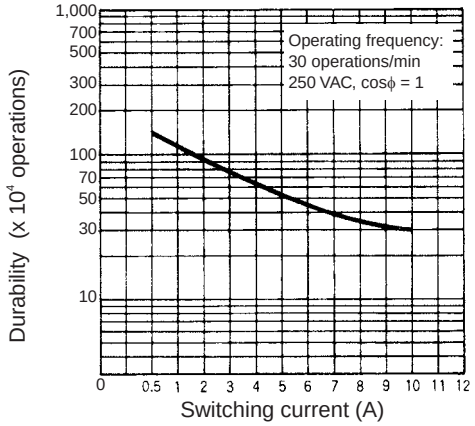
Nomenclature (for the VB-2211)



Engineering Data

■ Electrical Durability (with more than 300,000 Operations)

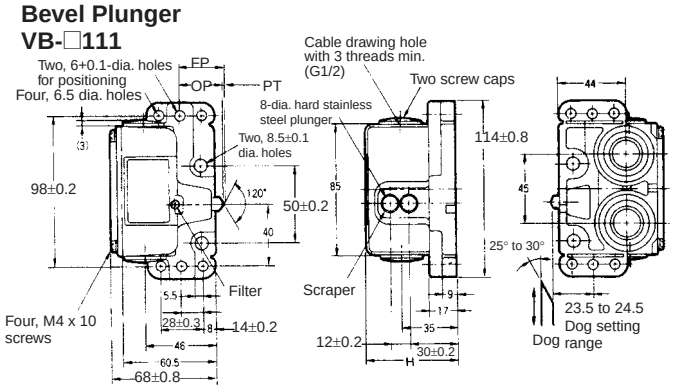
(Ambient temperature: 5°C to 35°C; Ambient humidity: 40% to 70%)



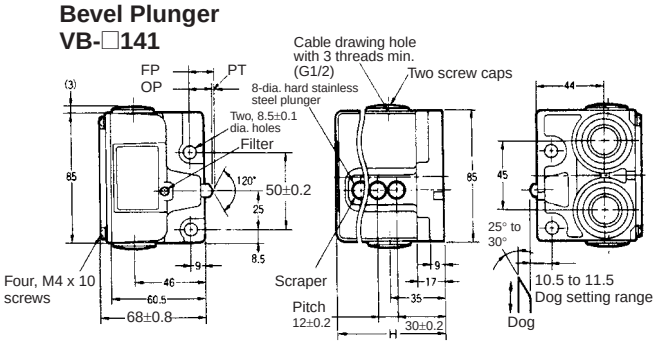
Dimensions

Note: All units are in millimeters unless otherwise indicated.

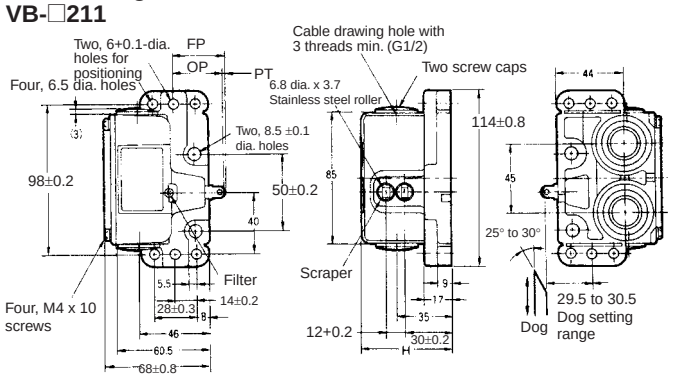
Bevel Plunger
VB-□111



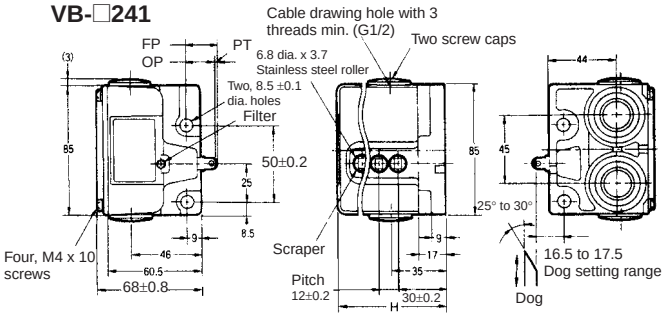
Bevel Plunger
VB-□141



Roller Plunger
VB-□211



Roller Plunger
VB-□241



Model	VB-□211	VB-□241	VB-□111	VB-□141
OF max.	14.71 N	14.71 N	14.71 N	14.71 N
RF min.	4.90 N	4.90 N	4.90 N	4.90 N
PT max.	1.5 mm	1.5 mm	1.5 mm	1.5 mm
OT (see note 2)	(3.5 mm)	(3.5 mm)	(3.5 mm)	(3.5 mm)
MD max.	0.5 mm	0.5 mm	0.5 mm	0.5 mm
OP	32±0.4 mm	19±0.4 mm	26±0.4 mm	13±0.4 mm
FP (see note 2)	(33 mm)	(20 mm)	(27 mm)	(14 mm)

Note: 1. The above operating characteristic values apply to a single switch.
2. The OT and FP values are reference values.
3. The actual model numbers of each of the above VB models have a figure 2 to 6, which indicate the number of plungers.

Number of plungers	H
2	58 mm
3	70 mm
4	82 mm
5, 6 (see note)	106 mm

Note: When five plungers are mounted in series, no outer actuator will be provided.

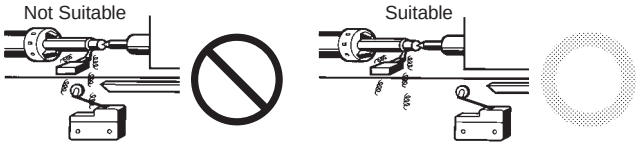
Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Operating Environment

- Seal material may deteriorate if a Switch is used outdoor or where subject to special cutting oils, solvents, or chemicals. Always appraise performance under actual application conditions and set suitable maintenance and replacement periods.
- Install Switches where they will not be directly subject to cutting chips, dust, or dirt. The Actuator and Switch must also be protected from the accumulation of cutting chips or sludge.



- Constantly subjecting a Switch to vibration or shock can result in wear, which can lead to contact interference with contacts, operation failure, reduced durability, and other problems. Excessive vibration or shock can lead to false contact operation or damage. Install Switches in locations not subject to shock and vibration and in orientations that will not produce resonance.
- The Switches have physical contacts. Using them in environments containing silicon gas will result in the formation of silicon oxide (SiO_2) due to arc energy. If silicon oxide accumulates on the contacts, contact interference can occur. If silicon oil, silicon filling agents, silicon cables, or other silicon products are present near the Switch, suppress arcing with contact protective circuits (surge killers) or remove the source of silicon gas.

Be sure to connect a fuse with a breaking current 1.5 to 2 times larger than the rated current to the Switch in series in order to protect the Switch from damage due to short-circuiting.

If the VB is used for EN ratings, use a gI or gG 10-A fuse approved by IEC269.

Operation

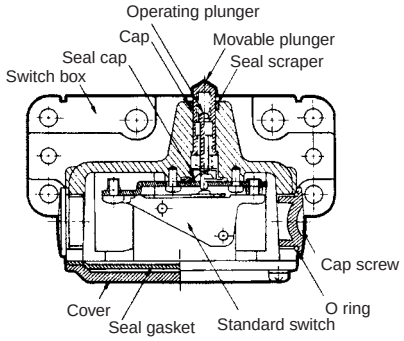
Make sure the notch of the plunger is not pressed into the scraper when operating the VB Multiple Limit Switch, otherwise chips or dust may penetrate into the VB Multiple Limit Switch.

Sealing

The switch box and cover are made of die-cast aluminum and the mounting part of the Switch is covered with a seal cap, and ensure a sealing performance of more than 98×10^3 Pa for the VB Multiple Limit Switch.

The filter on the side of the head prevents oil and water from penetrating into the interior of the VB Multiple Limit Switch while preventing the internal pressure of the VB Multiple Limit Switch from rising when the plunger is pressed.

The seal scraper on the tip of the actuator prevents chips and dust from penetrating into the moving parts of the VB Multiple Limit Switch.

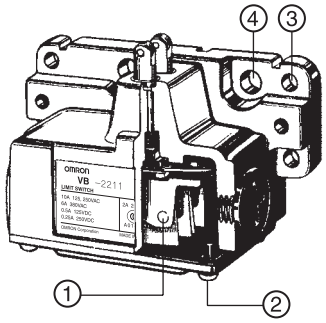


Apply extra tightening to the cap screw on the conduit.

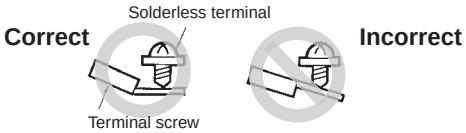
In order to protect the plunger from abrasion and prolong its service life, apply a small amount of grease to the plunger and dog or cam that come into contact with the plunger. (Molybdenum disulfide grease is recommended.)

Tightening Torque

1. Tighten each cover mounting screw to a torque of 1.18 to 1.37 N·m.
2. Tighten each switch terminal screw to a torque of 0.20 to 0.49 N·m if the mounting screw is M3 in size.



Be sure to wire each solderless terminal correctly with a screw as shown below.

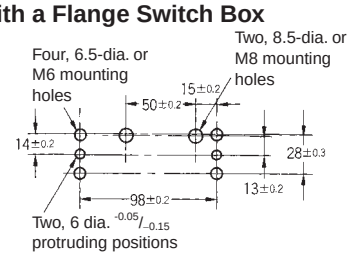


3. Apply a torque of 5.88 to 6.86 N·m to tighten each mounting bolt of the casing if the mounting bolt is an Allen-head bolt that is M6 in size. Apply a torque of 8.04 to 9.22 N·m instead if the mounting bolt is an Allen-head bolt that is M8 in size.

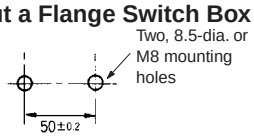
■ Mounting

Mounting Holes

With a Flange Switch Box



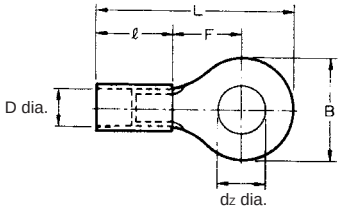
Without a Flange Switch Box



Wiring

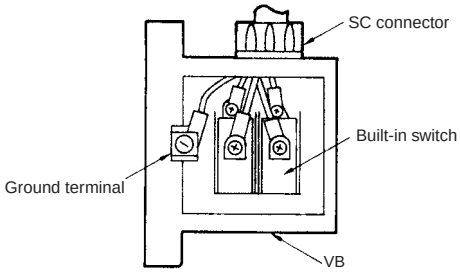
Connect a cable with a thickness of 0.75 mm^2 to the VB Multiple Limit Switch through the M3 round solderless terminals with insulation covers.

Dimensions of Round Solderless Terminal



dz dia.: 3.2
D dia.: 1.9
B: 5.2
L: 16.4
F: 5.8
ℓ: 8.0 (mm)

Wiring (Ground Terminal Models)



Note: Consult your OMRON representative for details on models with 3 to 6 plungers.

Others

Carefully connect a conduit to each conduit hole and apply a seal or tape to seal the conduit hole so that cuttings or other materials will not penetrate through the conduit hole.

Use the SC Connector. Consult your OMRON representative for details on SC Connectors.

Make sure that the position of the actuator that is traveling does not exceed the overtravel (OT) position.

Make sure that the operating stroke is 70% to 100% of the specified OT distance.

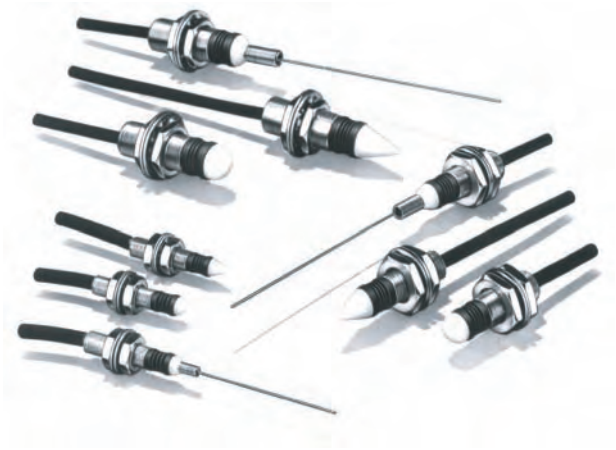
ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C115-E1-04

Mechanical Touch Switch
D5B

Detects Objects in Multiple Directions with High Sensitivity, Ideal for Robotics

- Detects object contact from multiple directions and operates even with a slight force.
- Slow-action switching mechanism used. Movement differential as small as 0.01 mm assures high accuracy of detection.
- Gold-plated contact with coil spring capable of switching micro current/voltage load while providing high contact reliability.
- Highly resistant to dust, fine particles and water or oil splash, conforming to IP67.
- Three sizes (M10, M8, and M5) and three types of actuators (hemispheric, cone-shaped, and wobble stick).



Model Number Structure

■ Model Number Legend

D5B-□□□
1 2 3

1. Size
5: M5
8: M8
1: M10

2. Actuator
01: Hemispheric
02: Cone-shaped
51: Wobble stick (short spring)
53: Wobble stick (long spring). Only with the M10 type.

3. Cable length
1: 1 m
3: 3 m
5: 5 m

Ordering Information

■ List of Models

Type		Cable length	M5	M8	M10
Hemispheric actuator		1 m	D5B-5011	D5B-8011	D5B-1011
		3 m	D5B-5013	D5B-8013	D5B-1013
		5 m	D5B-5015	D5B-8015	D5B-1015
Cone-shaped actuator		1 m	D5B-5021	D5B-8021	D5B-1021
		3 m	D5B-5023	D5B-8023	D5B-1023
		5 m	D5B-5025	D5B-8025	D5B-1025
Wobble stick actuator	Short spring	1 m	D5B-5511	D5B-8511	D5B-1511
		3 m	D5B-5513	D5B-8513	D5B-1513
		5 m	D5B-5515	D5B-8515	D5B-1515
	Long spring	1 m	---	---	D5B-1531
		3 m	---	---	D5B-1533
		5 m	---	---	D5B-1535

Specifications

■ Ratings

Switching power	1 mA at 5 VDC to 30 mA at 30 VDC (resistive load)

■ Characteristics

Degree of protection	IP67
Durability (see note 2)	Mechanical: 10,000,000 operations min. Electrical: 5,000,000 operations min. (at 30 VDC, 30-mA resistive load)
Operating speed	5 to 500 mm/s
Operating frequency	Mechanical: 120 operations/min. Electrical: 60 operations/min.
Insulation resistance	100 MΩ min. at 250 VDC between each terminal and ground
Contact resistance	With 1 m cable:700 mΩ max. (initial value) With 3 m cable:1.9 Ω max. (initial value) With 5 m cable:3.1 Ω max. (initial value)
Dielectric strength	250 VAC, 50/60 Hz for 1 min between terminals of same polarity (TTP) 1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and ground (600 VAC for M5 model)
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude (see note 3)
Shock resistance	Mechanical: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min. (see note 4)
Ambient temperature	Operating: –10°C to 70°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Actuator strength	14.7 N (see note 5)
Weight	Switch: M5: Approx. 14 g, M8: Approx. 20 g, M10: Approx. 21 g Cable: Approx. 10 g/m

Note: 1. The above figures are initial values.

2. Durability values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

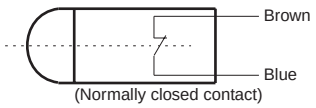
3. 16.7 Hz, 1-mm double amplitude for wobble stick models.

4. 50 m/s^2 min. for wobble stick models.

5. Excluding the wobble stick models.

Connections

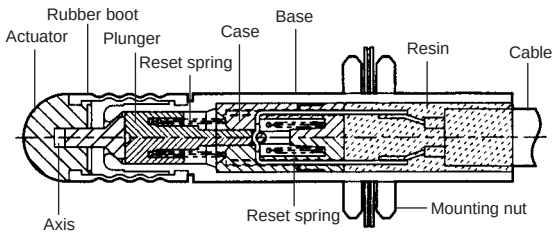
■ Contact Form



(Normally closed contact)

Note: Specifications for normally open (N.O.) contacts are not available.

Nomenclature

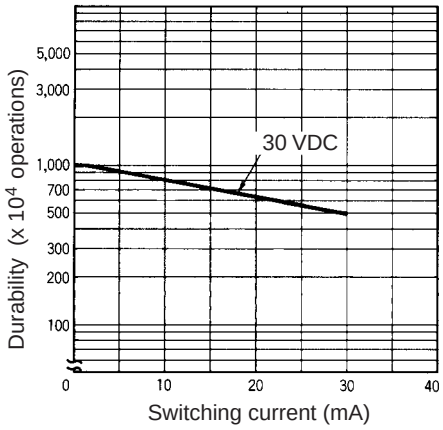


Note: NBR rubber is used with this Switch.

Engineering Data

Electrical Durability (cosϕ = 1)

Operating temperature: 5°C to 35°C
Operating humidity: 40% to 70%.



Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

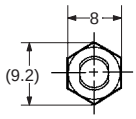
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions. Values in parentheses () are cumulative values and may exceed tolerance of ±0.4 mm.

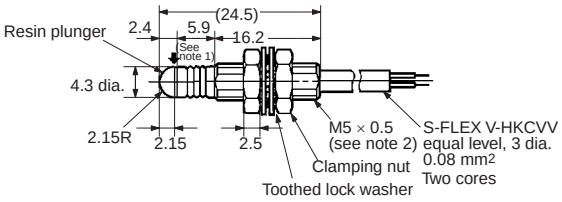
3. The square □ in the models represents the cable length. Refer to *Ordering Information*.

M5 Type

Hemispheric Plunger

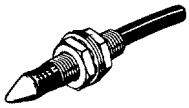
D5B-501□

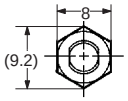


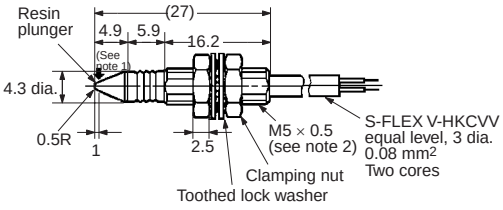


Cone-shaped Plunger

D5B-502□

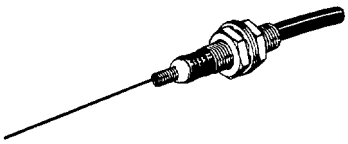


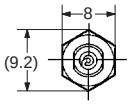


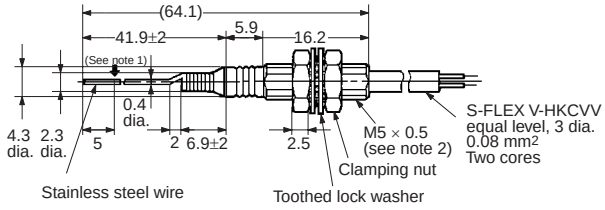


Wobble Stick

D5B-551□







Note: 1. Operating characteristics (X, Y) measuring position
2. The threads of the case are not standard; 0.5-mm pitch. Therefore standard tapping to the case is not possible for mounting.

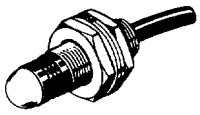
		TT (max.) (reference value)		OF (max.)		Permissible operating force (max.)	PT (reference value)	
		X, Y	Z	X, Y	Z	X, Y, Z	X, Y	Z
Hemispheric actuator 	**M5**	1.0 mm	0.8 mm	0.49 N	0.74 N	1.96 N	0.6 mm	0.3 mm
Cone-shaped actuator 	**M5**	2.2 mm	0.8 mm	0.20 N	0.74 N	1.96 N	0.6 mm	0.3 mm
Wobble stick actuator 	**M5**	22 mm	---	0.05 N max.	---	0.49 N	11 mm	---

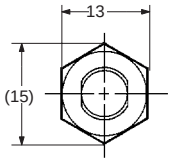
Note: The operating characteristic values shown in the above table are measured at the portions indicated by the downward arrows in *Dimensions*.

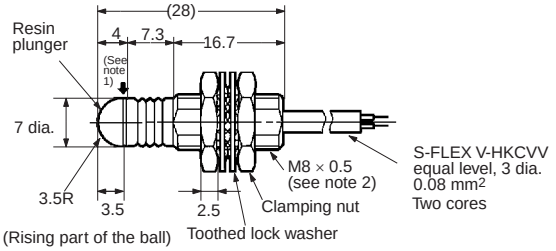
M8 Type

Hemispheric Plunger

D5B-801□

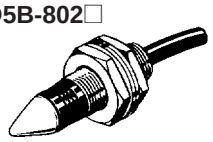


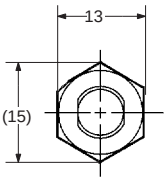


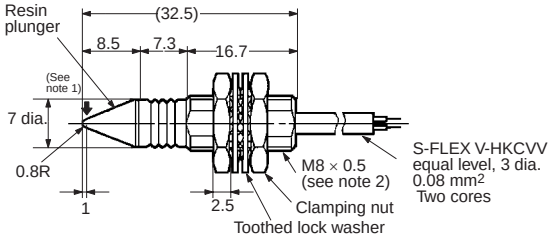


Cone-shaped Plunger

D5B-802□

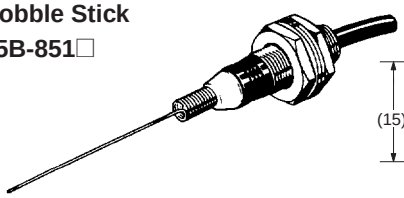


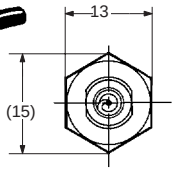


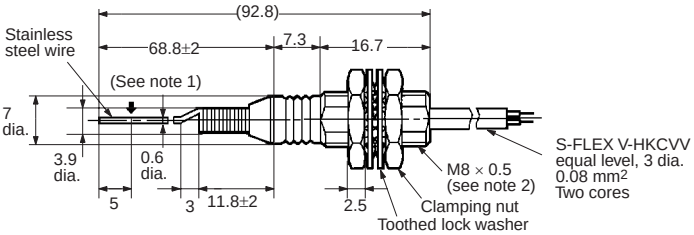


Wobble Stick

D5B-851□







Note: 1. Operating characteristics (X, Y) measuring position

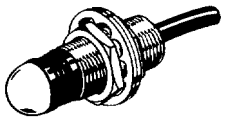
2. The threads of the case are not standard. Therefore standard tapping to the case is not possible for mounting.

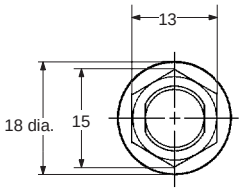
		TT (max.) (reference value)		OF (max.)		Permissible operating force (max.)	PT (reference value)	
		X, Y	Z	X, Y	Z	X, Y, Z	X, Y	Z
Hemispheric actuator 	**M8**	1.2 mm	0.9 mm	0.74 N	0.98 N	1.96 N	0.6 mm	0.3 mm
Cone-shaped actuator 	**M8**	3.0 mm	0.9 mm	0.20 N	0.98 N	1.96 N	1.4 mm	0.3 mm
Wobble stick actuator 	**M8**	23 mm	---	0.05 N max.	---	0.49 N	11 mm	---

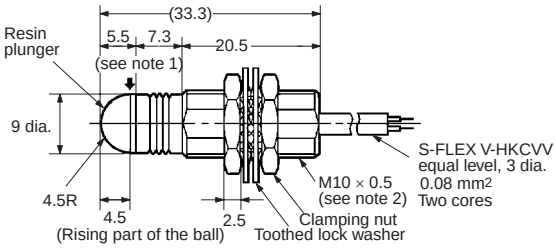
Note: The operating characteristic values shown in the above table are measured at the portions indicated by the downward arrows in *Dimensions*.

M10 Type

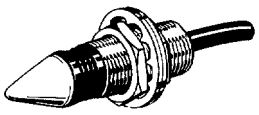
Hemispheric Plunger
D5B-101□

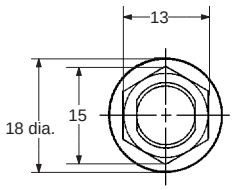


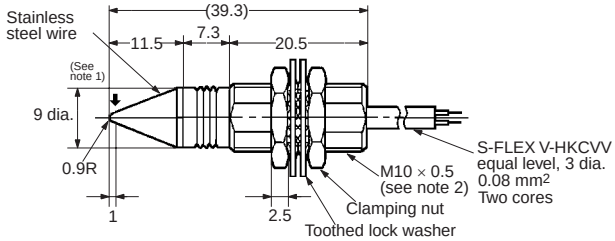




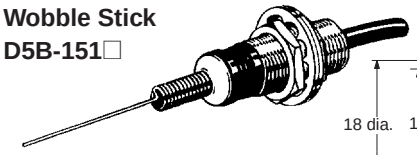
Cone-shaped Plunger
D5B-102□

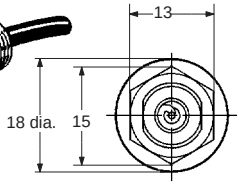


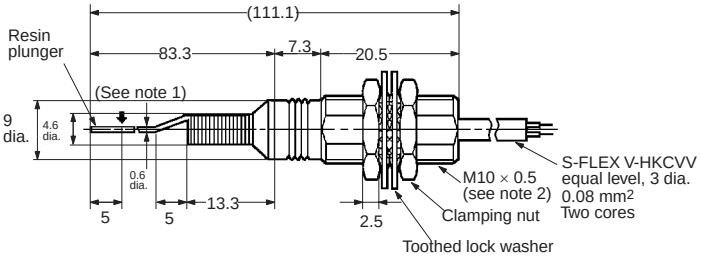




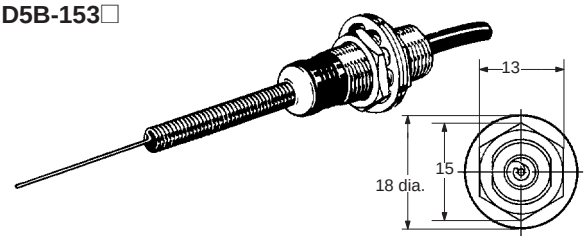
Wobble Stick
D5B-151□

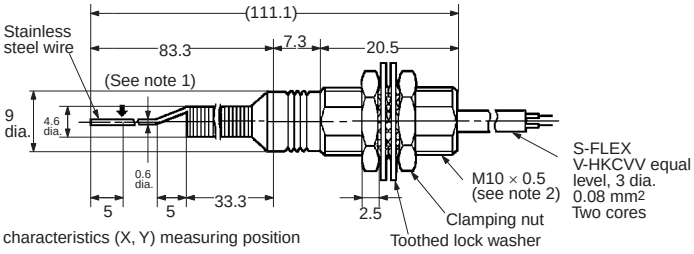




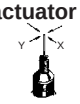


D5B-153□





Note: 1. Operating characteristics (X, Y) measuring position
2. The threads of the case are not standard. Therefore standard tapping to the case is not possible for mounting.

		TT (max.) (reference value)		OF (max.)		Permissible operating force (max.)	PT (reference value)	
		X, Y	Z	X, Y	Z	X, Y, Z	X, Y	Z
Hemispheric actuator 	**M10**	1.3 mm	1.0 mm	0.98 N	1.47 N	1.96 N	0.7 mm	0.3 mm
Cone-shaped actuator 	**M10**	4.0 mm	1.0 mm	0.39 N	1.47 N	1.96 N	2.0 mm	0.3 mm
Wobble stick actuator 	**M10**	30 mm	---	0.05 N max.	---	0.49 N	14 mm	---

Note: The operating characteristic values shown in the above table are measured at the portions indicated by the downward arrows in *Dimensions*.

Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Do not impose a load exceeding 29.42 N on the cord, otherwise the cord may break. If the cord is to be bent repeatedly, make sure that the bending radius is at least R20 mm.

Operation

Do not impose excessive force on the actuator. Even though the actuator withstands a maximum force of 14.7N, if the D5B is repeatedly actuated, make sure that the maximum force imposed on the actuator is 1.96 N. If the actuator is, however, a wire spring type, the maximum force imposed must be 0.49 N instead.

The operating characteristics of the D5B vary with the direction (i.e., X, Y, or Z) in which force is imposed. Refer to page 200.

The wobble stick model is actuated when force is imposed on the tip of the wobble stick and the built-in switch unit is closed or opened. This is different from the NL Limit Touch Switch or D5C Column Touch Switch in terms of the main mechanism. The NL or D5C is actuated when the actuator comes into contact with an actuating object.

The wobble stick model may break if the stroke is excessive. Make sure that the total travel (TT) is within the reference value provided in the datasheet.

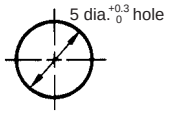
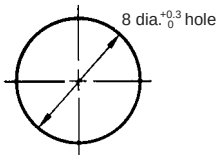
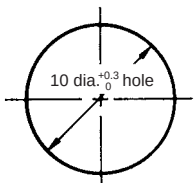
Attach an appropriate cover for protecting the D5B from direct exposure to sprayed oil or water. No protective cover is, however, provided together with the D5B.

The D5B may be damaged by ozone and failures may result if the D5B is used outdoors. Consult your OMRON representative before attempting to use the D5B outdoors.
Outdoor environmental conditions may have a bad influence on the service life of the D5B. Refer to the general precautions of Limit Switches for details.

Mounting

Do not tighten the nuts with excessive torque. Refer to the following for the appropriate tightening torque and mounting dimensions of each nut.

The base incorporates special threads that cannot be mounted to plates with standard tap holes.

Size	Max. tightening torque	Mounting hole dimension
M5	0.98 N·m	
M8	2.94 N·m	
M10	3.92 N·m	

An excessive load may deform the base. When mounting the base, be careful not to impose an excessive load on the base.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C060-E1-07

High-precision Switch
D5A

High-precision Switch for Detecting Micron-unit Displacement

- Ideal for detecting and measuring wear of cutting tools or for original point of work.
- Direct input possible to microprocessors and programmable controllers.
- Types available with built-in operation indicator for ease of operation monitoring as well as a version with fiber optics remote operation indicator.
- A version with screw-type cable connector available for easy installation and maintenance.

Ordering Information

■ List of Models

Contact Output Models (Without Operation Indicator)

Actuator	Type	Repeat accuracy	Operating force	Cable lead outlet		Degree of protection	Model
				Type	Length		
Pin plunger	M5	1 μm max.	0.29 N max.	Pre-wired	1 m	IP40	D5A-1100
			0.49 N max.				D5A-1200
		3 μm max.	0.29 N max.				D5A-2100
			0.49 N max.				D5A-2200
	M8	1 μm max.	0.49 N max.			IP67	D5A-3200
			0.98 N max.				D5A-3300
	M16	3 μm max.	2.45 N max.				D5A-7400
				Connector			D5A-7403

Solid-state Output Models (With Operation Indicator)

Actuator	Type	Repeat accuracy	Operating force	Cable lead outlet		Degree of protection	Model
				Type	Length		
Pin plunger	M8	1 μm max.	0.49 N max.	Pre-wired	1 m	IP67	D5A-3210
			0.98 N max.				D5A-3310
	Slim		0.49 N max.				D5A-5210
			0.98 N max.				D5A-5310
	M16	3 μm max.	2.45 N max.				D5A-7410
				Connector			D5A-7413
Top plunger	Limit	3 μm max.	3.92 N max.	Pre-wired	3 m		D5A-8511
					5 m		D5A-8512
				Connector	3 m		D5A-8514
					5 m		D5A-8515
Bevel plunger				Pre-wired	3 m		D5A-9511
					5 m		D5A-9512
				Connector	3 m		D5A-9514
					5 m		D5A-9515

Specifications

■ Ratings

Contact output models	10 mA at 24 VAC, 10 mA at 12 VDC
Solid-state output models	100 mA at 5 to 24 VDC±10% Leakage current: 0.15 mA max. Residual voltage: 3 V max. Power consumption: 3 mW max.

■ Characteristics

Degree of protection	D5A-1□, D5A-2□: IP40 Other than the above models: IP67
Repeat accuracy (see note 2)	M5 (D5A-1□□□ series), M8, slim type:1 μm max. M5 (D5A-2□□□ series), M16, limit type:3 μm max.
Durability (see note 3)	Mechanical: 10,000,000 operations min. Electrical: 1,000,000 operations min. (10 mA at 24 VAC)
Deviation in electrical durability after 1,000,000 operations	M5, M8, M16, slim type: 10 μm max. Limit type: 20 μm max.
Operating speed	1 μm to 0.5 m/s
Rated frequency	50/60 Hz
Insulation resistance	100 MΩ min. (at 250 VDC) between each terminal and ground
Contact resistance	800 mΩ max. (initial) with 1 m cable, 2.4 Ω max. (initial) with 3 m cable, 4 Ω max. (initial) with 5 m cable
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between each terminal and ground
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude
Shock resistance	Mechanical: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min.
Temperature coefficient (see note 4)	M5, M8, slim type: ±20 x 10^{-6}/°C max. M16 type: ±40 x 10^{-6}/°C max. Limit type: ±50 x 10^{-6}/°C max.
Ambient temperature	Operating: –20°C to 75°C (with no icing)
Ambient humidity	Operating: 35% to 85% (35% to 95% with the seal rubber)

Note: 1. The above figures are initial values.

2. Contact your OMRON sales representative for measurement conditions of the repeat accuracy.

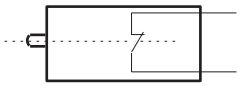
3. Durability values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

4. The value indicates the operating position change rate for a change of 1°C in the ambient temperature. The specifications depend on the model. Contact your OMRON sales representative for details.

Connections

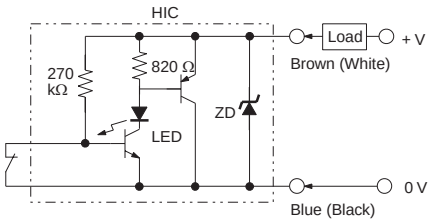
■ Contact Form

Contact Output Models



Output Circuit

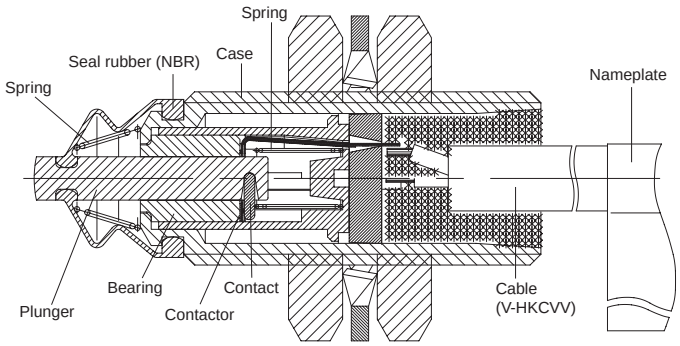
Solid-state Output Models (PNP Transistor Output)



Note: 1. HIC (hybrid integrated circuit)
2. An LED current limit resistor is incorporated.
3. The ZD absorbs surge.
4. The load can be connected to either the +V side or 0V side.

Nomenclature

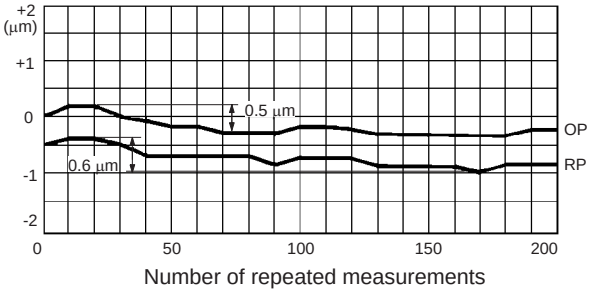
■ D5A-3200



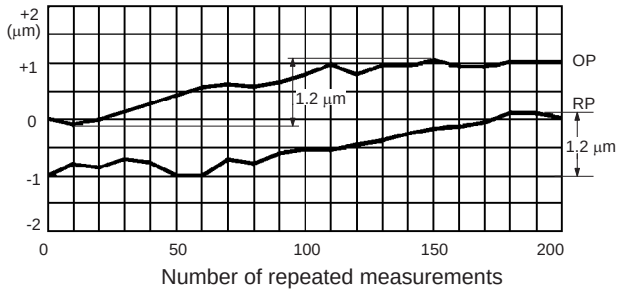
Engineering Data

Repeat Accuracy Examples (Reference Data)

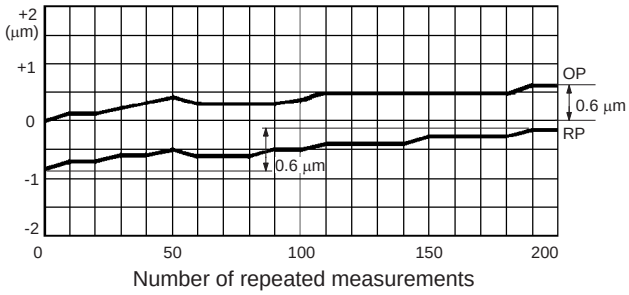
M5 Type (Contact Output) With Repeat Accuracy of 1 μm max.
D5A-1□□□ Series



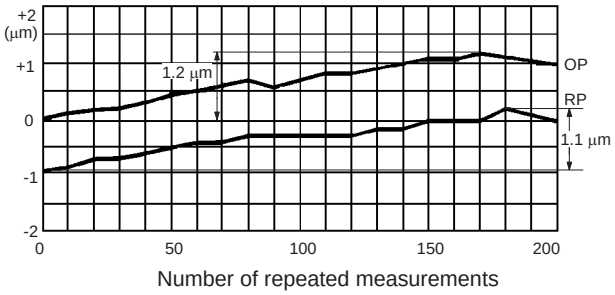
M5 Type (Contact Output) With Repeat Accuracy of 3 μm max.
D5A-2□□□ Series



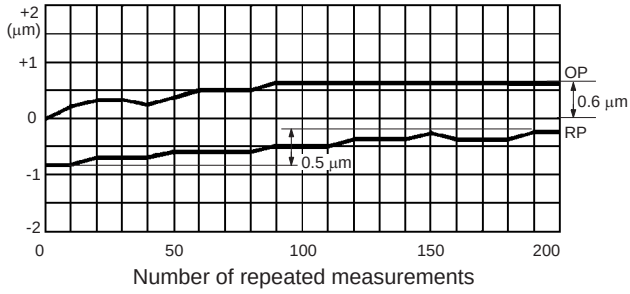
M8 Type (Contact/Solid-state Output) With Repeat Accuracy of 1 μm max.
D5A-3□□□ Series



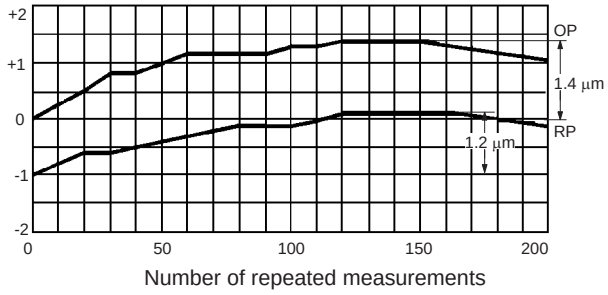
M16 Type (Contact/Solid-state Output) With Repeat Accuracy of 3 μm max.
D5A-7□□□ Series



Slim Type (Solid-state Output) With Repeat Accuracy of 1 μm max.
D5A-5□□□ Series



Limit Type (Solid-state Output) With Repeat Accuracy of 3 μm max.
D5A-8□□□ Series, D5A-9□□□ Series



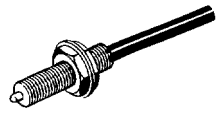
Dimensions

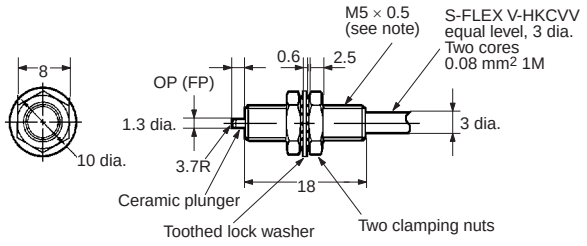
Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

M5 Type (Contact Output)

D5A-1100, D5A-2100
D5A-1200, D5A-2200

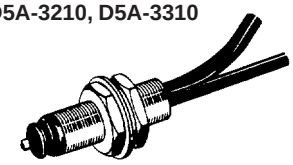


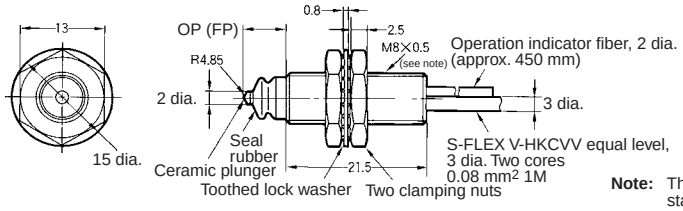


Note: The threads of the case are not standard. Therefore, standard tapping to the case is not possible for mounting.
Use the provided nuts for mounting.

M8 Type (Solid-state Output)

D5A-3210, D5A-3310

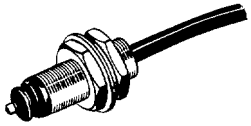


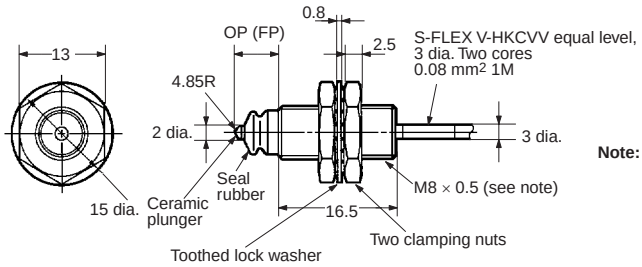


Note: The threads of the case are not standard. Therefore, standard tapping to the case is not possible for mounting.
Use the provided nuts for mounting.

M8 Type (Contact Output)

D5A-3200, D5A-3300

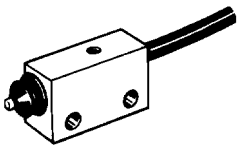


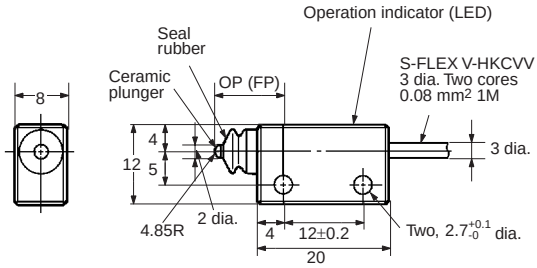


Note: The threads of the case are not standard. Therefore, standard tapping to the case is not possible for mounting.
Use the provided nuts for mounting.

Slim Type (Solid-state Output)

D5A-5210, D5A-5310





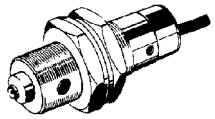
Model	D5A-1100 D5A-2100 (see note 2)	D5A-1200 D5A-2200 (see note 2)	D5A-3200 D5A-3210 (see note 2)	D5A-3300 D5A-3310 (see note 2)	D5A-5210 (see note 2)	D5A-5310 (see note 2)
OF max.	0.29 N	0.49 N	0.49 N	0.98 N	0.49 N	0.98 N
OT min.	1.5 mm	1.5 mm	1.5 mm	1.5 mm	1.5 mm	1.5 mm
MD max.	5 μm	5 μm	5 μm	5 μm	5 μm	5 μm
OP (see note 1)	(2 mm)	(2 mm)	(6.5 mm)	(6.5 mm)	10.5±0.4 mm	10.5±0.4 mm

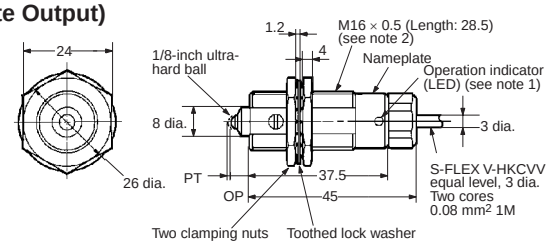
Note: 1. The operating position of these types is the same as the free position because of high sensitivity (repeat accuracy: 1 μm max.). This does not apply to M16 limit switch types.

2. Total movement is 1.9 to 2.1 mm. Set the appropriate stroke (plunging depth) to 1.0 to 1.5 mm from the FP.

M16 Type (Contact Output/Solid-state Output)

D5A-7400, D5A-7410



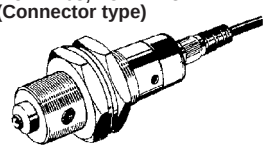


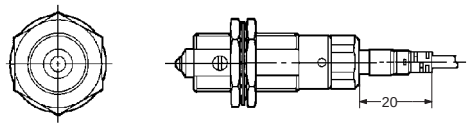
Note 1: Not available in the contact output type.

2: The threads of the case are not standard. Therefore, standard tapping to the case is not possible for mounting.
Use the provided number for mounting.

M16 Type (Contact Output/Solid-state Output)

D5A-7403, D5A-7413
(Connector type)



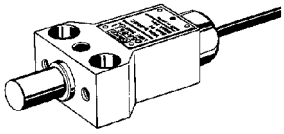


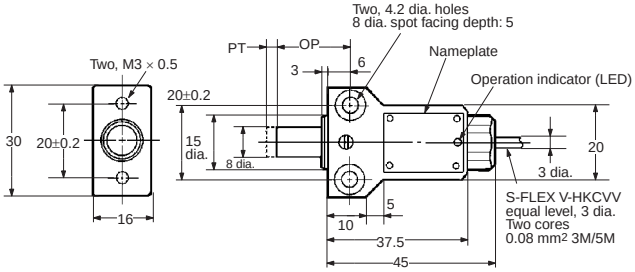
Note: The dimensions are the same as the above model's.

Cables with connectors are not sold separately.

Limit Type (Solid-state Output)

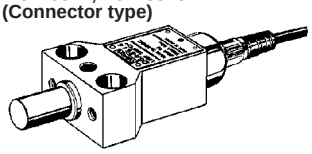
D5A-8511, D5A-8512

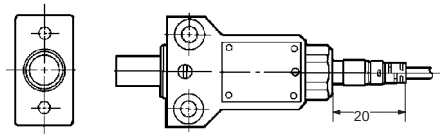




Limit Type (Solid-state Output)

D5A-8514, D5A-8515
(Connector type)



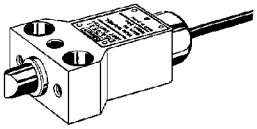


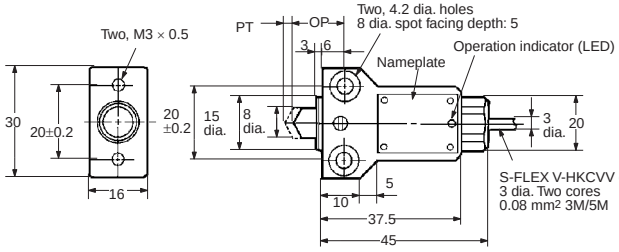
Note: The dimensions are the same as the above model's.

Cables with connectors are not sold separately.

Limit Type (Solid-state Output)

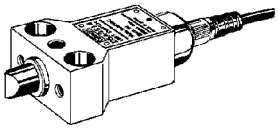
D5A-9511, D5A-9512

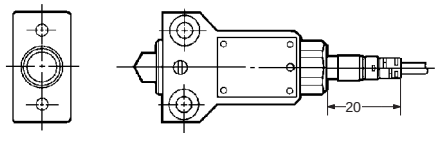




Limit Type (Solid-state Output)

D5A-9514, D5A-9515
(Connector type)





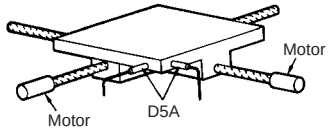
Note: The dimensions are the same as the above model's.

Cables with connectors are not sold separately.

Model	D5A-7400/-7410 D5A-7403/-7413	D5A-8511/-8514 D5A-8512/-8515	D5A-9511/-9514 D5A-9512/-9515
OF max.	2.45 N	3.93 N	
PT max.	1 mm	1 mm	
OT min.	2 mm	5 mm	4 mm
MD max.	5 μm	5 μm	5 μm
OP	(4.4 mm)	21.0±0.4 mm	15.2±0.4 mm
FP	(5 mm)	(21.8 mm)	(15.8 mm)

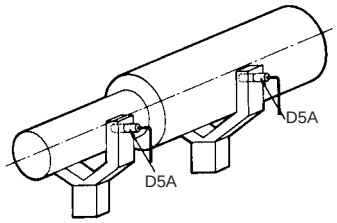
Application Examples

Origin Position Control of an X-Y Table



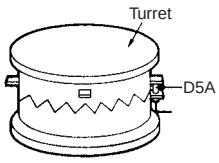
Note: Origin can be set to a desired position and the origin position can be controlled using the D5A.

Coaxiality Inspection



Note: The D5A can be mounted on a jig used for checking deviation to inspect its coaxiality.

Checking Turret Indexing Position



Note: Set the D5A on the turret indexing position to check if the turret is engaged properly at the specified position.

Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

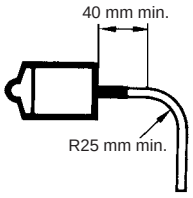
■ Correct Use

Handling of Fiber Cable

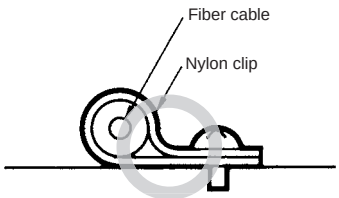
Do not pull or impose any force exceeding 29.42 N on the fiber cable.

Make sure that the bending radius of the fiber cable is as large as possible and at least R25 mm.

The 40-mm portion of the fiber cable on the connector end as shown below must not be bent.



Do not impose compressing loads on the fiber cable.



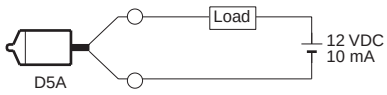
Correct

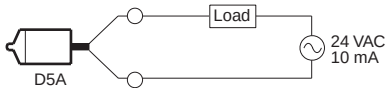
Incorrect

The fiber cable can be cut with OMRON's E39-F4 Cutting Tool.

Do not impose any force exceeding 29.42 N on the cord, otherwise the cord may break. Make sure that the bending radius of the cord is at least 20 mm.

Connection of Contact Output





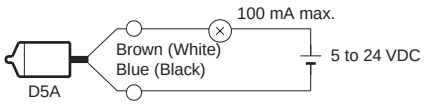
Consideration of polarity is not required.

Connection of Solid-state Output

Be sure to connect the load to the power source in series.

The operating state of the Switch can be checked by the LED operation indicator (illuminants when the Switch is in operation) incorporated in the solid-state output circuit.

The output residual voltage is approximately 3 V. Therefore, exercise care when selecting the load and setting the supply voltage. The residual voltage, however, can be easily calculated because it is almost constant and is free from the influence of fluctuation in the load current.



The core wire colors have been changed to meet new standards. Make sure that the wires are connected correctly.

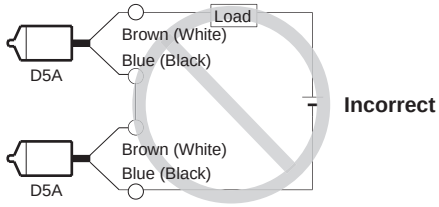
Example:

1. In the above circuit, suppose the MY relay rated at 12 VDC is used as the load. Since the must operate voltage of the relay is 80% or less than the rated voltage, it is 12 x 0.8 = 9.6 V. The supply voltage, in turn, is 3 + 9.6 = 12.6 V.
   Therefore, the relay may not operate with a 12 V power source.
2. However, if the relay rated at 24 VDC is employed, the must operate voltage and supply voltage of the relay are respectively 19.2 V and 22.2 V. The relay therefore can operate with a 24 V power source.

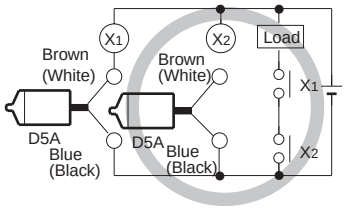
When a solid-state circuit is turned OFF, leakage current of 0.15 mA (max.) flows, causing some voltages to remain in the load. For this reason, be sure to check the must release voltage of the load before using it.

Series Connection of Switches

The Solid-state Output-type Switches must not be connected in series. To obtain the same effect as a series connection, form an AND gate with a relay inserted between the Switch and load.



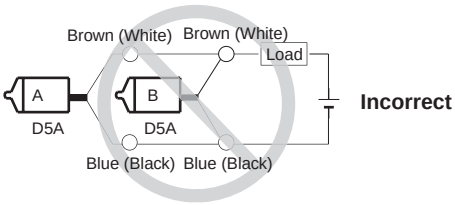
Incorrect



Correct

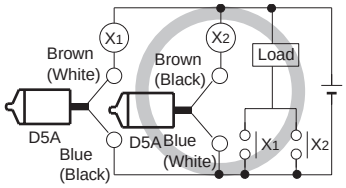
Parallel Connection of Switches

In principle, two or more D5A's should not be used in an OR configuration.



Incorrect

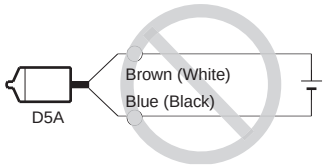
However, they can be connected in parallel provided that both switches A and B in the above figure do not operate at the same time and that the load does not have to be kept energized. In this circuit, however, the leakage current is increased, multiplied by the number of Switches connected in parallel. Consequently, the Switch may not release properly. To keep the load energized, connect a relay to each of the Switches as shown below.



Correct

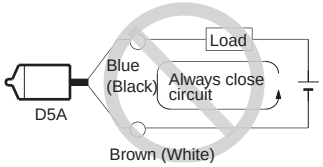
Connection to Power Source

Be sure to connect the Switch to the power source via the load. If directly connected to the power source, the internal elements of the Switch may be damaged.



Incorrect

Correctly connect the white and black lead wires to the positive and negative sides, respectively, of the power source. Although the D5A will not be damaged even if the polarity is reversed by mistake, if this happens, the Switch maintains the ON state (i.e., the contact is kept open) regardless of the presence or absence of the object to be detected.

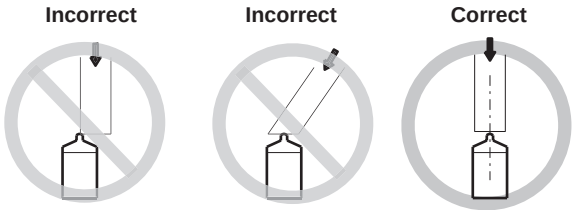


Incorrect

The core wire colors have been changed to meet new standards. Make sure that the wires are connected correctly.

Others

Adjust the mounting of the D5A until the stroke of the pin plunger and top plunger is aligned with the stroke of the operating body. Special attention should be paid to the ceramic pushbutton unit. It might be damaged if undue shock is applied.

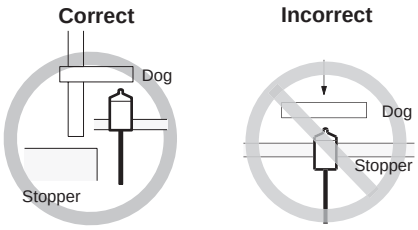


The harder the material for the dog and the more solidly the mounting base is fitted, the more accurately a minute displacement is detected.

When a limit switch type (D5A-8□□□, D5A-9□□□) is used, apply grease to the dog to reduce friction between it and the plunger. Do not apply grease to pin plungers, otherwise the grease may stick to the contacts or generate gas that may cause contact failures.

Be sure to use dogs made of hard materials for bevel or top plungers and apply grease to the surface of the dogs. The hardness (Hv) of a bevel plunger is 2,000 or over, for which it is recommended that a dog that has an Hv value of 1,000 or less be used.

Do not fail to provide a stopper so as to prevent the enclosure of the D5A from being used as the stoppers.

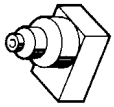


Attach an appropriate cover for the protection of the D5A from machining oil or cuttings. No protective cover is, however, provided together with the Switch.

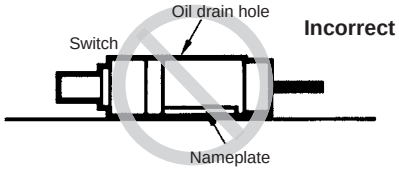
Exercise care that excessive force is not applied to the ceramic plunger of M5, M8, or slim type.
If the possibility exists that strong shock may be applied to the plunger when the Switch is being mounted, use a protective cap. The plunger may not release if it is depressed with too great a force. Set its stroke by referring to the OT value indicated in *Operating Characteristics.*

M5, M8

Slim



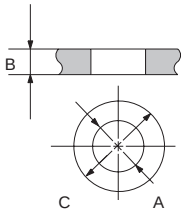
Do not mount the Switch with its nameplate facing downwards (i.e., in the direction of gravity), otherwise the oil drain hole will not work effectively.



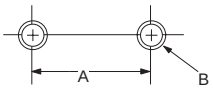
Mounting

The screw sections of cases for M5, M8, and M16 types have special dimensions. Do not use the mounting dimensions specified for standard types.

For the mounting dimensions, refer to the following figures and tables.



Dimensions		M5	M8		M16
			Contact output	Solid-state output	
A	**Mounting hole**	5.2±0.1 mm dia.	8.2±0.1 mm dia.		16.2±0.1 mm dia.
B	**Panel thickness**	3 to 10 mm	5 to 8 mm	5 to 13 mm	10 to 17 mm
C	**Toothed lock washer**	10 mm dia.	15 mm dia.		26 mm dia.

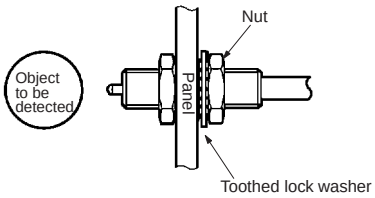


Dimensions		Slim	Limit
A	**Mounting pitch**	12±0.2 mm	20±0.2 mm
B	**Tapping**	M2.6	M4
	Mounting hole	$2.8^{+0.2}_{-0}$ mm dia.	$4.2^{+0.2}_{-0}$ mm dia.

Do not tighten the nut with too much force.
Be sure to apply the clamping torque shown in this table.

Type	Clamping torque
M5	0.98 N·m max.
M8	2.94 N·m max.
M16	9.81 N·m max.
Slim	0.29 N·m max. (M2.6 screw)
Limit	1.47 N·m max. (M4 screw)

When mounting the Switch to a panel, be sure to use the toothed lock washer attached as an accessory (to M5, M8, and M16 types only). Use the washer on the panel surface opposite the object to be detected by the Switch.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C070-E1-06

High-precision Optical Switch
D5F

Optical System Achieves 1-μm Operating Position Repeatability in this 4-way Switch

- A knife-edge mechanism in the optical system provides greater precision for a more stable output without faulty contact operation.
- Reduced size and weight (34 mm at operating section and 60 g total).
- Wear-resistive ceramic parts used in the measurement section.
- Two different output types (PNP and NPN) available.

Ordering Information

■ List of Models

Output configuration	Contact form	Operation indicator	Cable length	Model
PNP open collector (+ common)	SPST-NC	ON when not operated	1 m	D5F-2B10
			3 m	D5F-2B30
NPN open collector (– common)	SPST-NO	ON when operated	1 m	D5F-3C10
			3 m	D5F-3C30

Specifications

■ Ratings

Power supply voltage	12 to 24 VDC±10%, ripple (p–p): 10% max.
Output current	100 mA max.
Power consumption	30 mA max.
Leakage current	0.15 mA max.
Residual voltage	2 V max.

■ Characteristics

Degree of protection	IP67
Durability (see note 2)	Mechanical: 5,000,000 operations min. Electrical: 5,000,000 operations min.
Operating speed	1 μm/s to 0.5 m/s
Max. operating frequency	60 operations/minute max.
Insulation resistance	100 MΩ min. (at 500 VDC) between each terminal and ground
Dielectric strength	1,100 VAC between each terminal and ground
Vibration resistance	Malfunction: 10 to 500 Hz, 1.3-mm double amplitude
Shock resistance	Malfunction: 300 m/s^2 min.
Repeat accuracy	1 μm max. (see note 3)
Ambient temperature (see note 4)	Operating: –10°C to 60°C (with no icing)
Ambient humidity	Operating: 35% to 95%
Weight	Switch body: Approx. 50 g; Cord: Approx. 23 g/m

Note: 1. The above figures are initial values.

2. Durability values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

3. Measurements were conducted repeatedly at the same point. The value is 1 μm max. for 200 measurements. For other conditions in detail, contact your OMRON sales representative.

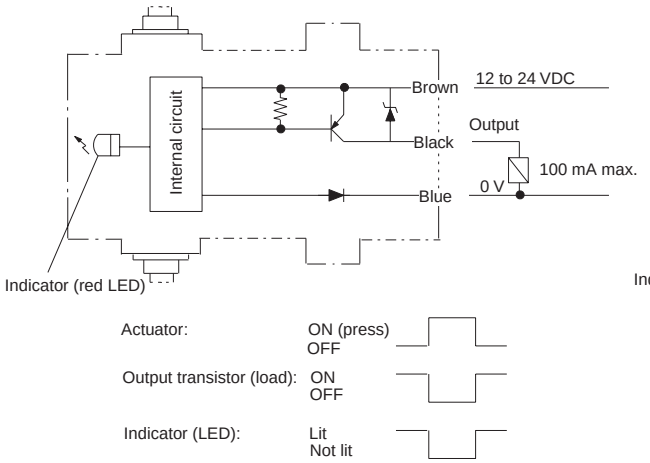
4. The ambient operating temperature varies depending on the current. Refer to the following *Engineering Data.*

Deviation	10 μm max. after 1,000,000 operations
Temperature coefficient	±50 x 10^{-6}/°C max.

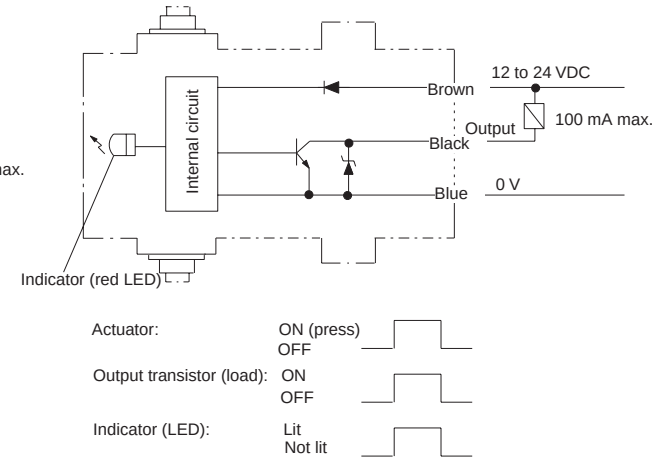
Note: Operating position fluctuation rate for a change of 1°C in the ambient temperature.

Output Circuit

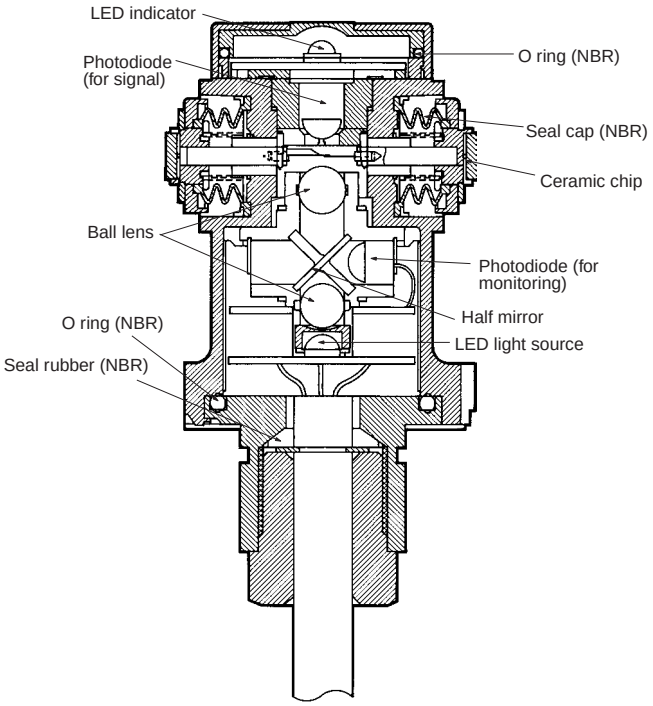
D5F-2B□0



D5F-3C□0

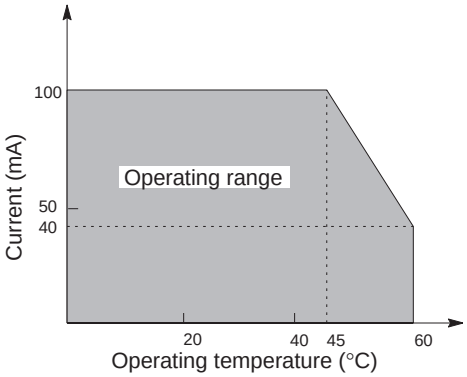


Nomenclature



Engineering Data

The permissible operating temperature range varies with the current flow as follows:

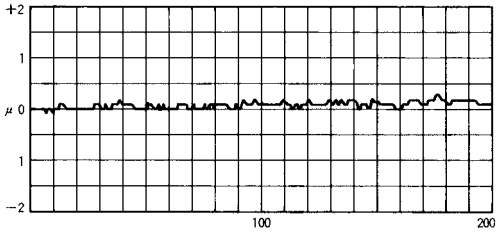


■ Repeat Accuracy (Reference Data)

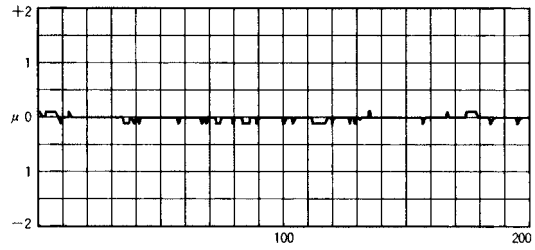
D5F-2B10

No. 1 ON

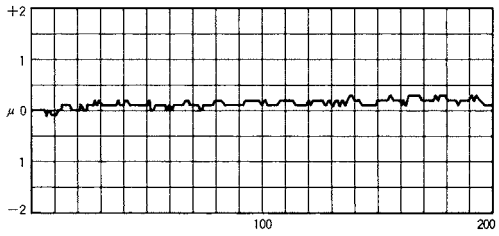
No. 2 ON



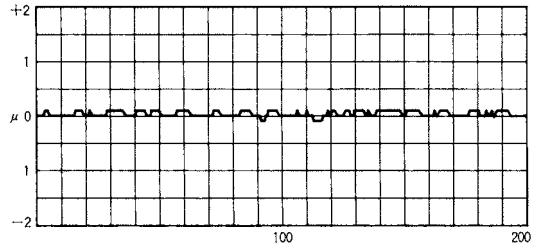
No. 1 OFF



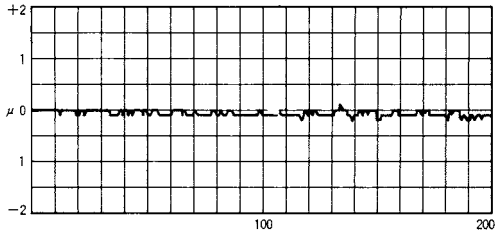
No. 2 OFF



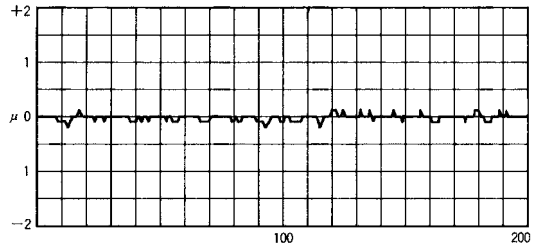
No. 3 ON



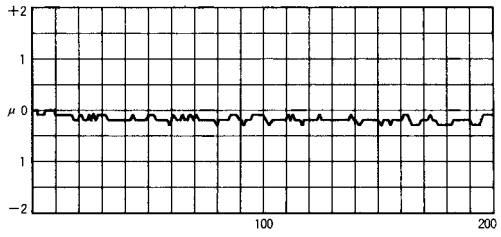
No. 4 ON



No. 3 OFF

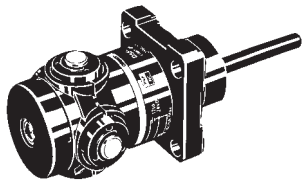


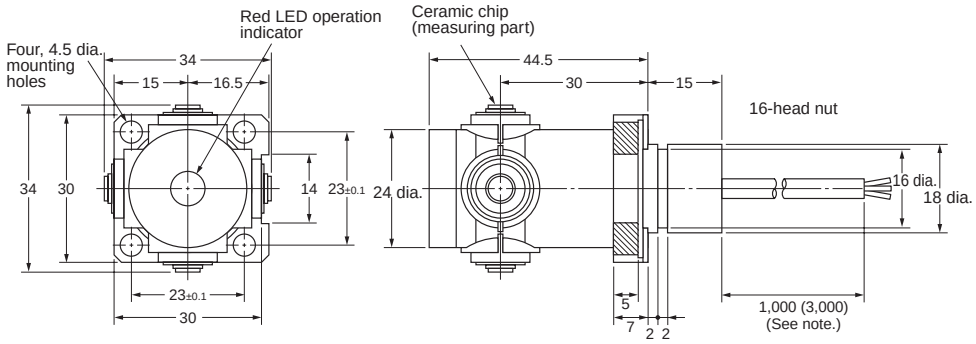
No. 4 OFF



Dimensions

Note: All units are in millimeters unless otherwise indicated.





Replace □ in the model number with the code for the Switch you require (i.e. 1 for Switches with a 1,000-mm cable and 3 for Switches with a 3,000-mm cable).

Note: The degree of parallelism and squareness of the ceramic chip are 5 μm/5 mm max. against the reference plane.

OF max.	2.45 N
RF min.	0.98 N
PT max.	0.5 mm
MD max.	20 μm
TT min.	2.2 mm

Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Correct Use

Do not impose any force exceeding 29.42 N max. on the cord, otherwise the cord may break. Make sure that the bending radius of the cord is at least R20 mm.

Handling

Do not drop or impose external force, such as shock, on the D5F. Otherwise, the D5F may malfunction or lose its accuracy.

Connections

Take the residual voltage (2 V max.) into consideration when connecting a load or power supply.

When the internal circuit of the D5F is open, there will be a leakage current of 0.15 mA maximum and a residual voltage on the load. Check the release voltage of the load before use.

Operating Environment

The operating environment has a significant effect on the D5F. Consult your OMRON representative before using the D5F in environments with different cutting oil, solvent, or gas.

Noise

If the power supply line is affected by excessive noise, the D5F may lose its accuracy.
Refer to the following and if the noise level is excessively high, take a proper countermeasure, such as the use of a noise filter.

Level	Influence on accuracy
1 kV p-p	3 μm max.
1.5 kV p-p	5 μm max.

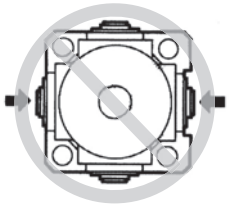
Make sure that the ripple rate of the power supply is 10% maximum.

Operation

Do not press two or more plungers at the simultaneously, otherwise the D5F may break.

Example: Two-directional Operation

Incorrect



Precautions

Light Source Burnout

The D5F does not use any contacts. Therefore no contact failures will result. If the LED light source burns out due to noise or any other cause, the following will result.

D5F-2B□0: The output transistor is kept turned OFF.

D5F-3C□0: The output transistor is kept turned ON.

Take the above into consideration and install a stopper mechanism so that the machine will not be damaged or the Switch will not be pressed excessively if the output transistor does not operate properly.

Adhesive Agent

The ceramic chips are glued with epoxy resin that may deteriorate due to cutting oil or warm solvent. In the worst case, the chips may fall off. The chips can withstand certain cutting oils or acetone. Check the operating environment before using the D5F.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C117-E1-03

Touch Switch
D5C

Unique 18-mm-dia. Capacitive Touch Switch with Choice of Three Actuators is Activated with Only a Very Slight Physical Contact

- Lightweight objects, such as thin wire or foil can be accurately detected.
- Solid-state switch activates the moment its actuator comes in contact with the object.
- Amplifier, operation indicator, and sensitivity adjuster are built-in on all models.
- Conforms to IEC IP67 and NEMA Type 6, 6P.
- Actuators can be freely interchanged between switch units.
- A unique free-attachment version allows any kind of actuator antenna to be attached.

Ordering Information

■ List of Models

Features		Usable by bending tip of antenna. Overtravel of 20 mm max.	Ideal for high-accuracy position control. Overtravel of 3.5 mm max.	Any actuator can be attached.
Cable		3 m		
Actuator		Coil spring 	Plunger 	Free-attachment 
Power source	**DC**	D5C-1DS0	D5C-1DP0	D5C-1DA0
	AC	D5C-1AS0	D5C-1AP0	D5C-1AA0
Antenna only		D5C-00S0	D5C-00P0	D5C-00A0

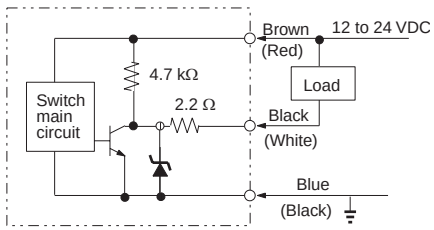
Specifications

■ Characteristics

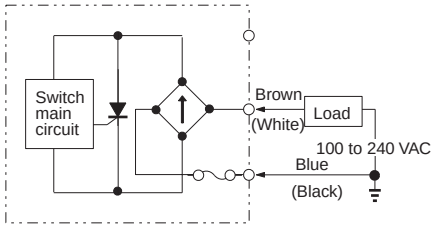
Model	DC	AC
	D5C-1D□0	D5C-1A□0
Degree of protection	Equivalent to IP67 (NEMA 6, 6P)	
Durability	Mechanical: 10,000,000 operations min. (at rated overtravel value)	
Supply voltage (operating voltage)	12 to 24 VDC (10 to 30 VDC), (ripple: 10% max.)	100 to 240 VAC (45 to 264 VAC), 50/60 Hz
Rated frequency	---	50/60 Hz
Sensitivity setting range	30 to 100 pF	
Current consumption	17 mA max.	---
Leakage current	Circuit: --- Antenna: 1 mA max.	Circuit: 2 mA max. Antenna: 1 mA max.
Response time	2 ms max.	8 ms max.
Output current	200 mA max. (resistive load)	
Insulation resistance	50 MΩ min. (at 500 VDC) between lead wires and case	
Dielectric strength	1,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and non-current-carrying metal parts	2,000 VAC, 50/60 Hz for 1 min between current-carrying metal parts and non-current-carrying metal parts
Rated insulation voltage (U_i)	1,000 VAC	
Pollution degree (operating environment)	Level 3 (IEC947-5-1)	
Protection against electric shock	Class II	
Proof tracking index (PTI)	175	
Switch category	D (IEC335)	
Vibration resistance	10 to 55 Hz, 1.5-mm double amplitude	
Shock resistance	1,000 m/s^2 min.	
Ambient temperature	Operating: –25°C to 70°C (with no icing)	
Ambient humidity	35% to 95%	
Weight	Approx. 110 g (in case of D5C-1DSO)	Approx. 120 g (in case of D5C-1ASO)

Output Circuit

D5C-1D□0 (DC Model)



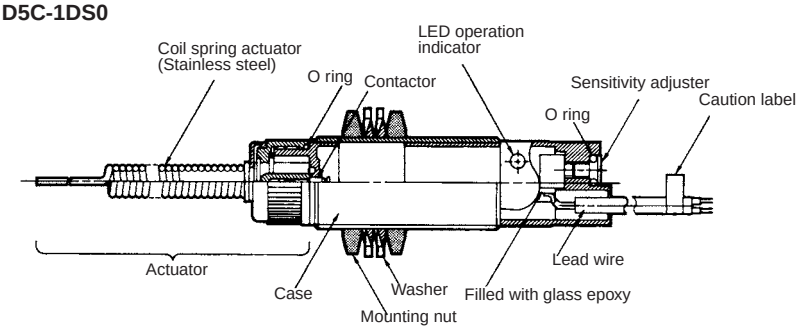
D5C-1A□0 (AC Model)



Note: Color in ( ) denotes the old model.

Nomenclature

D5C-1DS0

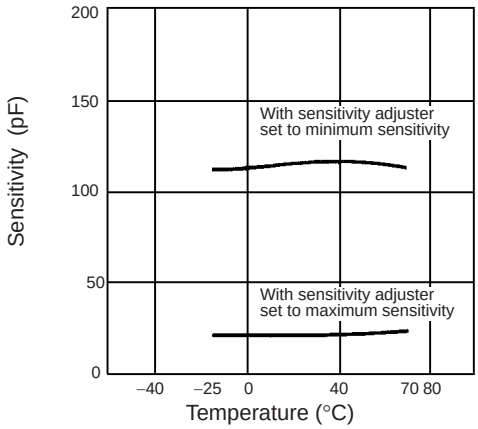


Engineering Data

Typical Examples

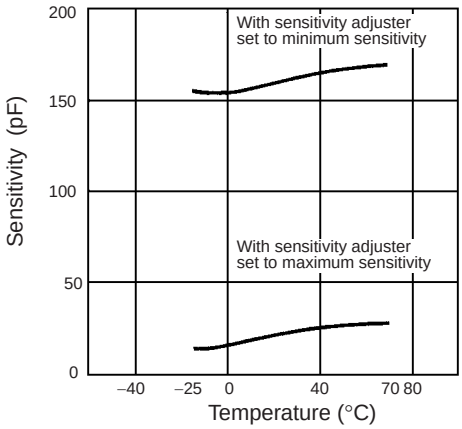
Temperature Characteristics of DC Models

D5C-1D□0 (24 VDC)



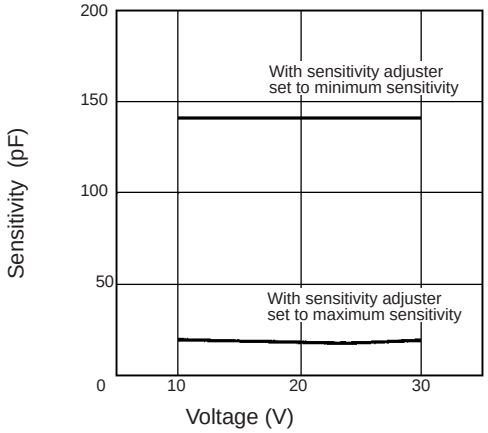
Temperature Characteristics of AC Models

D5C-1A□0 (100 VAC)



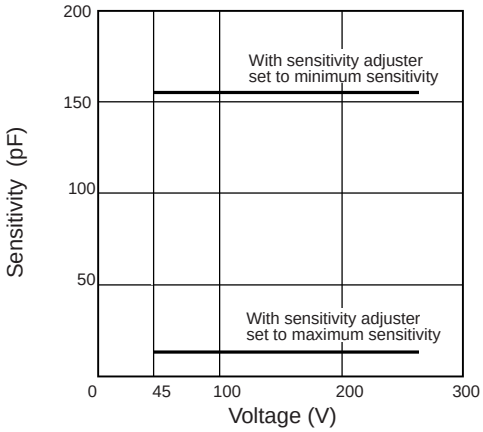
Voltage Characteristics of DC Model

D5C-1D□0 (at 25°C)



Voltage Characteristics of AC Model

D5C-1A□0 (at 25°C)



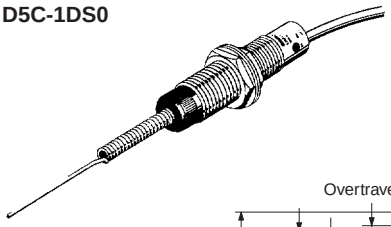
Dimensions

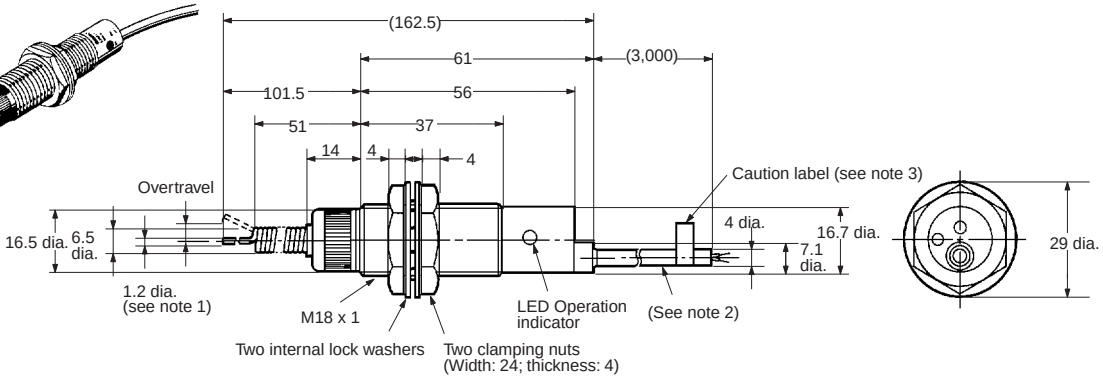
Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

DC Models

Coil Spring

D5C-1DS0

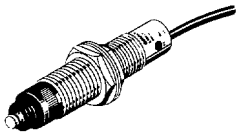


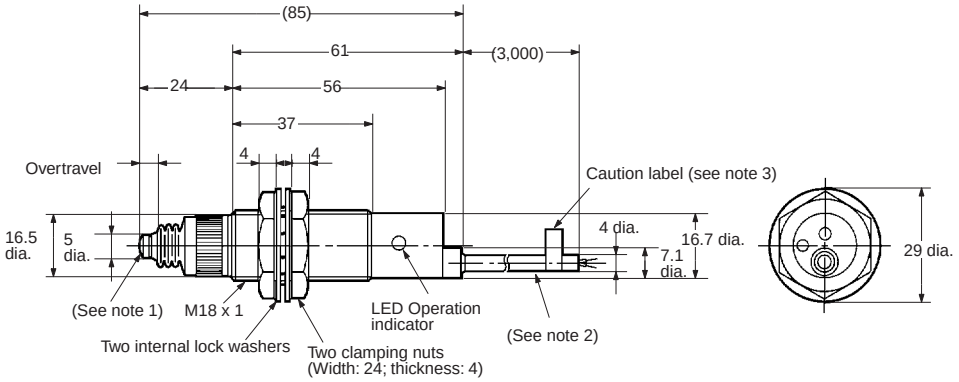


Note: 1. The stainless steel wire actuator can move in any direction. However, limit the overtravel to within 20 mm from the free position. The force that pushes the actuator must not exceed 1.96 N.
2. Vinyl insulated round cord (oil- and shock-resistant type) 4 dia., three cores × 0.2 mm².
3. Use after removing the caution label.

Plunger

D5C-1DP0

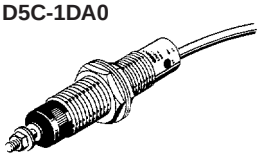


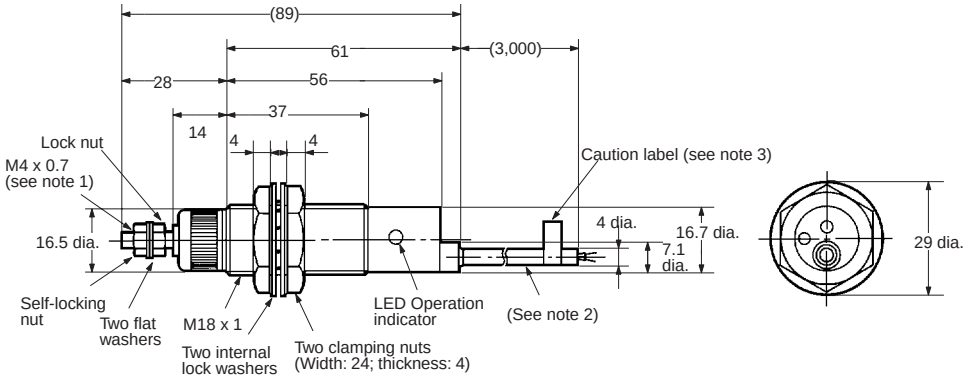


Note: 1. The overtravel of the stainless steel plunger is within 3.5 mm. Do not apply a force greater than 9.8 N to the plunger.
2. Vinyl insulated round cord (oil- and shock-resistant type) 4 dia., three cores × 0.2 mm².
3. Use after removing the caution label.

Free-attachment

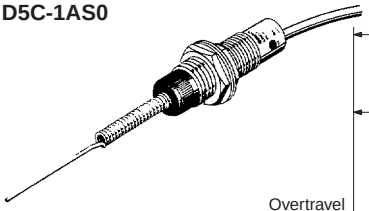
D5C-1DA0

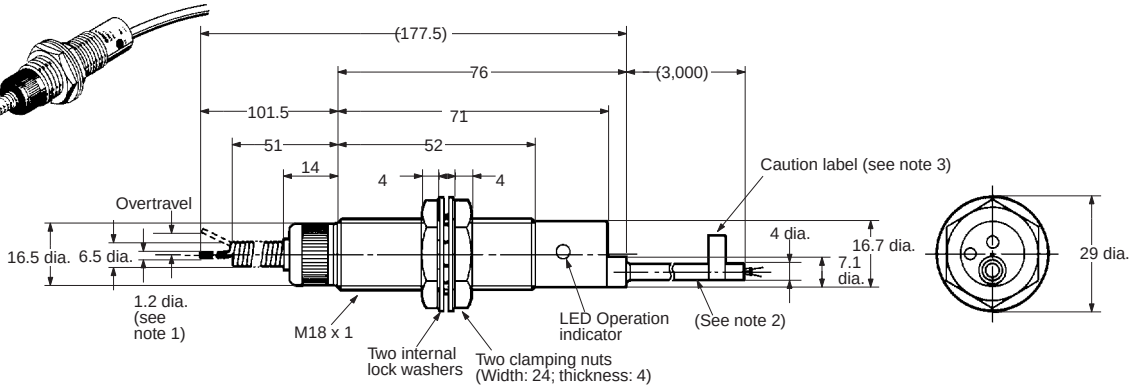




Note: 1. Limit the total length of actuator wire to 1 m or less. When mounting the Switch to a metal plate, do not exceed an area of 200 cm².
2. Vinyl insulated round cord (oil- and shock-resistant type) 4 dia., three cores y 0.2 mm².
3. Use after removing the caution label.

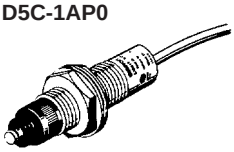
AC Models
Coil Spring
D5C-1AS0

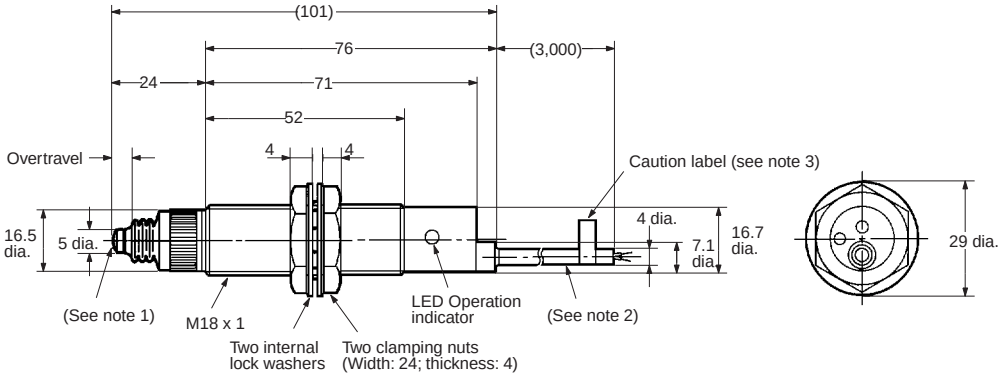




Note: 1. The stainless steel wire actuator can move in any direction. However, limit the overtravel to within 20 mm from the free position. The force that pushes the actuator must not exceed 1.96 N.
2. Vinyl insulated round cord (oil- and shock-resistant type) 4 dia., two cores × 0.3 mm².
3. Use after removing the caution label.

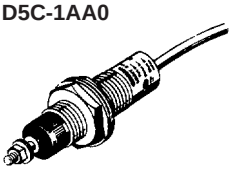
Plunger
D5C-1AP0

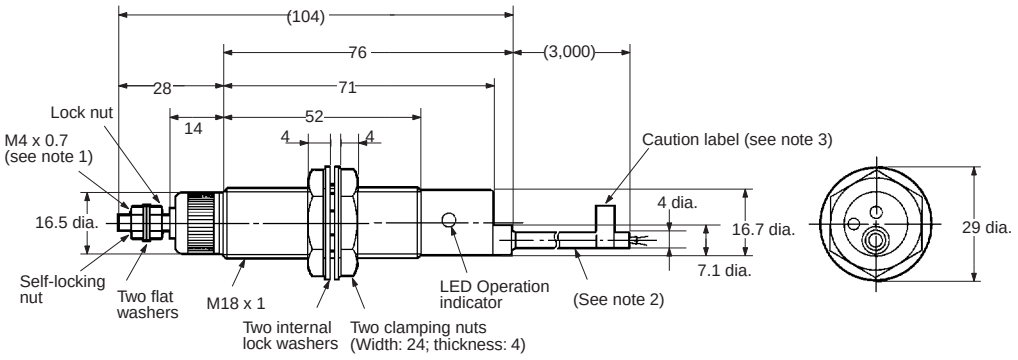




Note: 1. The overtravel of the stainless steel plunger is within 3.5 mm. Do not apply a force greater than 9.8 N to the plunger.
2. Vinyl insulated round cord (oil- and shock-resistant type) 4 dia., two cores × 0.3 mm².
3. Use after removing the caution label.

Free-attachment
D5C-1AA0

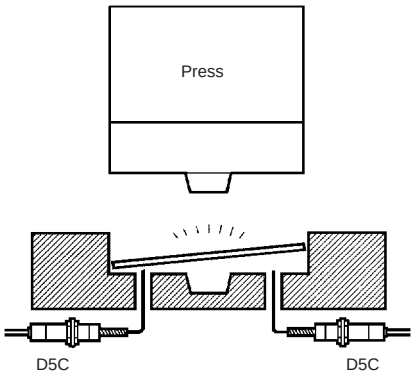




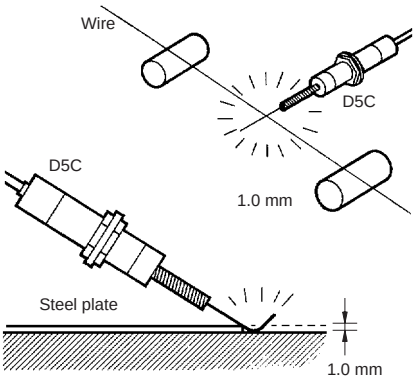
Note: 1. Limit the total length of actuator wire to 1 m or less. When mounting the Switch to a metal plate, do not exceed an area of 200 cm².
2. Vinyl insulated round cord (oil- and shock-resistant type) 4 dia., two cores × 0.3 mm².
3. Use after removing the caution label.

Application Examples

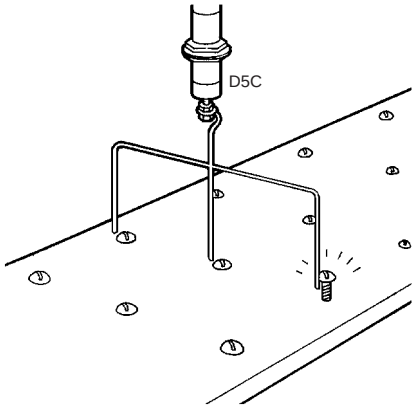
Detection of Incorrectly Set Work



Detection of Fine Wire or Thin Plate



Detection of Loose Screws



Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

⚠ CAUTION

Make sure that the antenna does not come into contact with the human body, otherwise an electric shock may be received.

■ Correct Use

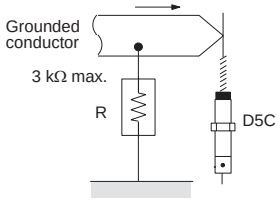
Grounding of Antenna and Sensing Object (Size of Sensing Object)

Grounded Object

If the sensing object is the following grounded conductor, its size will not affect the operation of the D5C. Check for the presence of insulators sticking to the sensing object or the corrosion of the sensing object, however, so that the ground resistance will not exceed 3 kΩ.

Contact with Grounded Conductor

The sensing object is equivalently grounded through ground resistor R.



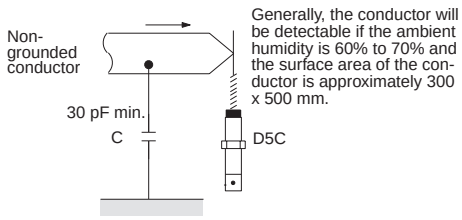
R: 3 kΩ max.
The sensing object must not come into contact with the human body.

Non-grounded Object

If the sensing object is the following non-grounded conductor, the D5C will operate if the capacitance between the sensing object and the ground is 30 pF or more. The larger the surface area of the sensing object is, the higher its capacitance will be. The shorter the distance between the sensing object and the ground is, the higher the capacitance will be. Furthermore, the capacitance greatly varies with the ground condition (e.g., dry sand, concrete, or wet soil).

Contact with Non-grounded Conductor

The sensing object is equivalently grounded through capacitor C.



C: 30 pF min.

Conditions of Sensing Object

The detection of conductors (e.g., iron, stainless steel, aluminum, and brass objects) poses no particular problem. A conductor coated with paint cannot be detected, however, because there is no electrical continuity between the antenna and the conductor.

Non-conductive objects (e.g., plastic, ceramic, glass, and cloth objects) can be detected by grounding them indirectly.

Antenna

Shape and Extension

If a metal plate is used as an antenna by connecting it to the built-in or separated antenna of the D5C, the surface area of the metal plate must be 200 cm^2 maximum (Fig. 1). The antenna can be extended, provided that the total length of the antenna is 1 m maximum (Fig. 2) and that the bottom of the antenna is at least 10 cm (Fig. 3) away from the ground. Refer to the illustrations below.
The D5C may be damaged if the antenna is excessively large or heavy or if the antenna is used in locations with excessive vibration or shock. Be sure to check the locations before use.

Fig. 1

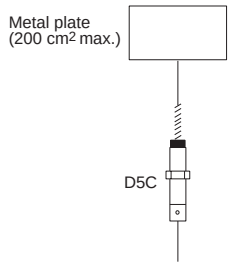


Fig. 2

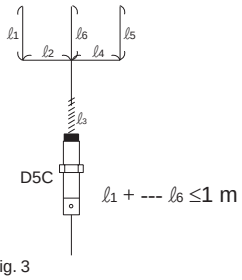
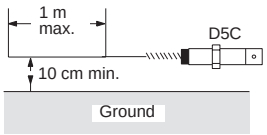


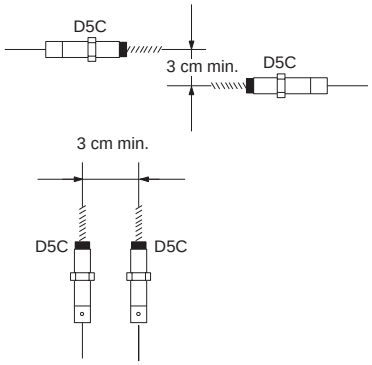
Fig. 3



Parallel Arrangement

If there are multiple D5Cs are located in parallel, make sure that the distance between adjacent antennas is at least 3 cm.

Fig. 4



Maintenance

Make sure that the portion of the antenna that comes into contact with sensing objects is free of oil, dirt, or rust, or any other insulator. Otherwise, the D5C will not operate.

The degree of protection of the D5C is IP67. The D5C cannot be, however, used in the water or oil.

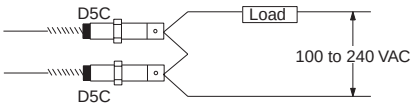
Locations with Sprayed Water or Oil
The D5C may malfunction in locations where the D5C is frequently exposed to sprayed water or oil. Especially, the D5C may malfunction more frequently if it is exposed to sprayed water-soluble cutting oil. In such locations, be sure to take appropriate measures to protect the D5C from oil and water.

Wiring and Connections

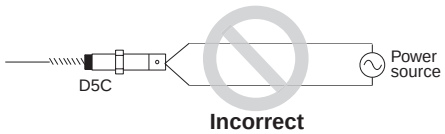
Be sure to wire the D5C correctly according to the color of each cord. Incorrect wiring may damage the internal components of the D5C or the D5C may malfunction.

If AC models are connected in parallel, make sure that a load is connected to each of the models.

A maximum of two models can be connected in series provided that 100 to 240 V is supplied. DC models cannot be connected in series.



Be sure to supply power to the D5C via the load. If power is supplied to the D5C directly, the fuse will blow.



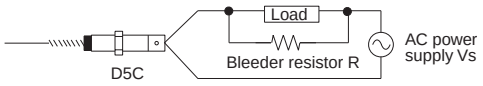
Incorrect

If there are wire power lines or high-tension lines close to the cord of the D5C, be sure to wire the cord of the D5C away from power lines or high-tension lines or lay the cord in an exclusive, shielded conduit.

Remove the caution label on the end of the cord before wiring the cord.

D5C-1A□0 (AC Models)

Be aware that the D5C-1A□0 not in operation has a leakage current of approximately 2 mA. Especially, if the load is a relay with a current flow of 10 mA or less, a reset failure may result due to the residual voltage. Therefore, connect a bleeder resistor as shown below so that the residual voltage will be less than the reset voltage of the load.



The bleeder resistance and permissible power are obtained from the following formula.

$R \leq V_S/(10 - I)$ (kΩ)

$P > V_S^2/R$ (mW)

P: W number of bleeder load

P: Withstanding power of bleeder resistor
(Practically, the wattage must be a few times larger than the obtainable value.)

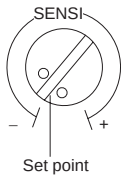
I: Load current (mA)

If a DC relay or DC counter is used as a load connected through an electronic timer or current rectification circuit, pay the utmost attention so that the leakage current of the D5C AC model will not cause the load to malfunction.

Sensitivity Adjustment

The sensitivity of the D5C can be adjusted by turning the adjuster on the rear side with a flat-blade screwdriver.

The sensitivity increases by turning the adjuster clockwise and decreases by turning the adjuster counterclockwise.



Be sure to turn the adjuster with a torque of 4.9 to 7.8 mN • m.
If excessive torque is applied, the adjuster will break.

Grounding

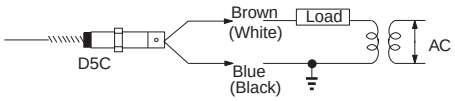
In order to maintain the operational reliability of the D5C, be sure to ground the blue or black wire of the power cord.

The service power supply of the PC (Programmable Controller) is not available to the D5C-1D□0. The negative line of the service power supply of the PC is not grounded. Therefore, the D5C may not operate.

Furthermore, if the negative line of the service power supply is grounded, the noise resistance of the PC will drop.

Provided that single-phase 200 V is supplied to the D5C-1A□0, if one phase is grounded, the power supply will be short-circuited and a machinery breakdown will result. Use an isolating transformer and ground the secondary side of the transformer instead.

In the above case, be sure to ground the secondary side, otherwise the D5C may not operate.

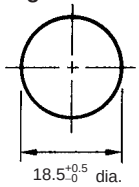


The lead wire colors of the D5C have been changed in compliance with the latest applicable JIS standards. Colors in parentheses are previous ones.

Mounting

Do not tighten the nuts with excessive force. The maximum permissible tightening force of each nut with a washer is 29.4 N·m.

Mounting Hole Dimension



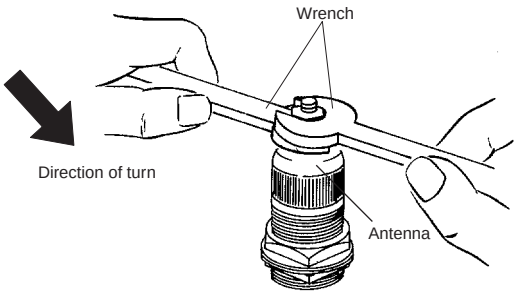
Others

Do not disassemble the D5C, otherwise the internal wiring will be damaged and the D5C will fail to operate.

The sealing of the D5C uses nitrile butadien rubber (NBR), which is highly oil resistive. If exposed to some types of oil or chemical indoors or outdoors, however, the NBR may deteriorate. Contact your OMRON representative for details.

When mounting the antenna to the D5C, be sure to tighten the antenna to a torque of 0.39 to 0.83 N·m. If the antenna is not tightened securely, the built-in contact may break.

If an appropriate antenna is mounted to a free attachment model, hold the nut on the outer side with a wrench so that the nut will not move. Then tighten the nut on the inner side within a torque range of 0.78 and 1.18 N·m.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C061-E1-05

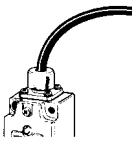
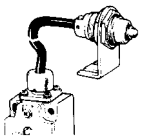
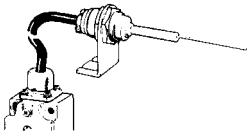
Limit Touch Switch
NL

Object Actuates Switch and Turns Built-in Monitor Indicator ON

- Solid-state switch activates the moment its actuator comes in contact with the object.
- Detects minute displacement or lightweight objects with minimal operating force.
- Built-in LED indicator ensures easy operation monitoring.
- DC models provide versatile functions in combination with the S3D2 Sensor Controller.

Ordering Information

■ List of Models

Model		Built-in antenna model		Separate antenna model		
Features		• Provides sufficient OT (overtravel). • Antenna tip withstands bending.	• Ensures high-precision positioning control. • OT of 5-mm max. (overtravel)	• Antenna with 3-m extension cable is available for narrow spaces where conventional limit switches cannot be used.		
Antenna		Coil spring 	Plunger 	No antenna 	Plunger with antenna 	Coil spring with antenna 
Series	Power supply voltage	Model	Model	Model	Model	Model
NL1	12 VDC	NL1-C	NL1-P	NL1-S	NL1-SP	NL1-SC
NL2	24 VDC	NL2-C	NL2-P	NL2-S	NL2-SP	NL2-SC
NL3	100 VAC	NL3-C 100 V (see note 2)	NL3-P 100 V (see note 2)	---	---	---
	200 VAC	NL3-C 200 V (see note 2)	NL3-P 200 V (see note 2)			
Antenna only		NL1-C ANTENNA ASSY (see note 3)	---	---	---	NL1-SC ANTENNA (see note 4)

Note: 1. Each model is provided with a standard 1-m cable.
2. Specify the power supply voltage when ordering the NL3-C□ or NL3-P□.
3. Same for NL1, NL2, and NL3 (set including coil spring and head).
4. Same for NL1 and NL2 (coil spring only).

Specifications

■ Characteristics

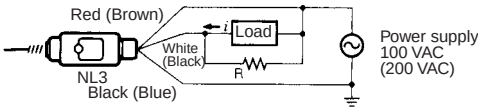
Item	NL1	NL2	NL3
Degree of protection	IP60		
Supply voltage (operating voltage)	12 VDC	24 VDC	100 VAC or 200 VAC
Rated frequency	---		50/60 Hz
Sensitivity	Grounded object:Contact resistance of 3 kΩ max. Non-grounded object:Antenna-to-ground capacitance of 100 pF min.		
Current consumption	8 mA	15 mA	---
Leakage current	---	---	Circuit: 2 mA; Antenna: 1 mA (see note 1)
Response time	5 ms max.		20 ms max.
Output signal	Voltage output model: 30 mA at 12 VDC with output impedance of 4.7 kΩ	Current output model: 24 VDC (directly switching resistive load of 170 mA max.)	Thyristor output model: 100 or 200 VAC (directly switching resistive load of 30 to 300 mA) (see note 2)
Insulation resistance	0 V (black lead wire) is connected to casing		100 MΩ min. at 500 VDC between current-carrying and non-current-carrying metal parts
Dielectric strength	0 V (black lead wire) is connected to casing		1,500 VAC at 50/60 Hz for 1 min between current-carrying and non-current-carrying metal parts
Pollution degree (operating environment)	Level 3 (IEC947-5-1)		
Protection against electric shock	Class II		
Proof tracking index (PTI)	175		
Switch category	D (IEC335)		
Vibration resistance	Malfunction: 10 to 55 Hz, 1.5-mm double amplitude		
Shock resistance	Malfunction: Approx. 200 m/s^2 min.		
Ambient temperature	Operating: –10°C to 60°C (with no icing)		
Ambient humidity	35% to 90%		
Weight	Approx. 370 g (NL□-C, -P) Approx. 550 g (NL□-S) Approx. 680 g (NL□-SP, -SC)		

Note: 1. The NL3 has a capacitor and resistor for the protection of the built-in SCR. Therefore, the NL3 has leakage current.

2. The NL3 requires a current of 30 mA for circuit protection. If the load current is less than 30 mA, connect the bleeder resistance R in parallel with the load as shown below so that the total current of the load circuit will be 30 to 300 mA.
Obtain R from the following formula.

$$R\ (k\Omega) = \frac{V}{30 - i}$$

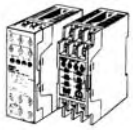
Make sure that the permissible power of the resistor is sufficient.



Connections

S3D2 Sensor Power Supply

The use of the S3D2 is recommended for supplying 12 VDC to the NL2 (or 24 VDC to the NL2) and converting the output of the NL into relay or open collector output in versatile timing control.
The NL3 does not require a sensor power supply.



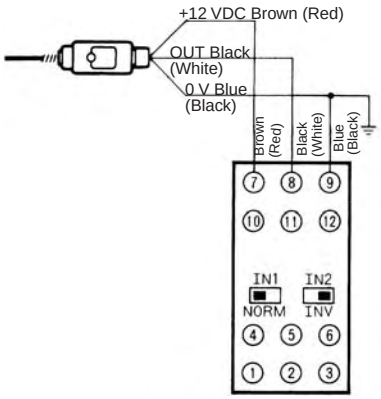
S3D2 Controller Unit

Model	Sensor Power Supply	Function	Power supply voltage
NL1	S3D2-AK	Basic operation	100 to 240 VAC
	S3D2-BK	Memory and timer operation	
	S3D2-CK	Timer operation	
NL2	S3D2-AKD	Basic operation	24 VDC
	S3D2-CKD	Timer operation	

Be sure to wire the cable correctly according to the color of each lead wire. Do not wire power lines or high-tension lines alongside the cable.

The use of S3D2 is recommended as a power supply to the NL1. Contact your OMRON representative for the datasheet of the S3D2.

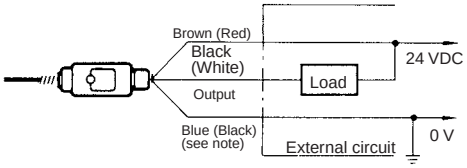
NL1



S3D2-AK

Note: Ground the blue (black) wire.

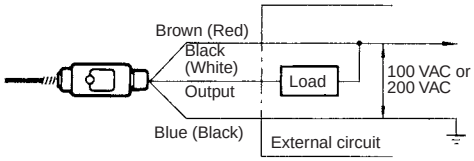
NL2



A maximum DC load of 170 mA (with no inductance or resistance).
Can be switched directly.

Note: Ground the blue (black) wire.

NL3



A maximum AC load of 300 mA (cos ϕ = 1).
Can be switched directly.

Note: Be sure to ground the blue (black) line of the NL3.

Note: 1. The lead wire colors of the NL have been changed in compliance with the latest applicable JIS standards. Colors in parentheses are previous ones.

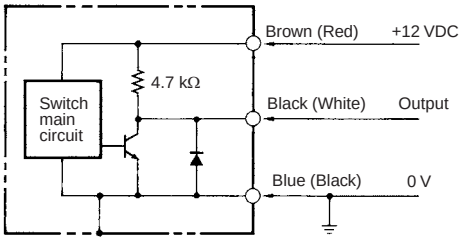
2. The figures in the S3D2 illustration indicate the terminal numbers of the socket.

3. Use a three-conductor cable with a minimum thickness of 0.75 mm to connect the NL and the Sensor Power Supply or other devices with no built-in contacts. The cable can be extended up to 100 m on condition that the cable is wired in an independent conduit.

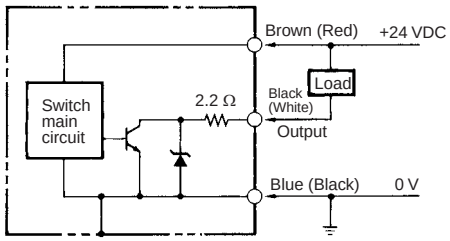
Output Circuit

Note: The lead wire colors of the NL have been changed in compliance with the latest applicable JIS standards. Colors in parentheses are previous ones.

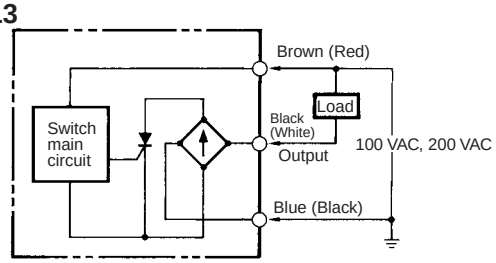
NL1



NL2

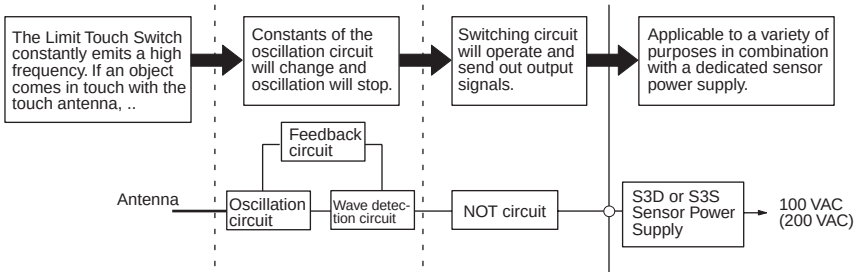


NL3



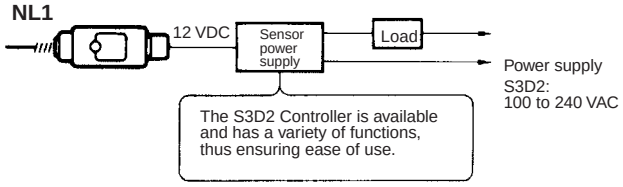
Note: The 0-V power supply side will be connected to the casing if the model is the NL1 or NL2.

■ Principle of Operation

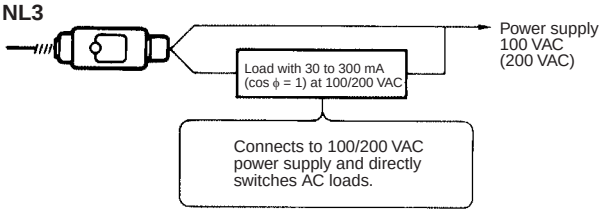


■ Classification by Series and Features

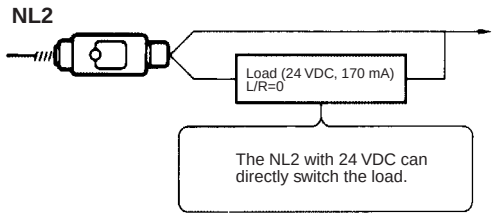
NL1



NL3

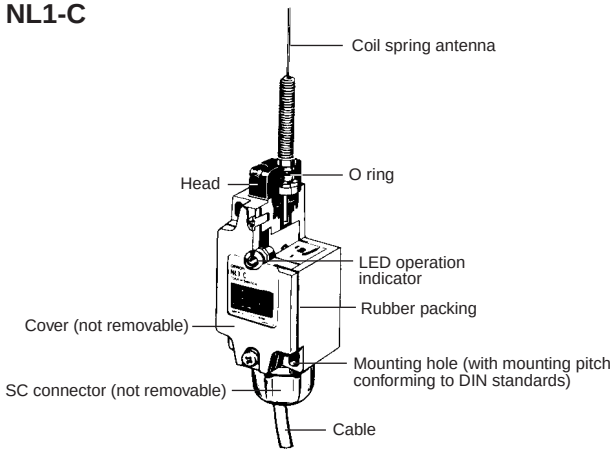


NL2



Nomenclature

NL1-C

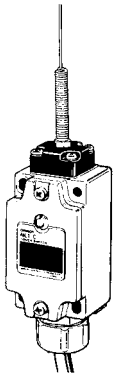


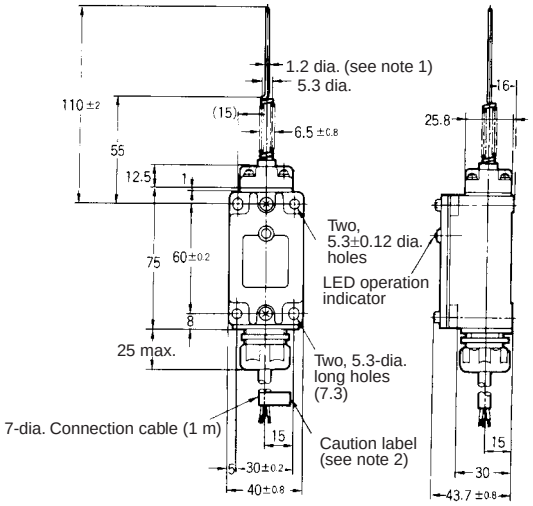
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Built-in Antenna Models

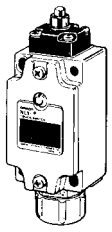
Coil Spring
NL1-C
NL2-C
NL3-C

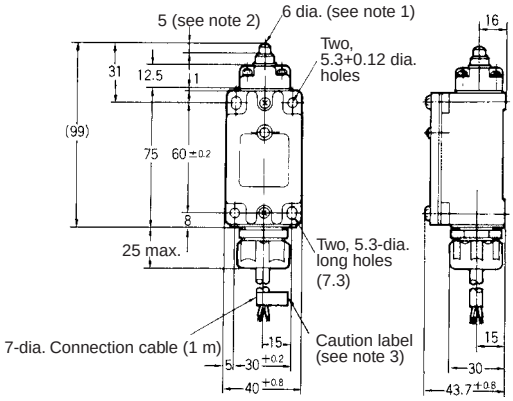




Note: 1. The coil spring antenna is movable in any direction. Make sure that the angle of the antenna is within 30° to the FP (free position) after the antenna comes into contact with the object.
2. Use after removing the caution label.
3. The force that pushes the actuator must not exceed 1.96 N.
4. The antenna is replaceable. Contact your OMRON representative for details.

Plunger
NL1-P
NL2-P
NL3-P





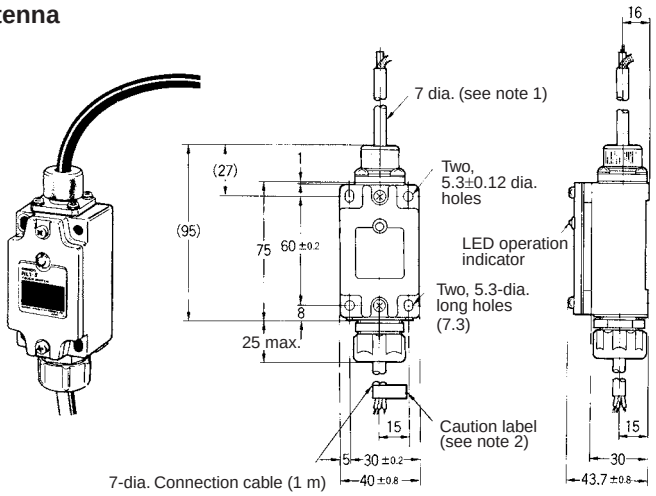
Note: 1. The stainless-steel plunger antenna allows a maximum OT (overtravel) of 5 mm.
2. This position is the FP (free position) of the plunger.
3. Use after removing the caution label.
4. Do not apply a force greater than 9.8 N to the plunger.

Separated Antenna Models

Note: The dimensions provided for the NL1-SP, NL2-SP, NL1-SC, and NL2-SC are the external dimensions for the antennas. The casing dimensions of these models are all the same as those for the coil spring or plunger models.

No Antenna

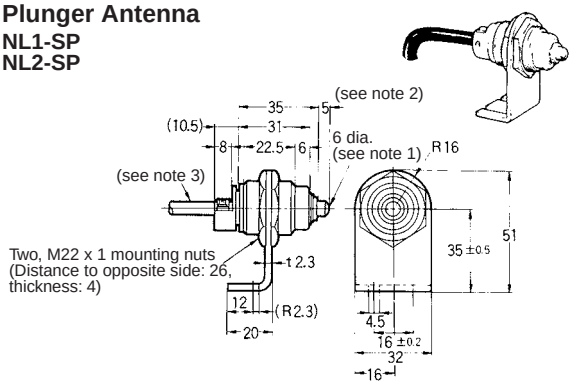
NL1-S
NL2-S



Note:
1. Make sure that the shape of the antenna is suitable to the application. Use the plunger antenna or coil spring antenna as shown below for the NL1-S or NL2-S.
2. Use after removing the caution label.
3. A standard 3-m high-frequency coaxial cable is provided. Models with 1- or 2-m connection cables are available as well.
4. Do not cut or extend the connecting cable.

Plunger Antenna

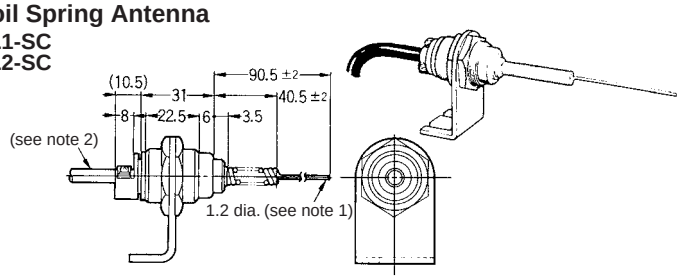
NL1-SP
NL2-SP



Note:
1. The stainless-steel plunger antenna allows a maximum OT (overtravel) of 5 mm.
2. This position is the FP (free position) of the plunger.
3. A standard 3-m high-frequency coaxial cable is provided. Models with 1- or 2-m connection cables are available as well.
4. Do not apply a force greater than 9.8 N to the plunger.
5. Do not cut or extend the connecting cable.

Coil Spring Antenna

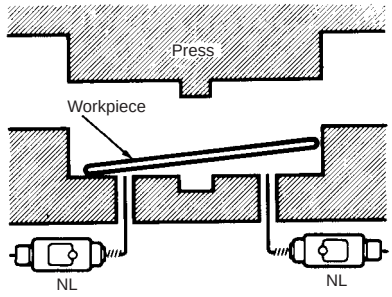
NL1-SC
NL2-SC



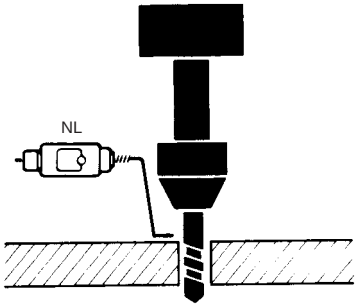
Note:
1. The coil spring antenna is movable in any direction. Make sure that the angle of the antenna is within 30° to the FP (free position) after the antenna comes into contact with the object.
2. A standard 3-m high-frequency coaxial cable is provided. Models with 1- or 2-m connection cables are available as well.
3. Do not cut or extend the connecting cable.
4. The antenna is replaceable. Contact your OMRON representative for details.

Application Examples

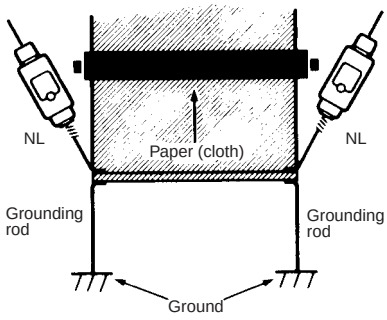
- Detection of press completion position.
- Detection of mistakes in workpiece setting or removal.
- Detection of minute workpieces.



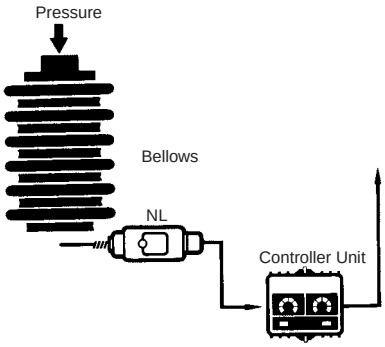
- Drill positioning.
- Material positioning.



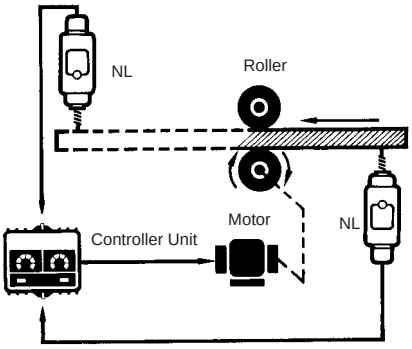
- Detection of workpiece edges.



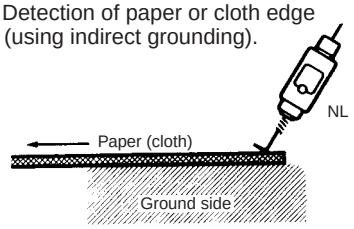
- Displacement detection and control.



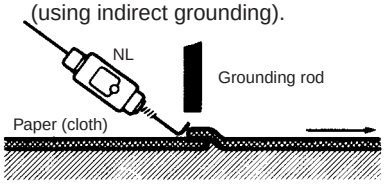
- Thickness control of rolling plates.



- Detection of paper or cloth edge (using indirect grounding).



- Detection of paper or cloth seam (using indirect grounding).



Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17*

⚠ CAUTION

Make sure that the antenna does not come into contact with the human body, otherwise an electric shock may be received.

■ Correct Use

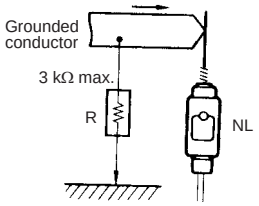
Antenna Grounded through Sensing Object (Size of Sensing Object)

Grounded Object

If the sensing object is the following grounded conductor, its size will not affect the operation of the NL. Check for the presence of insulators sticking to the sensing object or the corrosion of the sensing object, however, so that the ground resistance will not exceed 3 kΩ.

Contact with Grounded Conductor

The sensing object is equivalently grounded through ground resistor R.



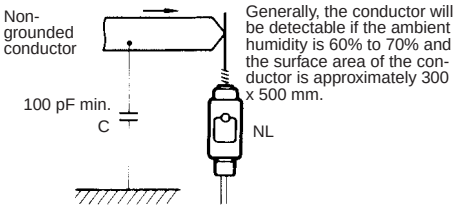
R: 3 kΩ max.
The sensing object must not come into contact with the human body.

Non-grounded Object

If the sensing object is the following non-grounded conductor, the NL will operate if the capacitance between the sensing object and the ground is 100 pF or more. The larger the surface area of the sensing object is, the higher its capacitance will be. The shorter the distance between the sensing object and the ground is, the higher the capacitance will be. Furthermore, the capacitance greatly varies with the ground condition (e.g., dry sand, concrete, or wet soil).

Contact with Non-grounded Conductor

The sensing object is equivalently grounded through capacitor C.



C: 100 pF min.

Conditions of Sensing Object

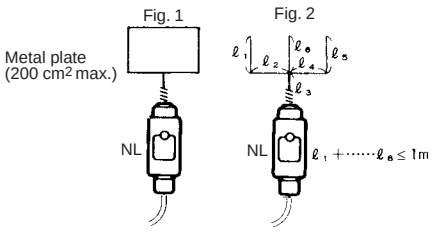
The detection of conductors (e.g., iron, stainless steel, aluminum, and brass objects) poses no particular problem. A conductor coated with paint cannot be detected, however, because there is no electrical continuity between the antenna and the conductor.

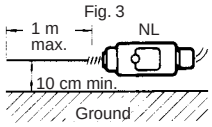
Non-conductive objects (e.g., plastic, ceramic, glass, and cloth objects) can be detected by grounding them indirectly.

Antenna

Shape and Extension

If a metal plate is used as an antenna by connecting it to the built-in or separated antenna of the NL, the surface area of the metal plate must be 200 cm^2 maximum. The antenna can be extended, provided that the total length of the antenna is 1 m maximum and that the bottom of the antenna is at least 10 cm away from the ground. Refer to the illustrations below.

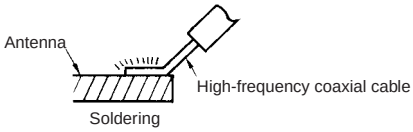


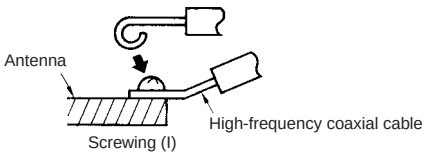


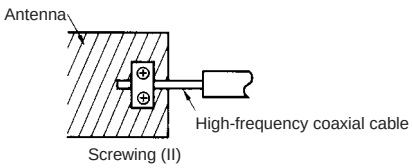
Antenna Connection

To connect a suitable antenna to the high-frequency coaxial cable of the NL□-S, perform the following steps.

Connecting Conductor to Antenna

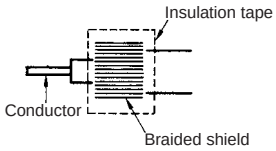






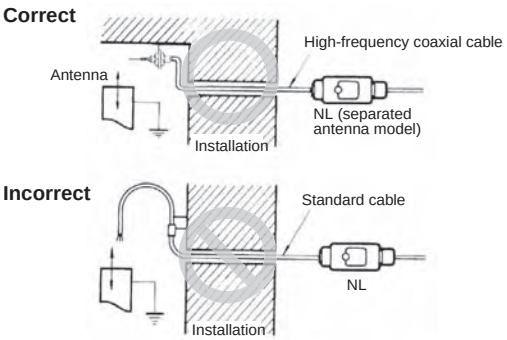
Braided Shield

The shield is connected to the casing of the NL. Pay the utmost attention so that the conductor connected to the antenna will not come into contact with the shield. Secure the shield with insulation tape.



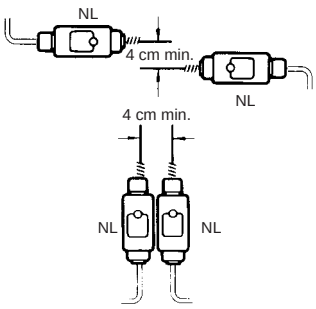
If the antenna cable needs to be extended, use the separated antenna model. Do not use a standard cable in place of the high-frequency coaxial cable.

Antenna in Parallel to Object



If more than one NL is used in parallel or side-by-side, make sure that the distance between the antennas is at least 4 cm.

Maintenance



Make sure that the antenna is free of oil, dust, or rust, otherwise the antenna may not operate.

Do not use the NL in places where water or oil (especially water-soluble oil) is frequently sprayed to the NL or antenna, otherwise the NL may malfunction.

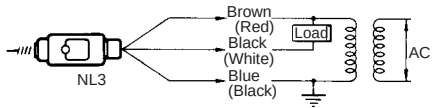
Grounding

In order to maintain the operational reliability of the NL, be sure to ground the blue (black) wire of the power cable.

The blue (black) lead wire of the connection cable will be connected to the casing internally if the model is the NL1 or NL2. The NL1 or NL2 does not operate with the service power supply of the PC (Programmable Controller) because the negative end of the service power supply is not grounded. The noise immunity performance of the PC will be degraded if the negative end of the service power supply is grounded.

Provided that single-phase 200 V is supplied to the NL3, if one phase is grounded, the power supply will be short-circuited and a machinery breakdown will result. Use an isolating transformer and ground the secondary side of the transformer instead.

In the above case, be sure to ground the secondary side, otherwise the NL may not operate.



Note: The lead wire colors of the NL have been changed in compliance with the latest applicable JIS standards. Colors in parentheses are previous ones.

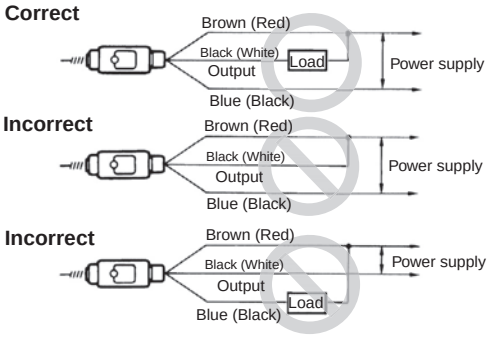
Others

Do not disassemble the NL, otherwise the internal wiring will be damaged and the NL will fail to operate.

Make sure that the conduit opening is free of foreign materials or cuttings.

The sealing of the NL uses nitrile butadien rubber (NBR), which is highly oil resistive. If exposed to some types of oil or chemical indoors or outdoors, however, the NBR may deteriorate. Contact your OMRON representative for details.

Make sure that the load is connected according to the connection diagram. The internal circuit of the NL will break due to mistakes in wiring or load short-circuiting.



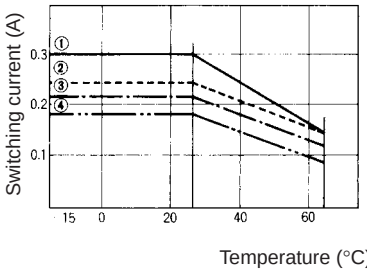
Note: The lead wire colors of the NL have been changed in compliance with the latest applicable JIS standards. Colors in parentheses are previous ones.

Remove the warning label on the end of the connection cable before wiring.

Load Switching

The NL3 switches AC loads. The maximum switching load varies with the ambient temperature as shown in the following graph of load characteristic curves.

Load Characteristic Curves



Note: 1. Load ① is an inductive load with a maximum repetitive operation rate of once per 5-minute period or resistive load.

2. Load ② is an inductive load with a maximum repetitive operation rate of 3 times per minute.

3. Load ③ is an inductive load with a maximum repetitive operation rate of 30 times per minute.

4. Load ④ is an inductive load with a maximum repetitive operation rate of 300 times per minute.

5. Except for the resistive load, the characteristic curves cover repetitive operations in an ON-to-OFF ratio of 1:1. If the OFF period is extremely short in actual application, use 80% of the above values.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C113-E1-03

On-site Flexible Rod Switch
TP70

Easy on-site input on-the-move.

- Incorporation of plastic rod actuator makes the Switch easy on hands.
- One-way operation:
  Equipped with stopper so that operation is only possible from one direction.
- Distinctive yellow used for the body.
- Three different types of mounting are available.
- Models with emergency-stop switch are available to suit the application.

Model Number Structure

■ Model Number Legend

TP70-□□□
1 2 3

1. **Built-in Switch Model**
   1: D4D-2187N
2. **Function**
   A: Integrated switch only
   S: With separable emergency-stop switch
3. **Mounting Method**
   1: Front mounting
   2: Base mounting (with height adjustment)
   3: C-clamp mounting (with height adjustment)

Ordering Information

■ List of Models

Name	Mounting method	Model
On-site Flexible Rod Switch (integrated switch only)	Front mounting	TP70-1A1
	Base mounting	TP70-1A2
	C-clamp mounting	TP70-1A3
On-site Flexible Rod Switch (with separable emergency-stop switch)	Front mounting	TP70-1S1
	Base mounting	TP70-1S2
	C-clamp mounting	TP70-1S3

Specifications

■ Ratings

Rated voltage	Non-inductive load				Inductive load			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10 A	10 A	3 A	1.5 A	10 A	10 A	5 A	2.5 A
30 VDC	6 A	6 A	4 A	3 A	6 A	6 A	4 A	4 A
125 VDC	0.8 A	0.8 A	0.2 A	0.2 A	0.8 A	0.8 A	0.2 A	0.2 A

Note: 1. The above figures are for steady-state currents.
2. Lamp loads have an inrush current of 10 times the steady-state current.
3. Inductive loads have a power factor of 0.4 min. (AC), or a time constant of 7 ms max. (DC).
4. Motor loads have an inrush current of 6 times the steady-state current.

■ Characteristics

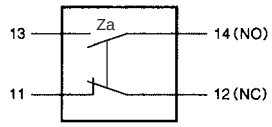
Degree of protection (See note 3.)		IP65
Vibration resistance		Malfunction: 10 to 55 Hz, 0.65-mm single amplitude, 100 m/s^2 max.
Shock resistance		Destruction: 1,000 m/s^2 max. Malfunction: 20 m/s^2 max.
Ambient temperature		Operating: –10°C to 70°C
Ambient humidity		Operating: 35% to 95%
Built-in switch specifications	**Switch model**	D4D-2187N
	Allowable operating speed	1 mm/s to 0.5 m/s
	Allowable operating frequency	Mechanical: 60 operations/min Electrical: 30 operations/min (with resistive load)
	Durability (See note 4.)	Mechanical: 1,000,000 operations min. Electrical: 200,000 operations min. (for a resistive load of 10 A at 125 VAC)
	Contact type	SPST-NO+SPST-NC
	Terminal type	Screw terminals
Emergency-stop switch specifications	**Switch model**	A165E-M-02
	Operating method	Slow action, positive-opening mechanism
	Operating functions	Push to lock, turn to reset Contact is opened by pushing in switch and closed by returning switch to original position.
	Contact type	DPST-NC
	Operating part	Size: 40 dia. Color: red, non-illuminated
	Terminal type	Soldered terminals

Note: 1. The values in the above table are the initial values.
2. For more details on specifications, refer to individual specification sheets for the relevant models.
3. The specification given for the degree of protection is for the built-in switch (D4D-2187N) and does not apply to the casing for the whole product.
4. The durability values shown above are for operation at an ambient temperature of 5°C to 35°C, an ambient humidity of 40% to 70%, with an operating stroke of 30 mm at a point 20 mm away from the end of the actuator.
Contact your OMRON representative for details on other operating conditions.

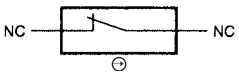
Connections

■ Contact Form

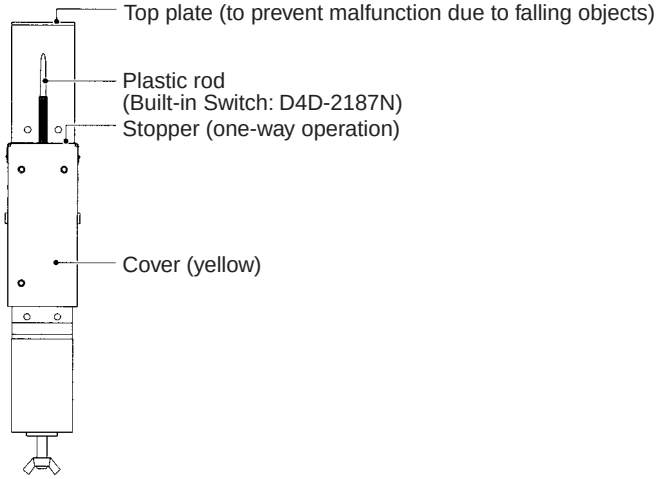
Built-in Switch



Emergency-stop Switch



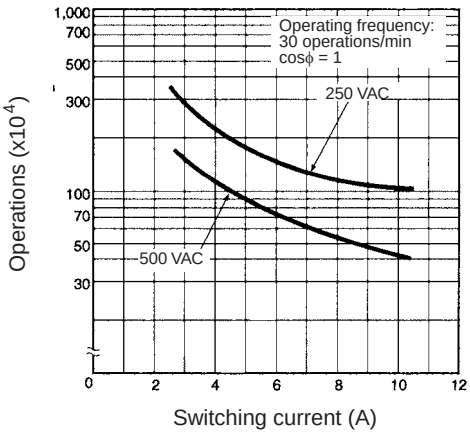
Nomenclature



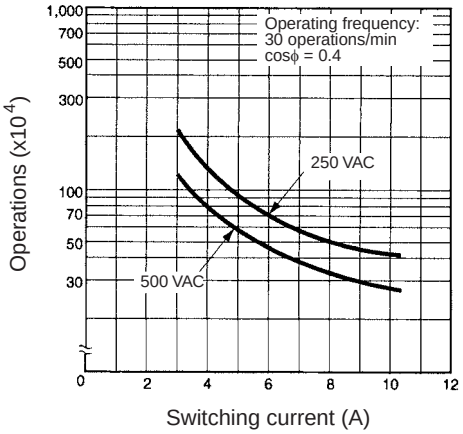
Engineering Data

Electrical Durability (SPST-NO+SPST-NC; Snap-action)

(cosϕ = 1)



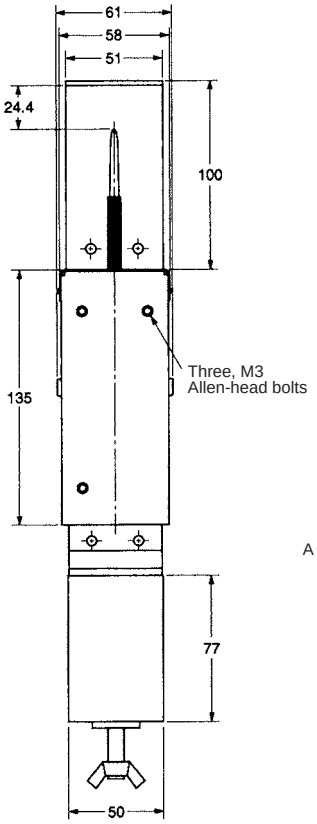
(cosϕ = 0.4)

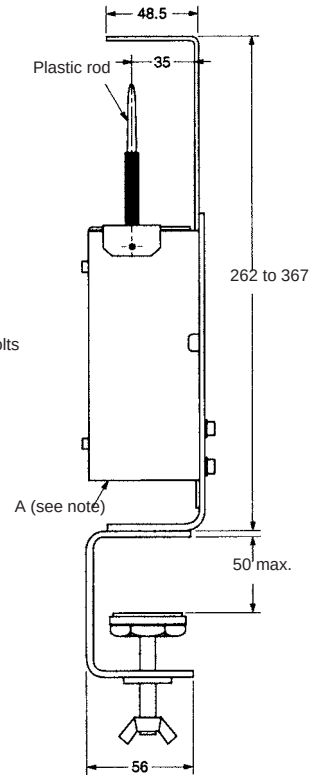


Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±4 mm applies to all dimensions.

TP70-1A3





Note: There is no base plate at A.

■ Operating Characteristics

Item	Standard value
OF max.	1.47 N
PT	15° max.

Precautions

Refer to the *"Precautions for General-purpose Limit Switches (Including Multiple Limit Switches, Mechanical Touch Switches, High-precision Switches, Touch Switches, On-site Flexible Switches; Not Including Safety Switches)" on page 17.*

■ Notice

Do not use the product in installations that require safety countermeasures for operation, such as presses, shears, mills, spinning machinery, or cotton-making machinery.

To prevent damage to the switch due to short-circuiting, connect a fuse that has a breaking current value of 1.5 to 2 times the rated current in series with the switch.

Do not use the product in locations subject to explosive or flammable gases.

Be sure to use the product only at load currents less than the rated values.

The casing has no sealing properties. The bottom of the casing is open. Do not use the product in locations subject to splashes of oil or chemicals. Do not handle the product with oily or wet hands. Bringing the product into contact with certain types of oil or chemical may result in faulty contact, insulation problems, current leakage, or fire.

■ Correct Use

Operating Environment

1. Do not use the product in the following environments:
- Locations subject to severe changes in temperature.
- Locations subject to condensation as a result of high humidity.
- Locations subject to severe vibration.

2. The product is intended for indoor use only. Using the product outdoors may result in malfunction.

Tightening Torque

Type	Proper tightening torque
Main body mounting screws (M5 screws)	2.4 to 2.7 N·m
Terminal screws (M3.5 screws)	0.59 to 0.78 N·m
Mounting screws for built-in switch cover	0.78 to 0.88 N·m
Connectors	1.8 to 2.2 N·m
Stopper mounting bolts (M3 Allen-head bolts)	12.7 to 19.3 N·m
Cover mounting bolts (M3 Allen-head bolts)	12.7 to 19.3 N·m

Removing the Cover

Remove the cover by loosening the Allen-head bolts that are located in 3 places on the front of the cover, and perform wiring for the built-in switch and indicator. After wiring is completed, remount the cover by tightening the bolts to the correct torque.

Wiring

Do not connect the lead wires for the built-in switch or counter directly to terminals. Wire via insulating tubes and crimp terminals and tighten securely.

Connect lead wires to the indicator or emergency-stop switch by soldering. Perform soldering at 30 W within 5 seconds. Do not apply any external force to the soldered parts for 1 minute after soldering.

Processing the Conduit Opening

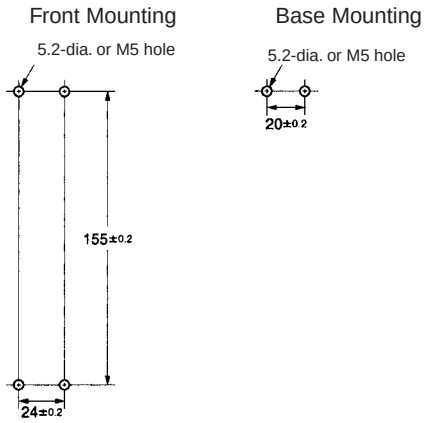
Tighten the connector to a torque of 1.8 to 2.2 N·m. Excessive tightening torque may damage the casing.

Mounting the Main Body

Front Mounting and Base Mounting

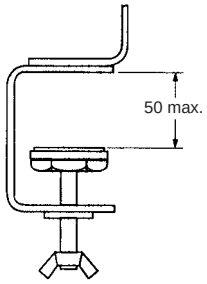
Mount the product using M5 screws and washers. Be sure to tighten the screws to the correct torque.

Mounting Hole Dimensions



C-clamp Mounting

Mount the product using a wing nut. Ensure that there is no looseness or rattling. The maximum mountable panel thickness is 50 mm.



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

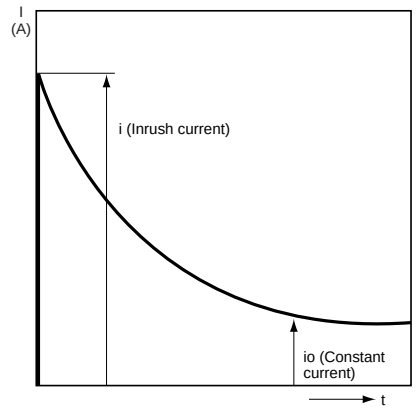
Cat. No. C119-E1-03

Precautions for All Safety Switches

Note: Refer to the Safety *Precautions* section for each Switch for specific precautions applicable to each Switch.

■ Precautions for Safe Use

- If the Switch is to be used as a switch in an emergency stop circuit or in a safety circuit for preventing accidents resulting in injuries or deaths, use a Switch with a direct opening mechanism, use the NC contacts with a forced release mechanism, and set the Switch so that it will operate in direct opening mode.
  For safety, install the Switch using one-way rotational screws or other similar means to prevent it from easily being removed. Protect the Switch with an appropriate cover and post a warning sign near the Switch to ensure safety.
- Do not perform wiring while power is being supplied. Wiring while the power is being supplied may result in electric shock.
- Keep the electrical load below the rated value.
- Be sure to evaluate the Switch under actual working conditions after installation.
- Do not touch the charged Switch terminals while the Switch has carry current, otherwise an electric shock may be received.
- If the Switch has a ground terminal, be sure to connect the ground terminal to a ground wire.
- Do not disassemble the Switch while the power is being supplied. Doing so may result in electric shock.
- The durability of the Switch greatly varies with switching conditions. Before using the Switch, be sure to test the Switch under actual conditions. Make sure that the number of switching operations is within the permissible range.
  If a deteriorated Switch is used continuously, insulation failures, contact welding, contact failures, Switch damage, or Switch burnout may result.
- Maintain an appropriate insulation distance between wires connected to the Switch.
- Some types of load have a great difference between normal current and inrush current. Make sure that the inrush current is within the permissible value. The greater the inrush current in the closed circuit is, the greater the contact abrasion or shift will be. Consequently, contact welding, contact separation failures, or insulation failures may result. Furthermore, the Switch may become broken or damaged.



- The user must not attempt to repair or maintain the Switch and must contact the machine manufacturer for any repairs or maintenance.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- Do not drop the Switch. Doing so may result in the Switch not performing to its full capability.

Wiring

Pay the utmost attention so that each terminal is wired correctly. If the terminal is wired incorrectly, the Switch will not function. Furthermore, not only will the Switch have a negative influence on the external circuit, the Switch itself may become damaged or burnt.

Mounting

- Do not modify the Actuator, otherwise the operating characteristics and performance of the Actuator will change.
- Do not enlarge the mounting holes of the Switch or modify the Switch, otherwise insulation failures, housing damage, or human accidents may result.
- Be sure to evaluate the Switch under actual working conditions after installation.
- Do not apply oil, grease, or other lubricants to the moving parts of the Actuator, otherwise the Actuator may not operate correctly. Furthermore, ingress of oil, grease, or other lubricants inside the Switch may reduce sliding characteristic or cause failures in the Switch.
- Mount the Switch and secure it with the specified screws tightened to the specified torque along with flat and spring washers.
- Be sure to wire the Switch so that the conduit opening is free of metal powder or any other impurities.
- If glue or bonding agent is applied, make sure that it does not adhere to the movable parts or enter the Switch, otherwise the Switch may not work correctly or cause contact failure. Some types of glue or bonding agent may generate a gas that may have a negative influence on the Switch. Pay the utmost attention when selecting the glue or locking agent.
- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capability. Furthermore, the Switch may become broken or burnt.
- Some models allow changes in the head direction. When changing the head of such a model, make sure that the head is free of any foreign substance. Tighten each screw of the head to the rated torque.
- Be sure to take measures so that no foreign material, oil, or water will enter the Switch through the conduit opening. Be sure to attach a connector suitable for the cable thickness and tighten the connector securely to the rated torque.
- Do not impose shock or vibration on the Actuator while it is fully pressed. Otherwise, the Actuator will partially abrade and an actuation failure may result.

■ Precautions for Correct Use

Switch Operation

- The Switch in actual operation may cause accidents that cannot be foreseen from the design stage. Therefore, the Switch must be practically tested before actual use.
- When testing the Switch, be sure to apply the actual load conditions together with the actual operating environment.
- All the performance ratings in this catalog are provided under the following conditions unless otherwise specified.

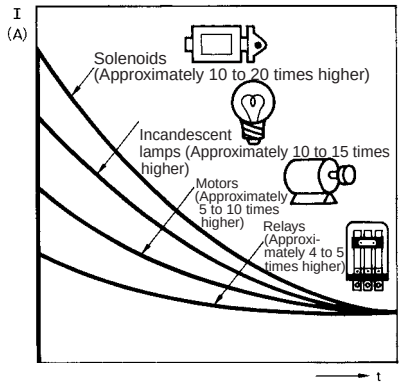
Inductive load: A minimum power factor of 0.4 (AC) or a maximum time constant of 7 ms (DC)

Lamp load: An inrush current 10 times higher than the normal current

Motor load: An inrush current 6 times higher than the normal current

1. Ambient temperature: 5°C to 35°C
2. Ambient humidity: 40% to 70%.

Note: An inductive load causes a problem especially in DC circuitry. Therefore, it is essential to know the time constants (L/R) of the load.



Mechanical Conditions for Switch Selection

- An Actuator suitable for the operating method must be selected. Ask your OMRON representative for details.
- Check the operating speed and switching frequency.
  1. If the operating speed is extremely low, switching of the movable contact will become unstable, thus resulting in incorrect contact or contact welding.
  2. If the operating speed is extremely high, the Switch may break due to shock. If the switching frequency is high, the switching of the contacts cannot keep up with the switching frequency. Make sure that the switching frequency is within the rated switching frequency.
- Do not impose excessive force on the Actuator, otherwise the Actuator may become damaged or not operate correctly.
- Make sure that the stroke is set within the suitable range specified for the model, or otherwise the Switch may break.

Electrical Characteristics for Switch Selection

Electrical Conditions

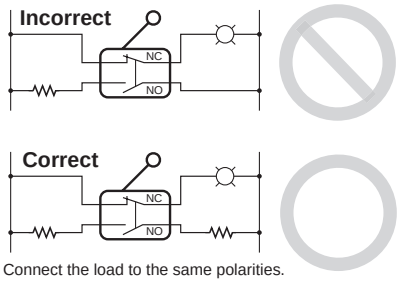
- The switching load capacity of the Switch greatly varies between AC and DC. Always be sure to apply the rated load. The control capacity will drastically drop if it is a DC load. This is because a DC load has no current zero-cross point, unlike an AC load. Therefore, if an arc is generated, it may continue comparatively for a long time. Furthermore, the current direction is always the same, which results in contact relocation, whereby the contacts easily stick to each other and do not separate when the surfaces of the contacts are uneven.
- If the load is inductive, counter-electromotive voltage will be generated. The higher the voltage is, the higher the generated energy will be, which will increase the abrasion of the contacts and contact relocation load conditions. Be sure to use the Switch within the rated conditions.
- If the load is a minute voltage or current load, use a Switch designed for minute loads. The reliability of silver-plated contacts, which are used by standard Switches, will be insufficient if the load is a minute voltage or current load.

Connections

- With a Za contact form, do not contact a single Switch to two power supplies that are different in polarity or type.

Power Connection Examples

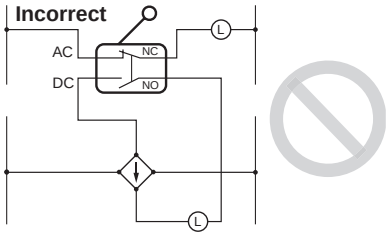
(Connection of Different Polarities)



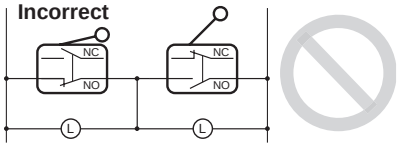
Connect the load to the same polarities.

Incorrect Power Connection Example

(Connection of Different Power Supplies)
There is a risk of AC and DC mixing.



- Do not use a circuit that will short-circuit if a fault occurs, otherwise the charged part may melt and break off.



- Application of Switch to a Low-voltage, Low-current Electronic Circuit
  1. If bouncing or chattering of the contacts results and causes problems, take the following countermeasures.

(a) Insert an integral circuit.

(b) Suppress the generation of pulses from the contact bouncing or chattering of the contacts so that it is less than the noise margin of the load.

2. Conventional silver-plated contacts are not suitable for this application, in which particularly high reliability is required. Use gold-plated contacts, which are ideal for handling minute voltage or current loads.

3. The contacts of the Switch used for an emergency stop must be normally closed with a positive opening mechanism.

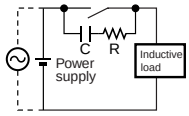
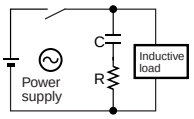
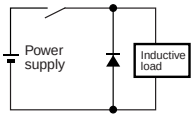
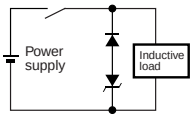
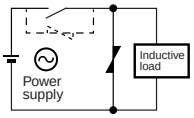
- To protect the Switch from damage due to short-circuits, be sure to connect in series a quick-response fuse with a breaking current 1.5 to 2 times larger than the rated current to the Switch. When complying with EN certified ratings, use a 10-A IEC 60269-compliant gI or gG fuse.

Contact Protective Circuits

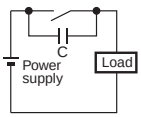
Apply a contact protective circuit to increase the contact durability, prevent noise, and suppress the generation of carbide or nitric acid. Be sure to apply the contact protective circuit correctly, otherwise an adverse effect may occur.

The following provides typical examples of contact protective circuits. If the Switch is used in an excessively humid location for switching a load that easily generates arcs, such as an inductive load, the arcs may generate NOx, which will change into HNO_3 when it reacts with moisture. Consequently, the internal metal parts may corrode and the Switch may fail. Be sure to select the best contact preventive circuit from the following.

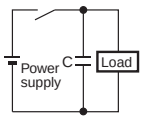
Typical Examples of Contact Protective Circuits

Circuit example		Applicable current		Feature	Element selection
		AC	DC		
CR circuit		*	Yes	*When AC is switched, the load impedance must be lower than the CR impedance.	C: 1 to 0.5 μF x switching current (A) R: 0.5 to 1 Ω x switching voltage (V) The values may change according to the characteristics of the load. The capacitor suppresses the spark discharge of current when the contacts are open. The resistor limits the inrush current when the contacts are closed again. Consider the roles of the capacitor and resistor and determine ideal capacitance and resistance values through testing. Use a capacitor that has a low dielectric strength. When AC is switched, make sure that the capacitor has no polarity.
		Yes	Yes	The operating time will be greater if the load is a relay or solenoid. Connecting the CR circuit in parallel to the load is effective when the power supply voltage is 24 or 48 V and in parallel to the contacts when the power supply voltage is 100 to 200 V.	
Diode method		No	Yes	Energy stored in the coil is changed into current by the diode connected in parallel to the load. Then the current flowing to the coil is consumed and Joule heat is generated by the resistance of the inductive load. The reset time delay with this method is longer than that in the CR method.	The diode must withstand a peak inverse voltage 10 times higher than the circuit voltage and a forward current as high or higher than the load current.
Diode and Zener diode method		No	Yes	This method will be effective if the reset time delay caused by the diode method is too long.	Use a Zener diode at a low Zener voltage.
Varistor method		Yes	Yes	This method makes use of constant-voltage characteristic of the varistor so that no high-voltage is imposed on the contacts. This method causes a reset time delay. Connecting a varistor in parallel to the load is effective when the supply voltage is 24 to 48 V and in parallel to the contacts when the supply voltage is 100 to 200 V.	---

Do not apply contact protective circuits as shown below.



This circuit effectively suppresses arcs when the contacts are OFF. The capacitor contacts are OFF. Consequently, when the contacts are ON again, short-circuited current from the capacitance may cause contact weld.

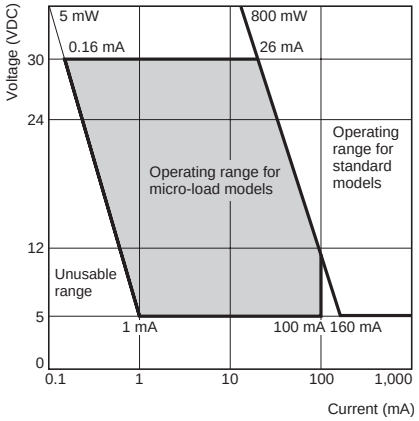


This circuit effectively suppresses arcs when the contacts are OFF. When the contacts are ON again, however, charge current will flow to the capacitor, which may result in contact weld.

Switching a DC inductive load is usually more difficult than switching a resistive load. By using an appropriate contact protective circuit, however, switching a DC inductive load will be as easy as switching a resistive load.

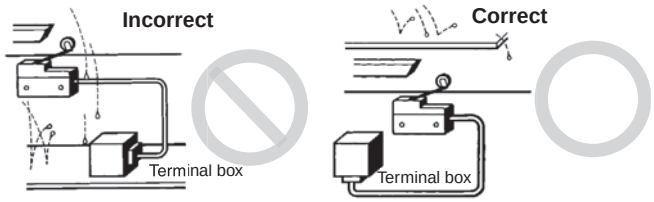
Using Switches for Microloads

Contact failure may occur if a Switch for a general load is used to switch a microload circuit. Use Switches in the ranges shown in the diagram on the right. However, even when using microload models within the operating range shown here, if inrush current occurs when the contact is opened or closed, it may increase contact wear and so decrease durability. Therefore, insert a contact protection circuit where necessary. The minimum applicable load is the N-level reference value. This value indicates the malfunction reference level for the reliability level of 60% (λ60). The equation, $\lambda 60 = 0.5 \times 10^{-6}$/operations indicates that the estimated malfunction rate is less than 1/2,000,000 operations with a reliability level of 60%.

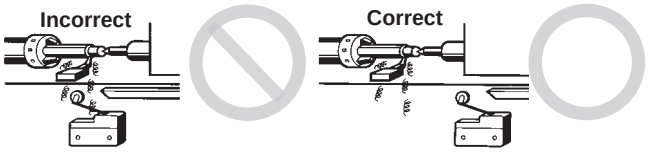


Operating Environment

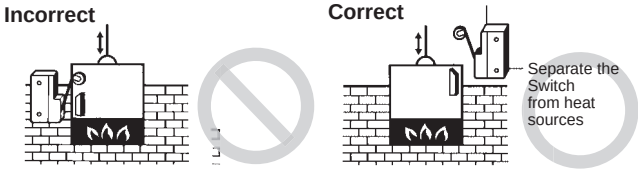
- Do not use the Switch by itself in atmospheres containing flammable or explosive gases. Arcs and heating resulting from switching may cause fire or explosion.
- The Switches are designed for use indoors. Using a Switch outdoors may cause it to malfunction.
- Do not use the Switch submerged in oil or water, or in locations continuously subject to splashes of water. Doing so may result in oil or water entering the Switch interior.
- Confirm suitability (applicability) in advance before using the Switch where it would be subject to oil, water, chemicals, or detergents. Contact with any of these may result in contact failure, insulation failure, earth leakage faults, or burning.
- Do not use the Switch in the following locations:
  - Locations subject to corrosive gases
  - Locations subject to severe temperature changes
  - Locations subject to high humidity, resulting in condensation
  - Locations subject to severe vibration
  - Locations subject to cutting chips, dust, or dirt
  - Locations subject to high humidity or high temperature
- Use protective covers to protect Switches that are not specified as waterproof or airtight whenever they are used in locations subject to splattering or spraying oil or water, or to accumulation of dust or dirt.



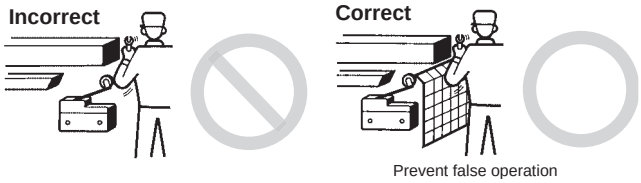
- Be sure to install the Switch so that the Switch is free from dust or metal powder. The Actuator and the Switch casing must be protected from the accumulation of dust or metal powder.



- Do not use the Switch in locations where the Switch is exposed to steam or hot water at a temperature greater than 60°C.
- Do not use the Switch under temperatures or other environmental conditions not within the specified ranges. The rated permissible ambient temperature range varies with the model. Refer to the *Specifications* in this catalog.
  If the Switch is exposed to radical temperature changes, the thermal shock may deform the Switch and the Switch may malfunction.



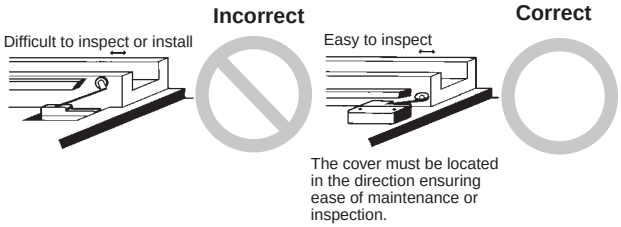
- Be sure to protect the Switch with a cover if the Switch is in a location where the Switch may be actuated by mistake or where the Switch is likely cause an accident.



- Make sure to install the Switch in locations free of vibration or shock. If vibration or shock is continuously imposed on the Switch, contact failure, malfunction, or decrease in service life may be caused by abrasive powder generated from the internal parts. If excessive vibration or shock is imposed on the Switch, the contacts may malfunction or become damaged.
- Do not use the Switch with silver-plated contacts for long periods if the switching frequency of the Switch is comparatively low or the load is minute. Otherwise, sulfuric film will be generated on the contacts and contact failures may result. Use the Switch with gold-plated contacts or use a Switch designed for minute loads instead.
- Do not use the Switch in locations with corrosive gas, such as sulfuric gas (H_2S or SO_2), ammonium gas (NH_3), nitric gas (HNO_3), or chlorine gas (Cl_2), or high temperature and humidity. Otherwise, contact failure or corrosion damage may result.
- If the Switch is used in locations with silicone gas, arc energy may create silicon dioxide (SiO_2) on the contacts and a contact failure may result. If there is silicone oil, silicone sealant, or wire covered with silicone close to the Switch, attach a contact protective circuit to suppress the arcing of the Switch or eliminate the source of silicone gas generation.

Regular Inspection and Replacement

- If the Switch is normally closed with low switching frequency (e.g., once or less per day), a reset failure may result due to the deterioration of the parts of the Switch. Regularly inspect the Switch and make sure that the Switch is in good working order.
- In addition to the mechanical durability or electrical durability of the Switch described previously, the durability of the Switch may decrease due to the deterioration of each part, especially rubber, resin, and metal. Regularly inspect the Switch and replace any part that has deteriorated to prevent accidents from occurring.
- If the Switch is not turned ON and OFF for a long period of time, contact reliability may be reduced due to contact oxidation. Continuity failure may result in accidents (i.e., the switch may not turn ON due to increased contact resistance.)
- Be sure to mount the Switch securely in a clean location to ensure ease of inspection and replacement. The Switch with operation indicator is available, which is ideal if the location is dark or does not allow easy inspection or replacement.



Storage of Switch

- When storing the Switch, make sure that the location is free of corrosive gas, such as H_2S, SO_2, NH_3, HNO_3, or Cl_2, or dust and does not have a high temperature or humidity.
- Be sure to inspect the Switch before use if it has been stored for three months or more.

Typical Problems, Probable Causes, and Remedies

Problem		Probable cause	Remedy
Mechanical failure	1. The Actuator does not operate. 2. The Actuator does not return. 3. The Actuator has been deformed. 4. The Actuator is worn. 5. The Actuator has been damaged.	The shape of the dog or cam is incorrect.	• Change the design of the dog or cam and smooth the contacting surface of the cam. • Scrutinize the suitability of the Actuator. Make sure that the Actuator does not bounce.
		The contacting surface of the dog or cam is rough.	
		The Actuator in use is not suitable.	
		The operating direction of the Actuator is not correct.	
		The operation speed is excessively high.	• Attach a decelerating device or change the mounting position of the Switch.
		Excessive stroke.	• Change the stroke.
		The rubber or grease hardened due to low temperature.	• Use a cold-resistive Switch.
		The accumulation of sludge, dust, or cuttings.	• Use a drip-proof model or one with high degree of protection. • Use a protection cover and change the solvent and materials.
		Dissolution, expansion, or swelling damage to the rubber parts of the driving mechanism.	
	There is a large deviation in operating position (with malfunctioning involved).	Damage to and wear and tear of the internal movable spring.	• Regularly inspect the Switch. • Use a better quality Switch. • Tighten the mounting screws securely. Use a mounting board.
		Wear and tear of the internal mechanism.	
		The loosening of the mounting screws causing the position to be unstable.	
	The terminal part wobbles. (The mold part has been deformed.)	Overheating due to a long soldering time.	• Solder the Switch quickly. • Change the lead wire according to the carry current and ratings.
		The Switch has been connected to and pulled by thick lead wires with excessive force.	
		High temperature or thermal shock resulted.	• Use a temperature-resistive Switch or change mounting positions.
Failures related to chemical or physical characteristics	Contact chattering	Vibration or shock is beyond the rated value.	• Attach an anti-vibration mechanism. • Attach a rubber circuit to the solenoid. • Increase the operating speed (with an accelerating mechanism).
		Shock has been generated from a device other than the Switch.	
		Too-slow operating speed.	
	Oil or water penetration	The sealing part has not been tightened sufficiently.	• Use a drip-proof or waterproof Switch. • Use the correct connector and cable.
		The wrong connector has been selected and does not conform to the cable.	
		The wrong Switch has been selected.	
		The terminal part is not molded.	
		The Switch has been burnt or carbonated due to the penetration of dust or oil.	
	Deterioration of the rubber part	The expansion and dissolution of the rubber caused by solvent or lubricating oil.	• Use an oil-resistant rubber or fluororesin bellows. • Use a weather-resistant rubber or protective cover. • Use a Switch with a metal bellows protective cover.
		Cracks due to direct sunlight or ozone.	
		Damage to the rubber caused by scattered or heated cuttings.	
	Corrosion (rusting or cracks)	The oxidation of metal parts resulted due to corrosive solvent or lubricating oil.	• Change the lubricating oil. • Change mounting positions. • Use a crack-resistant material.
		The Switch has been operated in a corrosive environment, near the sea, or on board a ship.	
		The electrical deterioration of metal parts of the Switch resulted due to the ionization of cooling water or lubricating oil.	
		The cracking of alloyed copper due to rapid changes in temperature.	
Failures related to electric characteristics	No actuation. No current breakage. Contact welding	Inductive interference in the DC circuit.	• Add an erasing circuit.
		Carbon generated on the surface of the contacts due to switching operations.	• Use a Switch with a special alloy contact or use a sealed Switch.
		A short-circuit or contact welding due to contact migration.	• Reduce the switching frequency or use a Switch with a large switching capacity.
		Contact welding due to an incorrectly connected power source.	• Change the circuit design.
		Foreign materials or oil penetrated into the contact area.	• Use a protective box.

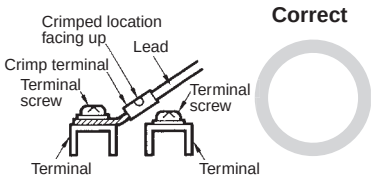
Maintenance and Repairs

- The user of the system must not attempt to perform maintenance and repairs. Contact the manufacturer of the system concerning maintenance and repairs

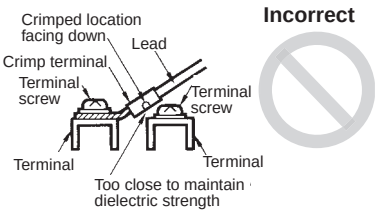
Other

- The standard material for the Switch seal is nitrile rubber (NBR), which has superior resistance to oil. Depending on the type of oil or chemicals in the application environment, however, NBR may deteriorate, e.g., swell or shrink. Confirm performance in advance.
- The correct Switch must be selected for the load to ensure contact reliability. Refer to *Precautions* for microloads in individual product information for details.
- Wire the leads as shown in the following diagram.

Correct Wiring



Incorrect Wiring



Precautions for All Safety Limit Switches

Note: Refer to the *Safety Precautions* section for each Switch for specific precautions applicable to each Switch.

■ Precautions for Safe Use

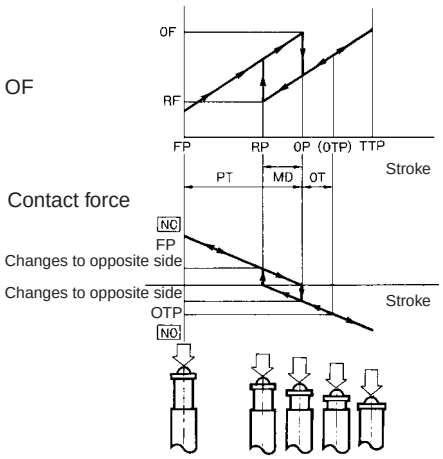
- Do not use the Switch in atmospheres containing explosive or flammable gases.
- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capability.
- Check the Switches before use and inspect regularly, replacing them when necessary. If a Switch is kept pressed for an extended period of time, the components may deteriorate quickly, and the Switch may not release.
- To protect the Switch from damage due to short-circuits, be sure to connect a quick-response fuse with a breaking current 1.5 to 2 times larger than the rated current in series with the Switch. When complying with EN certified ratings, use a 10-A IEC 60269-compliant gI or gG fuse.
- Do not use the Switch in a startup circuit. Use it instead for a safety confirmation signal.

■ Precautions for Correct Use

Mechanical Characteristics

Operating Force, Stroke, and Contact Characteristics

- The following graph indicates the relationship between operating force and stroke or stroke and contact force. In order to operate the Limit Switch with high reliability, it is necessary to use the Limit Switch within an appropriate contact force range. If the Limit Switch is used in the normally closed condition, the dog must be installed so that the actuator will return to the FP when the actuator is actuated by the object. If the Limit Switch is used in the normally open condition, the actuator must be pressed to 80% to 100% of the OT (i.e., 60% to 80% of the TT) and any slight fluctuation must be absorbed by the actuator.
- If the full stroke is set close to the OP or RP, contact instability may result. If the full stroke is set to the TTP, the actuator or switch may become damaged due to the inertia of the dog. In that case, adjust the stroke with the mounting panel or the dog. Refer to page 248, *Dog Design*, page 249, *Stroke Settings vs. Dog Movement Distance*, and page 249, *Dog Surface* for details.
- The following graph shows an example of changes in contact force according to the stroke. The contact force near the OP or RP is unstable, and the Limit Switch cannot maintain high reliability. Furthermore, the Limit Switch cannot withstand strong vibration or shock.



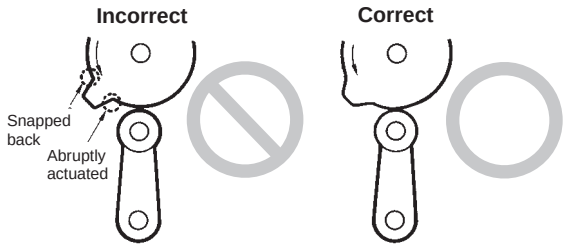
- If the Limit Switch is used so that the actuator is constantly pressed, it will fail quickly and reset faults may occur. Inspect the Limit Switch periodically and replace it as required.

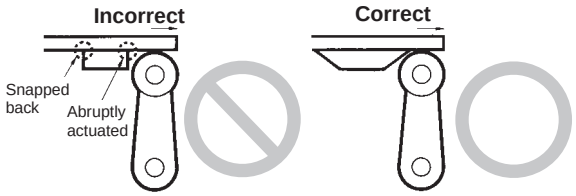
Mechanical Conditions

The actuator must be selected according to the operating method. Ask your OMRON representative for details.

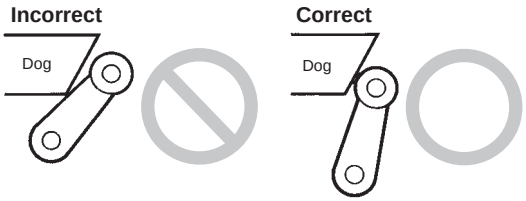
Operation

- Carefully determine the proper cam or dog so that the actuator will not abruptly snap back, thus causing shock. In order to operate the Limit Switch at a comparatively high speed, use a cam or dog with a long enough stroke that keeps the Limit Switch turned ON for a sufficient time so that the relay or valve will be sufficiently energized.
- The operating method, the shape of the dog or cam, the operating frequency, and the travel after operation have a large influence on the durability and operating accuracy of the Limit Switch. The cam must be smooth in shape.

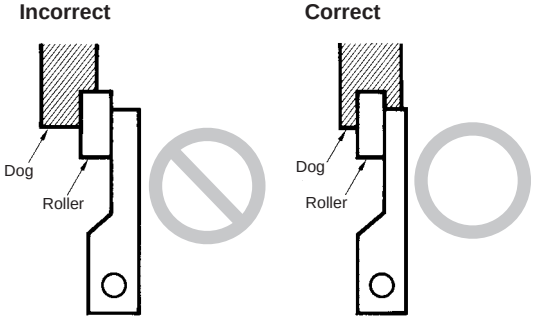




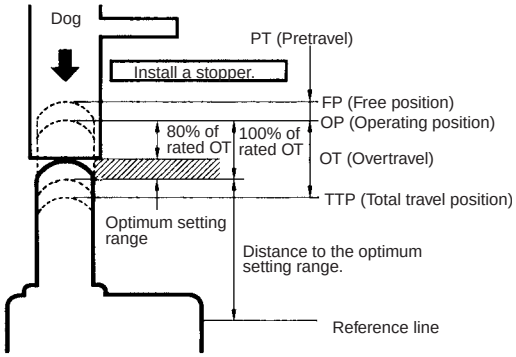
- Appropriate force must be imposed on the actuator by the cam or another object in both rotary operation and linear operation. If the object touches the lever as shown below, the operating position will not be stable.



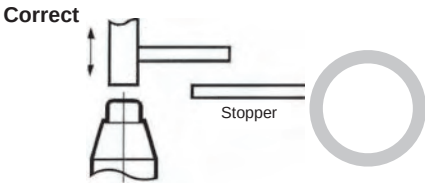
- Unbalanced force must not be imposed on the actuator. Otherwise, wear and tear on the actuator may result.



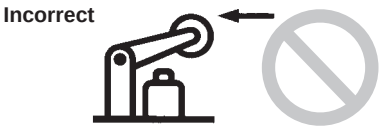
- Make sure that the actuator does not exceed the OT (overtravel) range, otherwise the Limit Switch may malfunction. When mounting the Limit Switch, be sure to adjust the Limit Switch carefully while considering the whole movement of the actuator.



- The Limit Switch may soon malfunction if the OT is excessive. Therefore, adjustments and careful consideration of the position of the Limit Switch and the expected OT of the actuator are necessary when mounting the Limit Switch.



- Be sure to use the Limit Switch according to the characteristics of the actuator. If a roller arm lever actuator is used, do not attempt to actuate the Limit Switch in the direction shown below.



- Do not modify the actuator to change the OP.
- In the case of a long actuator of an adjustable roller lever type, the following countermeasures against lever shaking are recommended.

1. Make the rear edge of the object smooth with an angle of 15° to 30° or make it in the shape of a quadratic curve.
2. Design the circuit so that no error signal will be generated.
3. Use or set a switch that is actuated in one direction only. (Also, set the switch for operation in one direction only.)

Operating Environment

These Switches are for indoor applications. The Switches may fail if they are used outdoors. Do not use them in oil. Do not use them in water or where they will be continually subjected to water. Water may enter the Switches.

If using Switches where they will be subjected to oil, water, chemicals, or detergents, confirm suitability (i.e., that the Switches will not be adversely affected). Depending on the type of oil, the nature of the water, or the type of chemicals, seals may deteriorate, causing contact failures, insulation failures, earth-leakage faults, or burning.

Do not use the Switches in the following locations.

- Locations subject to severe temperature changes
- Locations subject to high temperatures or condensation
- Locations subject to severe vibration
- Locations where the interior of the Protective Door may come into direct contact with cutting chips, metal filings, oil, or chemicals
- Locations where the Switch may come into contact with thinner or detergents
- Locations where explosive or flammable gases are present

Switch Durability

The durability of the Switch is greatly influenced by the switching conditions. Always test the Switch under actual conditions before application and use it in a switching circuit for which there are no problems with performance.

Maintenance and Repairs

The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.

Storing Switches

Do not store Switches where any of the following are present: sulfuric gas (H_2S or SO_2), ammonium gas (NH_3), nitric gas (HNO_3), chlorine gas (Cl_2), high temperatures, or high humidity.

Other Precautions

- Be sure that the seal rubber is in place and that there is no foreign material present. If the cover is attached with the seal rubber out of place or if foreign material is stuck to the rubber, a proper seal will not be obtained.
- Perform maintenance inspections periodically.
- Use the Switch with a load current that does not exceed the rated current.
- Do not use any screws to connect the cover other than the specified ones. The seal characteristics may be reduced.

Dog Design

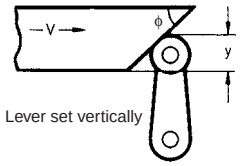
Operating Speed, Dog Angle, and Relationship with Actuator

Before designing a dog, carefully consider the operating speed and angle of the dog and their relationship with the shape of the actuator. The optimum operating speed (V) of a standard dog at an angle of 30° to 45° is 0.5 m/s maximum.

Roller Lever Models

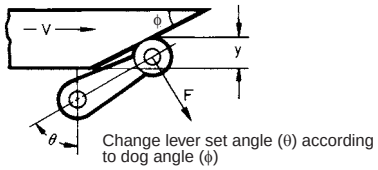
1. Non-overtravel Dog

Dog speed: 0.5 m/s max. (standard speed)



ϕ	V max. (m/s)	y
30° 45° 60° 60° to 90°	0.4 0.25 0.1 0.05 (low speed)	0.8 (TT) 80% of total travel

Dog speed: 0.5 m/s ≤ V ≤ 2 m/s (High Speed)

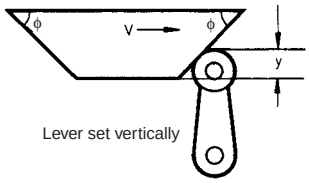


θ	ϕ	V max. (m/s)	y
45°	45°	0.5	0.5 to 0.8 (TT)
50°	40°	0.6	
60° to 55°	30° to 35°	1.3	0.5 to 0.7 (TT)
75° to 65°	15° to 25°	2	

Note: The above y values indicate the ratio ranges based on TT (total travel). Therefore, the optimum pressing distance of the dog is between 50% and 80% (or 50% and 70%).

2. Overtravel Dog

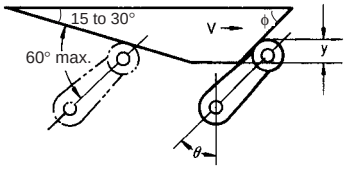
Dog speed: 0.5 m/s max.



ϕ	V max. (m/s)	y
30° 45° 60° 60° to 90°	0.4 0.25 0.1 0.05 (low speed)	0.8 (TT) 80% of total travel

Dog speed: 0.5 m/s min.

If the speed of the overtravel dog is comparatively high, make the rear edge of the object smooth at an angle of 15° to 30° or make it in the shape of a quadratic curve. Then lever shaking will be reduced.



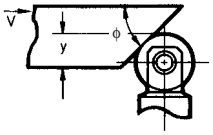
θ	ϕ	V max. (m/s)	y
45°	45°	0.5	0.5 to 0.8 (TT)
50°	40°	0.6	0.5 to 0.8 (TT)
60° to 55°	30° to 35°	1.3	0.5 to 0.7 (TT)
75° to 65°	15° to 25°	2	0.5 to 0.7 (TT)

Note: The above y values indicate the ratio ranges based on TT (total travel). Therefore, the optimum pressing distance of the dog is between 50% and 80% (or 50% and 70%).

Plunger Models

If the dog overrides the actuator, the front and rear of the dog may be the same in shape, provided that the dog is not designed to be separated from the actuator abruptly.

Roller Plunger

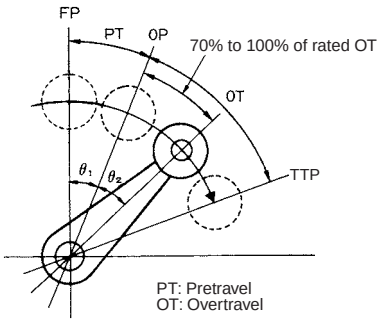


ϕ	V max. (m/s)	y
30° 20°	0.25 0.5	0.6 to 0.8 (TT) 0.5 to 0.7 (TT)

Stroke Settings vs. Dog Movement Distance

- The following provides information on stroke settings based on the movement distance of the dog instead of the actuator angle. The following is the optimum stroke of the Limit Switch.

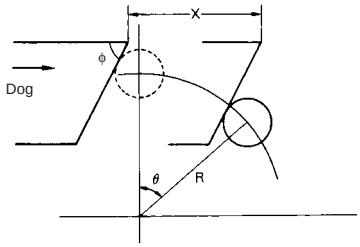
  Optimum stroke: PT + {Rated OT x (0.7 to 1.0)}
  The angle converted from the above: $\theta_1 + \theta_2$



- The movement distance of the dog based on the optimum stroke is expressed by the following formula.

  Movement distance of dog

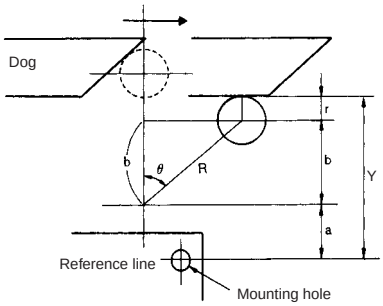
$$X = R\sin\theta + \frac{R(1-\cos\theta)}{\tan\phi}\ (\text{mm})$$



ϕ: Dog angle
θ: Optimum stroke angle
R: Actuator length
X: Dog movement distance

- The distance between the reference line and the bottom of the dog based on the optimum stroke is expressed by the following formula.

$$Y = a + b + r\ (\text{mm})$$



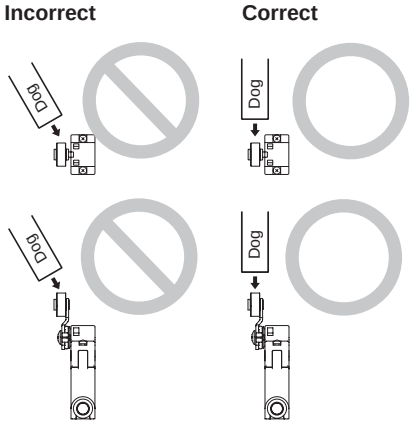
a: Distance between reference line and actuator fulcrum
b: R cosθ
r: Roller radius
Y: Distance between reference line and bottom of dog

Dog Surface

- The surface of dog touching the actuator should be 6.3 S in quality and hardened at approximately HV450.
- For smooth operation of the actuator, apply molybdenum disulfide grease to the actuator and the dog touching the actuator.

Others

- When using the Limit Switch with a long lever or long rod lever, make sure that the lever is in the downward direction.
- With a roller actuator, the dog must touch the actuator at a right angle. The actuator or roller may deform or break if the dog touches the actuator (roller) at an oblique angle.



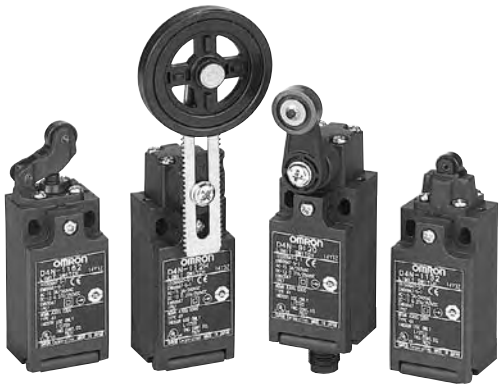
- Do not remove the Head. The Switch may fail.

Safety Limit Switch
D4N

Upgraded Safety Limit Switches Based on the Popular D4D, Providing a Full Lineup Conforming to International Standards

- Lineup includes three contact models with 2NC/1NO and 3NC contact forms in addition to the previous contact forms 1NC/1NO, and 2NC. Models with MBB contacts are also available.
- M12-connector models are available, saving on labor and simplifying replacement.
- Standardized gold-clad contacts provide high contact reliability. Can be used with both standard loads and microloads.
- Conforms to EN115 and EN81-2.
- Lineup includes both slow-action and snap-action models with Zb contacts.
- Certified standards: UL, EN (TÜV), and CCC

Note: Be sure to read the *"Safety Precautions"* on page 268.



Note: Contact your sales representative for details on models with safety standard certification.

Model Number Structure

■ Model Number Legend

D4N-□□□□
1 2 3

1. Conduit/Connector size
- 1: Pg13.5 (1-conduit)
- 2: G1/2 (1-conduit)
- 3: 1/2-14NPT (1-conduit)
- 4: M20 (1-conduit)
- 5: Pg13.5 (2-conduit)
- 6: G1/2 (2-conduit)
- 7: 1/2-14NPT (2-conduit)
- 8: M20 (2-conduit)
- 9: M12 connector (1-conduit)

2. Built-in Switch
- 1: 1NC/1NO (snap-action)
- 2: 2NC (snap-action)
- A: 1NC/1NO (slow-action)
- B: 2NC (slow-action)
- C: 2NC/1NO (slow-action)
- D: 3NC (slow-action)
- E: 1NC/1NO (MBB contact) (slow-action)
- F: 2NC/1NO (MBB contact) (slow-action)

3. Head and Actuator
- 20: Roller lever (resin lever, resin roller)
- 22: Roller lever (metal lever, resin roller)
- 25: Roller lever (metal lever, metal roller)
- 26: Roller lever (metal lever, bearing roller)
- 2G: Adjustable roller lever, form lock (metal lever, resin roller)
- 2H: Adjustable roller lever, form lock (metal lever, rubber roller)
- 31: Top plunger
- 32: Top roller plunger
- 62: One-way roller arm lever (horizontal)
- 72: One-way roller arm lever (vertical)
- 80: Cat whisker
- 87: Plastic rod
- RE: Fork lever lock (right operation)
- LE: Fork lever lock (left operation)

Ordering Information

■ List of Models

Switches with Two Contacts

Actuator	Conduit size		Built-in switch mechanism							
			1NC/1NO (Snap-action)		2NC (Snap-action)		1NC/1NO (Slow-action)		2NC (Slow-action)	
			Direct opening	Model	Direct opening	Model	Direct opening	Model	Direct opening	Model
Roller lever (resin lever, resin roller) 	1-conduit	Pg13.5	⊖	D4N-1120	⊖	D4N-1220	⊖	D4N-1A20	⊖	D4N-1B20
		G1/2		D4N-2120		D4N-2220		D4N-2A20		D4N-2B20
		1/2-14NPT		D4N-3120		D4N-3220		D4N-3A20		D4N-3B20
		M20		D4N-4120		D4N-4220		D4N-4A20		D4N-4B20
		M12 connector		D4N-9120		D4N-9220		D4N-9A20		D4N-9B20
	2-conduit	Pg13.5	⊖	D4N-5120	⊖	D4N-5220	⊖	D4N-5A20	⊖	D4N-5B20
		G1/2		D4N-6120		D4N-6220		D4N-6A20		D4N-6B20
		M20		D4N-8120		D4N-8220		D4N-8A20		D4N-8B20
Roller lever (metal lever, resin roller) 	1-conduit	Pg13.5	⊖	D4N-1122	⊖	D4N-1222	⊖	D4N-1A22	⊖	D4N-1B22
		G1/2		D4N-2122		D4N-2222		D4N-2A22		D4N-2B22
		1/2-14NPT		D4N-3122		D4N-3222		D4N-3A22		D4N-3B22
		M20		D4N-4122		D4N-4222		D4N-4A22		D4N-4B22
		M12 connector		D4N-9122		D4N-9222		D4N-9A22		D4N-9B22
	2-conduit	Pg13.5	⊖	D4N-5122	⊖	D4N-5222	⊖	D4N-5A22	⊖	D4N-5B22
		G1/2		D4N-6122		D4N-6222		D4N-6A22		D4N-6B22
		M20		D4N-8122		D4N-8222		D4N-8A22		D4N-8B22
Roller lever (metal lever, metal roller) 	1-conduit	Pg13.5	⊖	D4N-1125	⊖	D4N-1225	⊖	D4N-1A25	⊖	D4N-1B25
		G1/2		D4N-2125		D4N-2225		D4N-2A25		D4N-2B25
		1/2-14NPT		D4N-3125		D4N-3225		D4N-3A25		D4N-3B25
		M20		D4N-4125		D4N-4225		D4N-4A25		D4N-4B25
		M12 connector		D4N-9125		D4N-9225		D4N-9A25		D4N-9B25
Roller lever (metal lever, bearing roller) 	1-conduit	Pg13.5	⊖	D4N-1126	⊖	D4N-1226	⊖	D4N-1A26	⊖	D4N-1B26
		G1/2		D4N-2126		D4N-2226		D4N-2A26		D4N-2B26
		1/2-14NPT		D4N-3126		D4N-3226		D4N-3A26		D4N-3B26
		M20		D4N-4126		D4N-4226		D4N-4A26		D4N-4B26
		M12 connector		D4N-9126		D4N-9226		D4N-9A26		D4N-9B26
Plunger 	1-conduit	Pg13.5	⊖	D4N-1131	⊖	D4N-1231	⊖	D4N-1A31	⊖	D4N-1B31
		G1/2		D4N-2131		D4N-2231		D4N-2A31		D4N-2B31
		1/2-14NPT		D4N-3131		D4N-3231		D4N-3A31		D4N-3B31
		M20		D4N-4131		D4N-4231		D4N-4A31		D4N-4B31
		M12 connector		D4N-9131		D4N-9231		D4N-9A31		D4N-9B31
	2-conduit	Pg13.5	⊖	D4N-5131	⊖	D4N-5231	⊖	D4N-5A31	⊖	D4N-5B31
		G1/2		D4N-6131		D4N-6231		D4N-6A31		D4N-6B31
		M20		D4N-8131		D4N-8231		D4N-8A31		D4N-8B31
Roller plunger 	1-conduit	Pg13.5	⊖	D4N-1132	⊖	D4N-1232	⊖	D4N-1A32	⊖	D4N-1B32
		G1/2		D4N-2132		D4N-2232		D4N-2A32		D4N-2B32
		1/2-14NPT		D4N-3132		D4N-3232		D4N-3A32		D4N-3B32
		M20		D4N-4132		D4N-4232		D4N-4A32		D4N-4B32
		M12 connector		D4N-9132		D4N-9232		D4N-9A32		D4N-9B32
	2-conduit	Pg13.5	⊖	D4N-5132	⊖	D4N-5232	⊖	D4N-5A32	⊖	D4N-5B32
		G1/2		D4N-6132		D4N-6232		D4N-6A32		D4N-6B32
		M20		D4N-8132		D4N-8232		D4N-8A32		D4N-8B32

Actuator	Conduit size		Built-in switch mechanism							
			1NC/1NO (Snap-action)		2NC (Snap-action)		1NC/1NO (Slow-action)		2NC (Slow-action)	
			Direct opening	Model	Direct opening	Model	Direct opening	Model	Direct opening	Model
One-way roller arm lever (horizontal) 	1-conduit	Pg13.5	⊖	D4N-1162	⊖	D4N-1262	⊖	D4N-1A62	⊖	D4N-1B62
		G1/2		D4N-2162		D4N-2262		D4N-2A62		D4N-2B62
		1/2-14NPT		D4N-3162		D4N-3262		D4N-3A62		D4N-3B62
		M20		D4N-4162		D4N-4262		D4N-4A62		D4N-4B62
		M12 connector		D4N-9162		D4N-9262		D4N-9A62		D4N-9B62
	2-conduit	Pg13.5	⊖	D4N-5162	⊖	D4N-5262	⊖	D4N-5A62	⊖	D4N-5B62
		G1/2		D4N-6162		D4N-6262		D4N-6A62		D4N-6B62
		M20		D4N-8162		D4N-8262		D4N-8A62		D4N-8B62
One-way roller arm lever (vertical) 	1-conduit	Pg13.5	⊖	D4N-1172	⊖	D4N-1272	⊖	D4N-1A72	⊖	D4N-1B72
		G1/2		D4N-2172		D4N-2272		D4N-2A72		D4N-2B72
		1/2-14NPT		D4N-3172		D4N-3272		D4N-3A72		D4N-3B72
		M20		D4N-4172		D4N-4272		D4N-4A72		D4N-4B72
		M12 connector		D4N-9172		D4N-9272		D4N-9A72		D4N-9B72
	2-conduit	Pg13.5	⊖	D4N-5172	⊖	D4N-5272	⊖	D4N-5A72	⊖	D4N-5B72
		G1/2		D4N-6172		D4N-6272		D4N-6A72		D4N-6B72
		M20		D4N-8172		D4N-8272		D4N-8A72		D4N-8B72
Adjustable roller lever, form lock (metal lever, resin roller) 	1-conduit	Pg13.5	⊖	D4N-112G	⊖	D4N-122G	⊖	D4N-1A2G	⊖	D4N-1B2G
		G1/2		D4N-212G		D4N-222G		D4N-2A2G		D4N-2B2G
		1/2-14NPT		D4N-312G		D4N-322G		D4N-3A2G		D4N-3B2G
		M20		D4N-412G		D4N-422G		D4N-4A2G		D4N-4B2G
		M12 connector		D4N-912G		D4N-922G		D4N-9A2G		D4N-9B2G
	2-conduit	G1/2	⊖	D4N-612G	⊖	D4N-622G	⊖	D4N-6A2G	⊖	D4N-6B2G
		M20		D4N-812G		D4N-822G		D4N-8A2G		D4N-8B2G
Adjustable roller lever, form lock (metal lever, rubber roller) 	1-conduit	Pg13.5	⊖	D4N-112H	⊖	D4N-122H	⊖	D4N-1A2H	⊖	D4N-1B2H
		G1/2		D4N-212H		D4N-222H		D4N-2A2H		D4N-2B2H
		1/2-14NPT		D4N-312H		D4N-322H		D4N-3A2H		D4N-3B2H
		M20		D4N-412H		D4N-422H		D4N-4A2H		D4N-4B2H
		M12 connector		D4N-912H		D4N-922H		D4N-9A2H		D4N-9B2H
	2-conduit	G1/2	⊖	D4N-612H	⊖	D4N-622H	⊖	D4N-6A2H	⊖	D4N-6B2H
		M20		D4N-812H		D4N-822H		D4N-8A2H		D4N-8B2H

Note: It is recommended that M20 be used for Switches to be exported to Europe and 1/2-14NPT be used for Switches to be exported to North American countries.

Switches with Three Contacts and MBB Contacts

Actuator	Conduit size		Built-in switch mechanism							
			2NC/1NO (Slow-action)		3NC (Slow-action)		1NC/1NO MBB (Slow-action)		2NC/1NO MBB (Slow-action)	
			Direct opening	Model	Direct opening	Model	Direct opening	Model	Direct opening	Model
Roller lever (resin lever, resin roller) 	1-conduit	Pg13.5	⊖	D4N-1C20	⊖	D4N-1D20	⊖	D4N-1E20	⊖	D4N-1F20
		G1/2		D4N-2C20		D4N-2D20		D4N-2E20		D4N-2F20
		1/2-14NPT		D4N-3C20		D4N-3D20		D4N-3E20		D4N-3F20
		M20		D4N-4C20		D4N-4D20		D4N-4E20		D4N-4F20
		M12 connector		---		---		D4N-9E20		---
	2-conduit	Pg13.5	⊖	D4N-5C20	⊖	D4N-5D20	⊖	D4N-5E20	⊖	D4N-5F20
		G1/2		D4N-6C20		D4N-6D20		D4N-6E20		D4N-6F20
		M20		D4N-8C20		D4N-8D20		D4N-8E20		D4N-8F20

Actuator	Conduit size		Built-in switch mechanism							
			2NC/1NO (Slow-action)		3NC (Slow-action)		1NC/1NO MBB (Slow-action)		2NC/1NO MBB (Slow-action)	
			Direct opening	Model	Direct opening	Model	Direct opening	Model	Direct opening	Model
Roller lever (metal lever, resin roller) 	1-conduit	Pg13.5	⊖	D4N-1C22	⊖	D4N-1D22	⊖	D4N-1E22	⊖	D4N-1F22
		G1/2		D4N-2C22		D4N-2D22		D4N-2E22		D4N-2F22
		1/2-14NPT		D4N-3C22		D4N-3D22		D4N-3E22		D4N-3F22
		M20		D4N-4C22		D4N-4D22		D4N-4E22		D4N-4F22
		M12 connector		---		---		D4N-9E22		---
	2-conduit	Pg13.5	⊖	D4N-5C22	⊖	D4N-5D22	⊖	D4N-5E22	⊖	D4N-5F22
		G1/2		D4N-6C22		D4N-6D22		D4N-6E22		D4N-6F22
		M20		D4N-8C22		D4N-8D22		D4N-8E22		D4N-8F22
Roller lever (metal lever, metal roller) 	1-conduit	Pg13.5	⊖	D4N-1C25	⊖	D4N-1D25	⊖	D4N-1E25	⊖	D4N-1F25
		G1/2		D4N-2C25		D4N-2D25		D4N-2E25		D4N-2F25
		1/2-14NPT		D4N-3C25		D4N-3D25		D4N-3E25		D4N-3F25
		M20		D4N-4C25		D4N-4D25		D4N-4E25		D4N-4F25
		M12 connector		---		---		D4N-9E25		---
Roller lever (metal lever, bearing roller) 	1-conduit	Pg13.5	⊖	D4N-1C26	⊖	D4N-1D26	⊖	D4N-1E26	⊖	D4N-1F26
		G1/2		D4N-2C26		D4N-2D26		D4N-2E26		D4N-2F26
		1/2-14NPT		D4N-3C26		D4N-3D26		D4N-3E26		D4N-3F26
		M20		D4N-4C26		D4N-4D26		D4N-4E26		D4N-4F26
		M12 connector		---		---		D4N-9E26		---
Plunger 	1-conduit	Pg13.5	⊖	D4N-1C31	⊖	D4N-1D31	⊖	D4N-1E31	⊖	D4N-1F31
		G1/2		D4N-2C31		D4N-2D31		D4N-2E31		D4N-2F31
		1/2-14NPT		D4N-3C31		D4N-3D31		D4N-3E31		D4N-3F31
		M20		D4N-4C31		D4N-4D31		D4N-4E31		D4N-4F31
		M12 connector		---		---		D4N-9E31		---
	2-conduit	Pg13.5	⊖	D4N-5C31	⊖	D4N-5D31	⊖	D4N-5E31	⊖	D4N-5F31
		G1/2		D4N-6C31		D4N-6D31		D4N-6E31		D4N-6F31
		M20		D4N-8C31		D4N-8D31		D4N-8E31		D4N-8F31
Roller plunger 	1-conduit	Pg13.5	⊖	D4N-1C32	⊖	D4N-1D32	⊖	D4N-1E32	⊖	D4N-1F32
		G1/2		D4N-2C32		D4N-2D32		D4N-2E32		D4N-2F32
		1/2-14NPT		D4N-3C32		D4N-3D32		D4N-3E32		D4N-3F32
		M20		D4N-4C32		D4N-4D32		D4N-4E32		D4N-4F32
		M12 connector		---		---		D4N-9E32		---
	2-conduit	Pg13.5	⊖	D4N-5C32	⊖	D4N-5D32	⊖	D4N-5E32	⊖	D4N-5F32
		G1/2		D4N-6C32		D4N-6D32		D4N-6E32		D4N-6F32
		M20		D4N-8C32		D4N-8D32		D4N-8E32		D4N-8F32
One-way roller arm lever (horizontal) 	1-conduit	Pg13.5	⊖	D4N-1C62	⊖	D4N-1D62	⊖	D4N-1E62	⊖	D4N-1F62
		G1/2		D4N-2C62		D4N-2D62		D4N-2E62		D4N-2F62
		1/2-14NPT		D4N-3C62		D4N-3D62		D4N-3E62		D4N-3F62
		M20		D4N-4C62		D4N-4D62		D4N-4E62		D4N-4F62
		M12 connector		---		---		D4N-9E62		----
	2-conduit	Pg13.5	⊖	D4N-5C62	⊖	D4N-5D62	⊖	D4N-5E62	⊖	D4N-5F62
		G1/2		D4N-6C62		D4N-6D62		D4N-6E62		D4N-6F62
		M20		D4N-8C62		D4N-8D62		D4N-8E62		D4N-8F62
One-way roller arm lever (vertical) 	1-conduit	Pg13.5	⊖	D4N-1C72	⊖	D4N-1D72	⊖	D4N-1E72	⊖	D4N-1F72
		G1/2		D4N-2C72		D4N-2D72		D4N-2E72		D4N-2F72
		1/2-14NPT		D4N-3C72		D4N-3D72		D4N-3E72		D4N-3F72
		M20		D4N-4C72		D4N-4D72		D4N-4E72		D4N-4F72
		M12 connector		---		---		D4N-9E72		---
	2-conduit	Pg13.5	⊖	D4N-5C72	⊖	D4N-5D72	⊖	D4N-5E72	⊖	D4N-5F72
		G1/2		D4N-6C72		D4N-6D72		D4N-6E72		D4N-6F72
		M20		D4N-8C72		D4N-8D72		D4N-8E72		D4N-8F72

Actuator	Conduit size		Built-in switch mechanism							
			2NC/1NO (Slow-action)		3NC (Slow-action)		1NC/1NO MBB (Slow-action)		2NC/1NO MBB (Slow-action)	
			Direct opening	Model	Direct opening	Model	Direct opening	Model	Direct opening	Model
Adjustable roller lever, form lock (metal lever, resin roller) 	1-conduit	Pg13.5	⊖	D4N-1C2G	⊖	D4N-1D2G	⊖	D4N-1E2G	⊖	D4N-1F2G
		G1/2		D4N-2C2G		D4N-2D2G		D4N-2E2G		D4N-2F2G
		1/2-14NPT		D4N-3C2G		D4N-3D2G		D4N-3E2G		D4N-3F2G
		M20		D4N-4C2G		D4N-4D2G		D4N-4E2G		D4N-4F2G
		M12 connector		---		---		D4N-9E2G		---
	2-conduit	G1/2	⊖	D4N-6C2G	⊖	D4N-6D2G	⊖	D4N-6E2G	⊖	D4N-6F2G
		M20		D4N-8C2G		D4N-8D2G		D4N-8E2G		D4N-8F2G
Adjustable roller lever, form lock (metal lever, rubber roller) 	1-conduit	Pg13.5	⊖	D4N-1C2H	⊖	D4N-1D2H	⊖	D4N-1E2H	⊖	D4N-1F2H
		G1/2		D4N-2C2H		D4N-2D2H		D4N-2E2H		D4N-2F2H
		1/2-14NPT		D4N-3C2H		D4N-3D2H		D4N-3E2H		D4N-3F2H
		M20		D4N-4C2H		D4N-4D2H		D4N-4E2H		D4N-4F2H
		M12 connector		---		---		D4N-9E2H		---
	2-conduit	G1/2	⊖	D4N-6C2H	⊖	D4N-6D2H	⊖	D4N-6E2H	⊖	D4N-6F2H
		M20		D4N-8C2H		D4N-8D2H		D4N-8E2H		D4N-8F2H

Note: It is recommended that M20 be used for Switches to be exported to Europe and 1/2-14NPT be used for Switches to be exported to North American countries.

General-purpose Switches with Two Contacts

Actuator	Conduit size		Built-in switch mechanism							
			1NC/1NO (Snap-action)		2NC (Snap-action)		1NC/1NO (Slow-action)		2NC (Slow-action)	
			Direct opening	Model	Direct opening	Model	Direct opening	Model	Direct opening	Model
Fork lever lock (right operation) 	1-conduit	G1/2	---	---	---	---	---	D4N-2ARE	---	D4N-2BRE
		1/2-14NPT						D4N-3ARE		D4N-3BRE
		M20						D4N-4ARE		D4N-4BRE
	2-conduit	G1/2	---		---		---	D4N-6ARE	---	D4N-6BRE
		M20						D4N-8ARE		D4N-8BRE
Fork lever lock (left operation) 	1-conduit	G1/2	---		---		---	D4N-2ALE	---	D4N-2BLE
		1/2-14NPT						D4N-3ALE		D4N-3BLE
		M20						D4N-4ALE		D4N-4BLE
	2-conduit	G1/2	---		---		---	D4N-6ALE	---	D4N-6BLE
		M20						D4N-8ALE		D4N-8BLE
Cat whisker 	1-conduit	G1/2	---	D4N-2180	---	D4N-2280	---	---	---	D4N-2B80
		1/2-14NPT		D4N-3180		D4N-3280				D4N-3B80
		M20		D4N-4180		D4N-4280				D4N-4B80
	2-conduit	G1/2	---	D4N-6180	---	D4N-6280	---		---	D4N-6B80
		M20		D4N-8180		D4N-8280				D4N-8B80
Plastic rod 	1-conduit	G1/2	---	D4N-2187	---	D4N-2287	---		---	D4N-2B87
		1/2-14NPT		D4N-3187		D4N-3287				D4N-3B87
		M20		D4N-4187		D4N-4287				D4N-4B87
	2-conduit	G1/2	---	D4N-6187	---	D4N-6287	---		---	D4N-6B87
		M20		D4N-8187		D4N-8287				D4N-8B87

Note: 1. It is recommended that M20 be used for Switches to be exported to Europe and 1/2-14NPT be used for Switches to be exported to North American countries.

2. Mechanically speaking, these models are basic limit switches.

General-purpose Switches with Three Contacts and MBB Contacts

Actuator	Conduit size		Built-in switch mechanism							
			Direct opening	2NC/1NO (Slow-action)	Direct opening	3NC (Slow-action)	Direct opening	1NC/1NO MBB (Slow-action)	Direct opening	2NC/1NO MBB (Slow-action)
Fork lever lock (right operation) 	1-conduit	G1/2	---	D4N-2CRE	---	D4N-2DRE	---	D4N-2ERE	---	D4N-2FRE
		1/2-14NPT		D4N-3CRE		D4N-3DRE		D4N-3ERE		D4N-3FRE
		M20		D4N-4CRE		D4N-4DRE		D4N-4ERE		D4N-4FRE
	2-conduit	G1/2	---	D4N-6CRE	---	D4N-6DRE	---	D4N-6ERE	---	D4N-6FRE
		M20		D4N-8CRE		D4N-8DRE		D4N-8ERE		D4N-8FRE
Fork lever lock (left operation) 	1-conduit	G1/2	---	D4N-2CLE	---	D4N-2DLE	---	D4N-2ELE	---	D4N-2FLE
		1/2-14NPT		D4N-3CLE		D4N-3DLE		D4N-3ELE		D4N-3FLE
		M20		D4N-4CLE		D4N-4DLE		D4N-4ELE		D4N-4FLE
	2-conduit	G1/2	---	D4N-6CLE	---	D4N-6DLE	---	D4N-6ELE	---	D4N-6FLE
		M20		D4N-8CLE		D4N-8DLE		D4N-8ELE		D4N-8FLE
Cat whisker 	1-conduit	G1/2	---	---	---	D4N-2D80	---	---	---	---
		1/2-14NPT				D4N-3D80				
		M20				D4N-4D80				
	2-conduit	G1/2	---		---	D4N-6D80	---		---	
		M20				D4N-8D80				
Plastic rod 	1-conduit	G1/2	---		---	D4N-2D87	---		---	
		1/2-14NPT				D4N-3D87				
		M20				D4N-4D87				
	2-conduit	G1/2	---		---	D4N-6D87	---		---	
		M20				D4N-8D87				

Note: 1. It is recommended that M20 be used for Switches to be exported to Europe and 1/2-14NPT be used for Switches to be exported to North American countries.

2. Mechanically speaking, these models are basic limit switches.

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN50047
  EN60204-1
  EN1088
  GS-ET-15

■ Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN60947-5-1 (certified direct opening)	(See note 1.)
UL (See note 2.)	UL508, CSA C22.2 No.14	E76675
CCC (CQC)	GB14048.5	2004010305105973

Note: 1. Consult your OMRON representative for details.

2. Certification for CSA C22.2 No. 14 is authorized by the UL mark.

3. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item / Utilization category	AC-15	DC-13
Rated operating current (I_e)	3 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC269 as a short-circuit protection device. This fuse is not built into the Switch.

UL/CSA (UL508, CSA C22.2 No. 14)

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

Q300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VDC		0.27 A	0.27 A		

■ Characteristics

Degree of protection (See note 3.)		IP67 (EN60947-5-1)
Durability (See note 4.)	**Mechanical**	15,000,000 operations min. (See note 7.)
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC (See note 5.) 300,000 operations min. for a resistive load of 10 A at 250 VAC
Operating speed		1 to 500 mm/s (D4N-1120)
Operating frequency		30 operations/minute max.
Contact resistance		25 mΩ max. (Initial value)
Minimum applicable load (See note 6.)		Resistive load of 1 mA at 5 VDC (N-level reference value)
Rated insulation voltage (U_i)		300 V
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		Level 3 (EN60947-5-1)
Impulse withstand voltage (EN60947-5-1)		Between terminals of the same polarity: 2.5 kV
		Between terminals of different polarities: 4 kV
		Between other terminals and uncharged metallic parts: 6 kV
Insulation resistance		100 MΩ min.
Contact gap		Snap-action: 2 x 0.5 mm min Slow-action: 2 x 2 mm min
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude
Shock resistance	**Destruction**	1,000 m/s^2 min.
	Malfunction	300 m/s^2 min.
Conditional short-circuit current		100 A (EN60947-5-1)
Rated open thermal current (I_{th})		10 A (EN60947-5-1)
Ambient temperature		Operating: –30°C to 70°C with no icing
Ambient humidity		Operating: 95% max.
Weight		Approx. 82 g (D4N-1120) Approx. 99 g (D4N-5120)

Note: 1. The above values are initial values.

2. Once a contact has been used to switch a standard load, it cannot be used for a load of a smaller capacity. Doing so may result in roughening of the contact surface and contact reliability may be lost.

3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4N in places where foreign material such as dust, dirt, oil, water, or chemicals may penetrate through the head. Otherwise, premature wear, Switch damage or malfunctioning may occur.

4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.

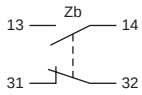
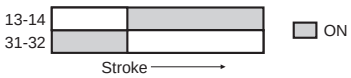
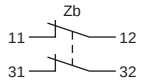
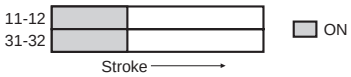
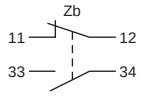
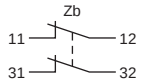
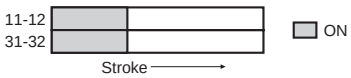
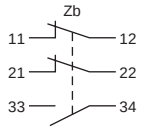
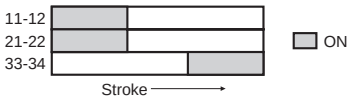
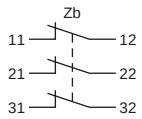
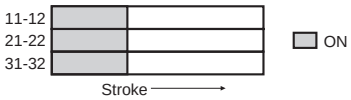
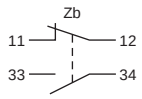
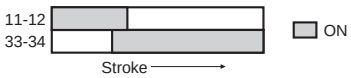
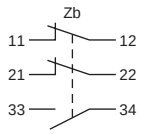
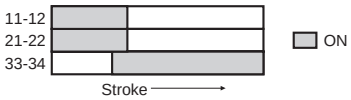
5. Do not pass the 3-A, 250-VAC load through more than 2 circuits.

6. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

7. The mechanical durability of fork lever lock models is 10,000,000 operations min.

Connections

■ Contact Form

Model	Contact	Contact form	Operating pattern	Remarks
D4N-□1□	1NC/1NO (Snap-action)			Only NC contacts 31-32 have a certified direct opening mechanism. ⊖ The terminals 13-14 and 31-32 can be used as unlike poles.
D4N-□2□	2NC (Snap-action)			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 31-32 can be used as unlike poles.
D4N-□A□	1NC/1NO (Slow-action)			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4N-□B□	2NC (Slow-action)			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 31-32 can be used as unlike poles.
D4N-□C□	2NC/1NO (Slow-action)			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 33-34 can be used as unlike poles.
D4N-□D□	3NC (Slow-action)			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 31-32 can be used as unlike poles.
D4N-□E□	1NC/1NO MBB (Slow-action)			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4N-□F□	2NC/1NO MBB (Slow-action)			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22 and 33-34 can be used as unlike poles.

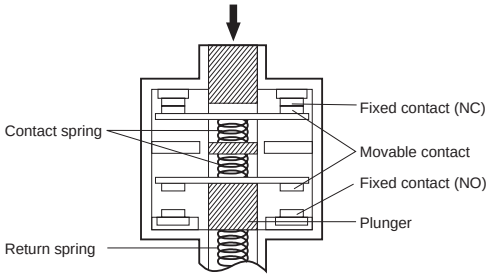
Note: 1. Terminals are numbered according to EN50013 and the contact forms are according to IEC947-5-1.

2. MBB (Make Before Break) contacts have an overlapping structure, so that before the normally closed contact (NC) opens, the normally open contact (NO) closes.

Operation

■ Direct Opening Mechanism

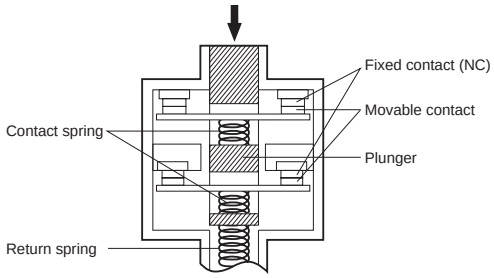
1NC/1NO Contact (Slow-action)



Conforms to EN60947-5-1 Direct Opening Operation ⊖

(Only the NC contact side has a direct opening mechanism.)
When contact welding occurs, the contacts are separated from each other by the plunger being pushed in.

2NC Contact (Slow-action)

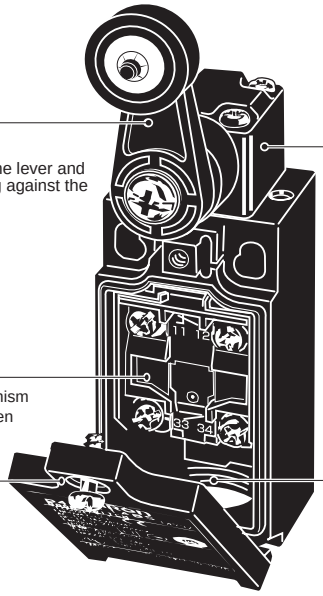


Conforms to EN60947-5-1 Direct Opening Operation ⊖

(Both NC contacts have a direct opening mechanism.)

Nomenclature

■ Structure



Safety-oriented Lever Setting (Form-lock construction)
Grooves which engage the lever are cut in the lever and rotary shaft to prevent the lever from slipping against the rotary shaft.
There are resin-lever and metal-lever types.

Built-in Switch
The built-in switch has a direct opening mechanism that forcibly separates the NC contact even when there is contact deposit.

Cover
The cover, with a hinge on its lower part, can be opened by removing the screw of the cover, which ensures ease of maintenance and wiring.

Head
The direction of the switch head can be varied to any of the four directions. (Roller plunger models can be mounted in either of two directions at a 90° angle.)

Conduit Opening
A wide variety of conduits is available.

Size	1-conduit	2-conduit
Pg13.5	Yes	Yes
G1/2	Yes	Yes
1/2-14NPT	Yes	Yes
M20	Yes	Yes
M12 connector	Yes	---

Note: M12 connector types are not available for Switches with three contacts.

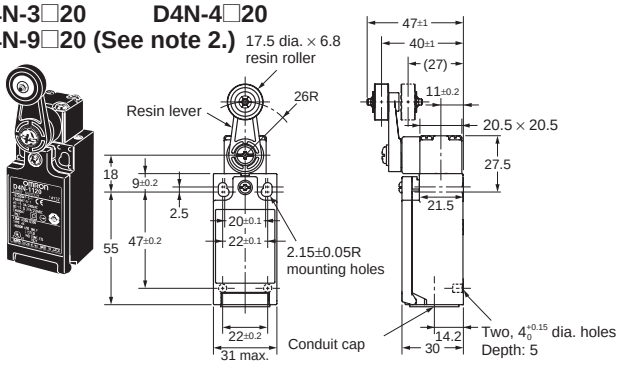
Dimensions

■ Switches

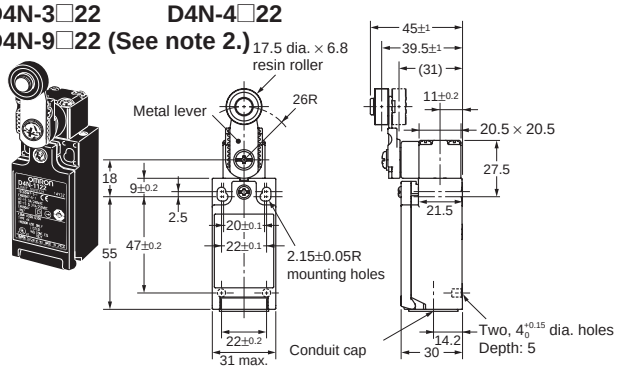
Note: All units are in millimeters unless otherwise indicated.

1-conduit Models

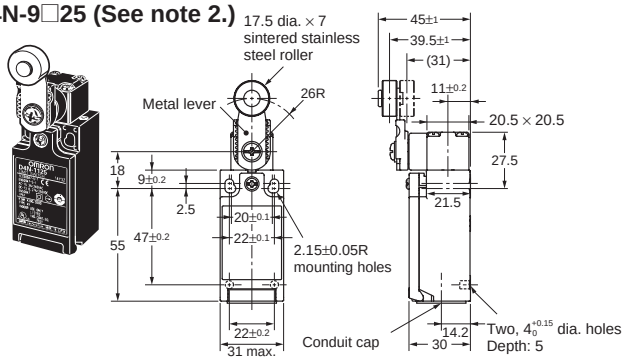
Roller Lever (Resin Lever, Resin Roller)
D4N-1□20 D4N-2□20
D4N-3□20 D4N-4□20
D4N-9□20 (See note 2.)



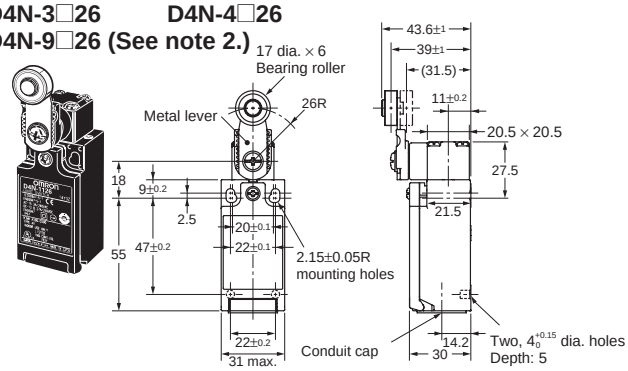
Roller Lever (Metal Lever, Resin Roller)
D4N-1□22 D4N-2□22
D4N-3□22 D4N-4□22
D4N-9□22 (See note 2.)



Roller Lever (Metal Lever, Metal Roller)
D4N-1□25 D4N-2□25
D4N-3□25 D4N-4□25
D4N-9□25 (See note 2.)



Roller Lever (Metal Lever, Bearing Roller)
D4N-1□26 D4N-2□26
D4N-3□26 D4N-4□26
D4N-9□26 (See note 2.)



Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Refer to page 262 for details on M12 connectors.

Snap-action (1NC/1NO) (2NC), Slow-action (2NC) (3NC)

Model	D4N-□120 D4N-□220 D4N-□B20 D4N-□D20	D4N-□122 D4N-□222 D4N-□B22 D4N-□D22	D4N-□125 D4N-□225 D4N-□B25 D4N-□D25	D4N-□126 D4N-□226 D4N-□B26 D4N-□D26
OF max.	5.0 N			
RF min.	0.5 N			
PT	18° to 27°			
OT min.	40°			
MD max. (See note 2.)	14°			
OP	---			
TT (See note 3.)	(80°)			
DOT min. (See note 4.)	50°			
DOF min. (See note 4.)	20 N			

Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. Only for snap-action models.
3. Reference value.
4. For safe use, always make sure that the minimum values or greater are provided.

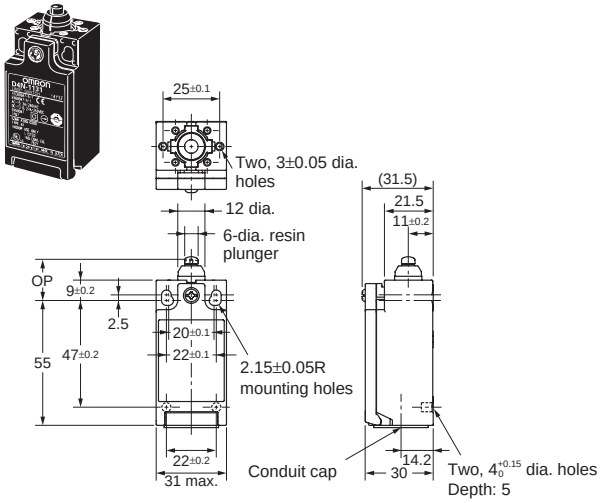
Slow-action (1NC/1NO) (2NC/1NO)

Model	D4N-□A20 D4N-□C20 D4N-□E20 D4N-□F20	D4N-□A22 D4N-□C22 D4N-□E22 D4N-□F22	D4N-□A25 D4N-□C25 D4N-□E25 D4N-□F25	D4N-□A26 D4N-□C26 D4N-□E26 D4N-□F26
OF max.	5.0 N			
RF min.	0.5 N			
PT (See note 1.)	18° to 27°			
PT (2nd) (See note 2.)	(44°)			
PT (See note 3.)	27.5° to 36.5°			
PT (2nd) (See note 4.)	(18°)			
OT min.	40°			
OP	---			
TT (See note 5.)	(80°)			
DOT min. (See note 6.)	50°			
DOF min. (See note 6.)	20 N			

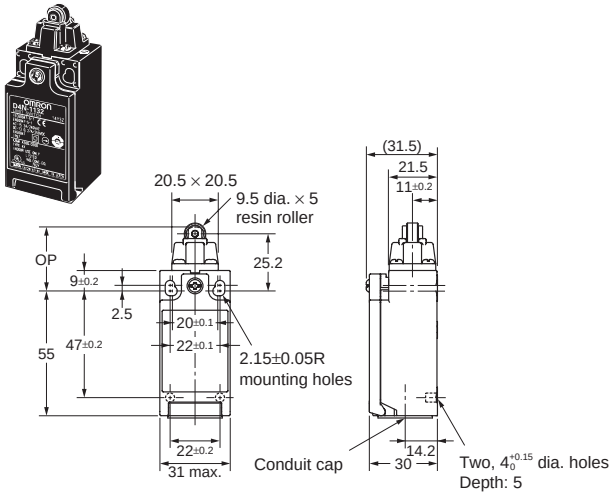
Note: 1. These PT values are possible when the NC contacts are open (OFF).
2. These PT values are possible when the NO contacts are closed (ON).
3. Only for MBB models.
4. Reference values for MBB models only.
5. Reference values.
6. For safe use, always make sure that the minimum values or greater are provided.

1-conduit Models

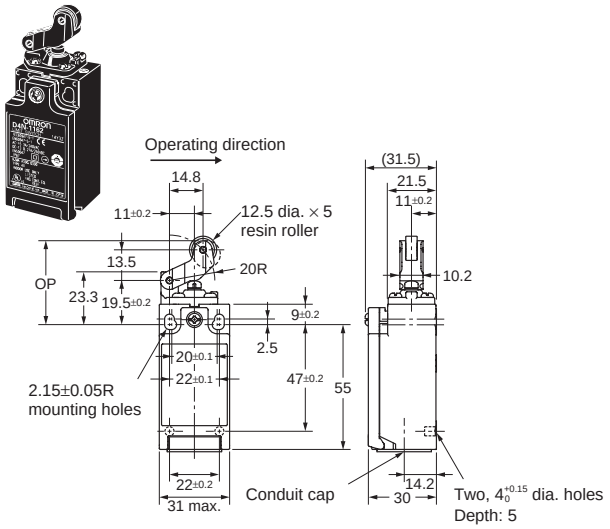
Plunger
D4N-1□31 D4N-2□31
D4N-3□31 D4N-4□31
D4N-9□31 (See note 2.)



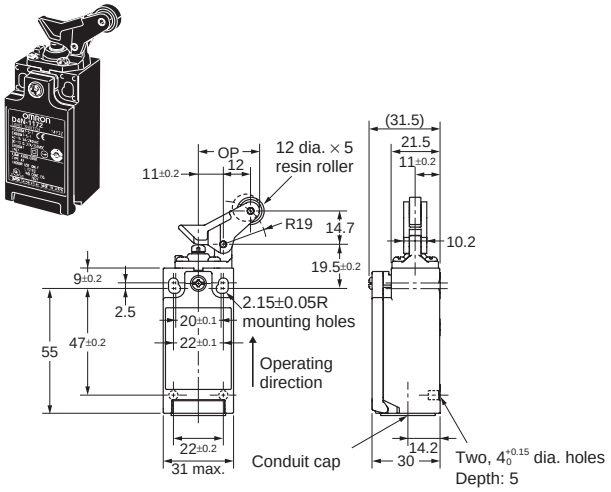
Roller Plunger
D4N-1□32 D4N-2□32
D4N-3□32 D4N-4□32
D4N-9□32 (See note 2.)



One-way Roller Arm Lever (Horizontal)
D4N-1□62 D4N-2□62
D4N-3□62 D4N-4□62
D4N-9□62 (See note 2.)



One-way Roller Arm Lever (Vertical)
D4N-1□72 D4N-2□72
D4N-3□72 D4N-4□72
D4N-9□72 (See note 2.)



Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Refer to page 262 for details on M12 connectors.

Snap-action (1NC/1NO) (2NC), Slow-action (2NC) (3NC)

Model	D4N-□131 D4N-□231 D4N-□B31 D4N-□D31	D4N-□132 D4N-□232 D4N-□B32 D4N-□D32	D4N-□162 D4N-□262 D4N-□B62 D4N-□D62	D4N-□172 D4N-□272 D4N-□B72 D4N-□D72
OF max.	6.5 N	6.5 N	5.0 N	5.0 N
RF min.	1.5 N	1.5 N	0.8 N	0.8 N
PT max.	2 mm	2 mm	4 mm	4 mm
OT min.	4 mm	4 mm	5 mm	5 mm
MD max. (See note 2.)	1 mm	1 mm	1.5 mm	1.5 mm
OP	18.2 ±0.5 mm	28.6 ±0.8 mm	37 ±0.8 mm	27 ±0.8 mm
TT (See note 3.)	(6 mm)	(6 mm)	(9 mm)	(9 mm)
DOT min. (See note 4.)	3.2 mm	3.2 mm	5.8 mm	4.8 mm
DOF min. (See note 4.)	20 N	20 N	20 N	20 N

Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. Only for snap-action models.
3. Reference value.
4. For safe use, always make sure that the minimum values or greater are provided.

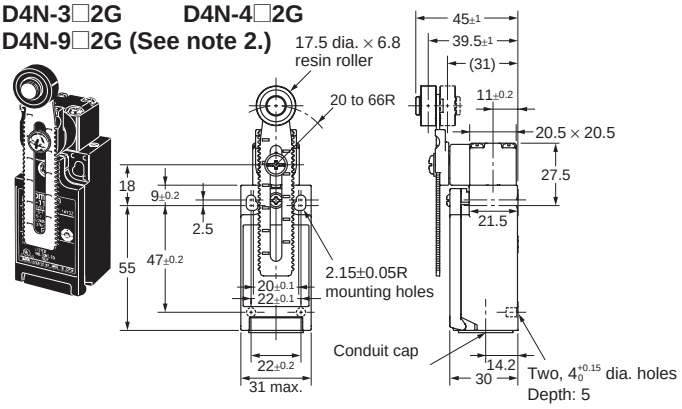
Slow-action (1NC/1NO) (2NC/1NO)

Model	D4N-□A31 D4N-□C31 D4N-□E31 D4N-□F31	D4N-□A32 D4N-□C32 D4N-□E32 D4N-□F32	D4N-□A62 D4N-□C62 D4N-□E62 D4N-□F62	D4N-□A72 D4N-□C72 D4N-□E72 D4N-□F72
OF max.	6.5 N	6.5 N	5.0 N	5.0 N
RF min.	1.5 N	1.5 N	0.8 N	0.8 N
PT max. (See note 1.)	2 mm	2 mm	4 mm	4 mm
PT (2nd) (See note 2.)	(2.9 mm)	(2.9 mm)	(5.2 mm)	(4.3 mm)
PT max. (See note 3.)	2.8 mm	2.8 mm	4 mm	4 mm
PT (2nd) (See note 4.)	(1 mm)	(1 mm)	(1.5 mm)	(1.5 mm)
OT min.	4 mm	4 mm	5 mm	5 mm
OP	18.2 ±0.5 mm	28.6 ±0.8 mm	37 ±0.8 mm	27 ±0.8 mm
OP (See note 5.)	17.4 ±0.5 mm	28 ±0.8 mm	36 ±0.8 mm	26.1 ±0.8 mm
TT (See note 6.)	(6 mm)	(6 mm)	(9 mm)	(9 mm)
DOT min. (See note 7.)	3.2 mm	3.2 mm	5.8 mm	4.8 mm
DOF min. (See note 7.)	20 N	20 N	20 N	20 N

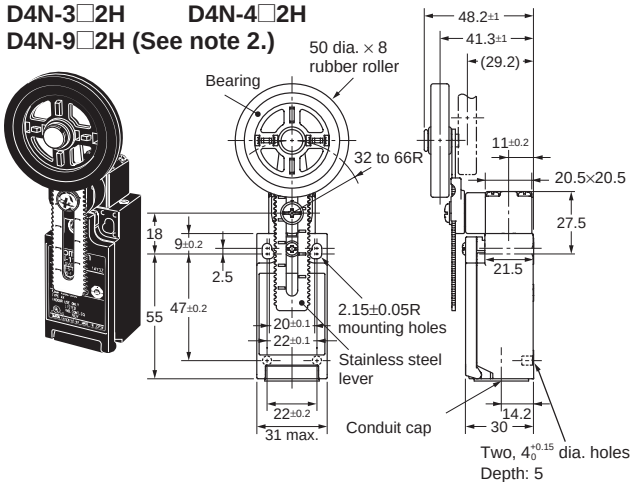
Note: 1. These PT values are possible when the NC contacts are open (OFF).
2. These PT values are possible when the NO contacts are closed (ON).
3. Only for MBB models.
4. Reference values for MBB models.
5. Only for MBB models.
6. Reference value.
7. For safe use, always make sure that the minimum values or greater are provided.

1-conduit Models

Adjustable Roller Lever, Form Lock
(with Metal Lever, Resin Roller)
D4N-1□2G D4N-2□2G
D4N-3□2G D4N-4□2G
D4N-9□2G (See note 2.)



Adjustable Roller Lever, Form Lock
(with Metal Lever, Rubber Roller)
D4N-1□2H D4N-2□2H
D4N-3□2H D4N-4□2H
D4N-9□2H (See note 2.)



Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Refer to following diagrams for details on M12 connectors.

Snap-action (1NC/1NO) (2NC), Slow-action (2NC) (3NC)

Model	D4N-□12H D4N-□22H D4N-□B2H D4N-□D2H	D4N-□12G D4N-□22G D4N-□B2G D4N-□D2G (See note 2.)
OF max.	4.5 N	
RF min.	0.4 N	
PT	18° to 27°	
OT min.	40°	
MD max. (See note 3.)	14°	
OP	---	
TT (See note 4.)	(80°)	
DOT min. (See note 5.)	50°	
DOF min. (See note 5.)	20 N	

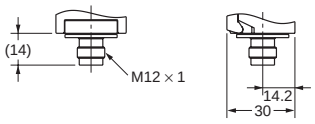
Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. The operating characteristics of these Switches were measured with the roller lever set at 32 mm.
3. Only for snap-action models.
4. Reference value.
5. For safe use, always make sure that the minimum values or greater are provided.

Slow-action (1NC/1NO) (2NC/1NO)

Model	D4N-□A2H D4N-□C2H D4N-□E2H D4N-□F2H	D4N-□A2G D4N-□C2G D4N-□E2G D4N-□F2G (See note 1.)
OF max.	4.5 N	
RF min.	0.4 N	
PT (See note 2.)	18° to 27°	
PT (2nd) (See note 3.)	(44°)	
PT (See note 4.)	27.5° to 36.5°	
PT (2nd) (See note 5.)	(18°)	
OT min.	40°	
OP	---	
TT (See note 6.)	(80°)	
DOT min.	50°	
DOF min. (See note 7.)	20 N	

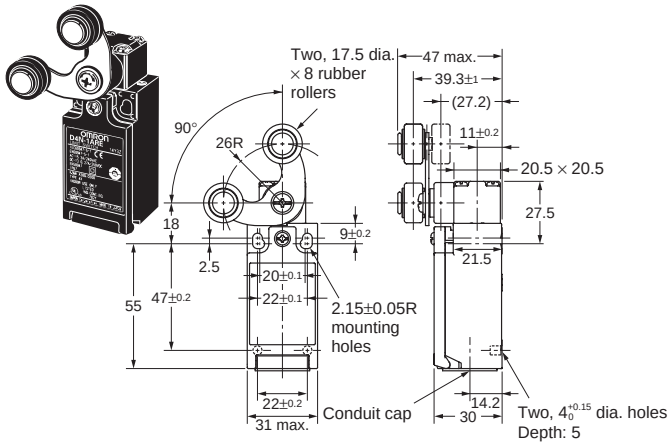
Note: 1. The operating characteristics of these Switches were measured with the roller lever set at 32 mm.
2. This PT value is possible when the NC contacts are open (OFF).
3. This PT value is possible when the NO contacts are closed (ON).
4. Only for MBB models.
5. Reference value for MBB models only.
6. Reference value.
7. For safe use, always make sure that the minimum values or greater are provided.

1-conduit M12 Connector
D4N-9□□□

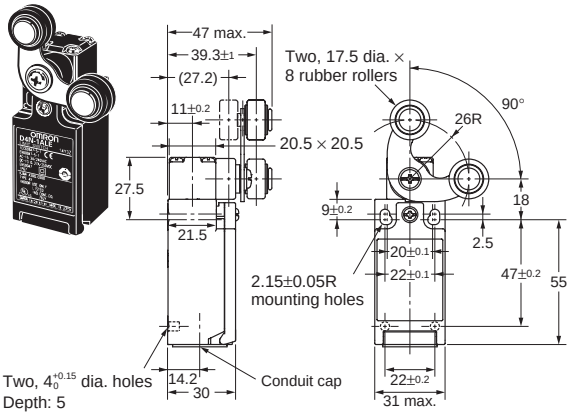


1-conduit Models

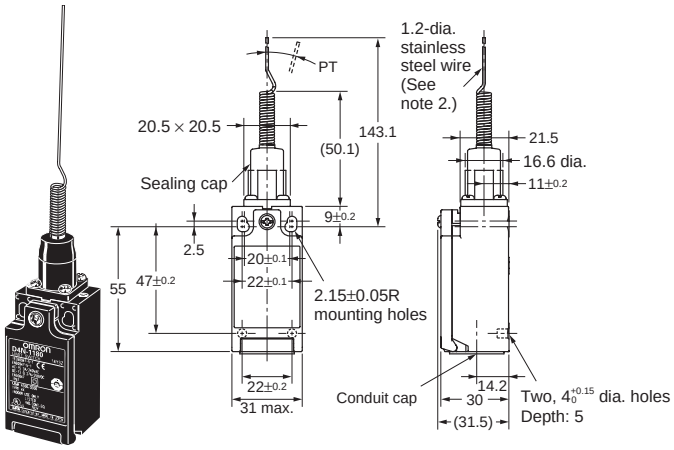
Fork Lever Lock
(Right Operation)
D4N-1□RE D4N-2□RE
D4N-3□RE D4N-4□RE



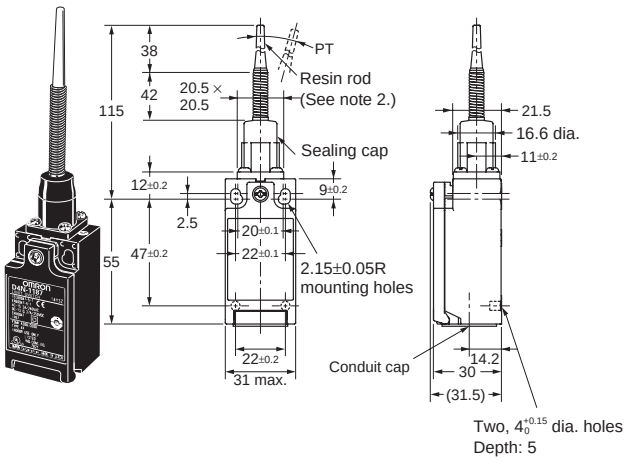
Fork Lever Lock
(Left Operation)
D4N-1□LE D4N-2□LE
D4N-3□LE D4N-4□LE



Cat Whisker
D4N-1□80 D4N-2□80
D4N-3□80 D4N-4□80



Plastic Rod
D4N-1□87 D4N-2□87
D4N-3□87 D4N-4□87



Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. The usable range for stainless steel wires and resin rods is 35 mm max. from the end with a total travel of 70 mm max.

Slow-action (1NC/1NO) (2NC/1NO) (2NC) (3NC)

Model	D4N-□□RE	D4N-□□LE
Force necessary to reverse the direction of the lever: max.	6.4 N	6.4 N
Movement until the lever reverses	55 ±10°	55 ±10°
Movement until switch operation (NC)	6.5° (MBB: 10°)	6.5° (MBB: 10°)
Movement until switch operation (NO)	18.5° (MBB: 5°)	18.5° (MBB: 5°)

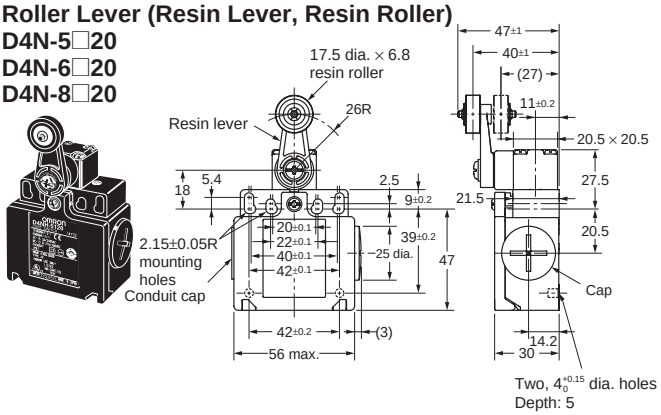
Note: Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.

Snap-action (1NC/1NO) (2NC), Slow-action (2NC) (3NC)

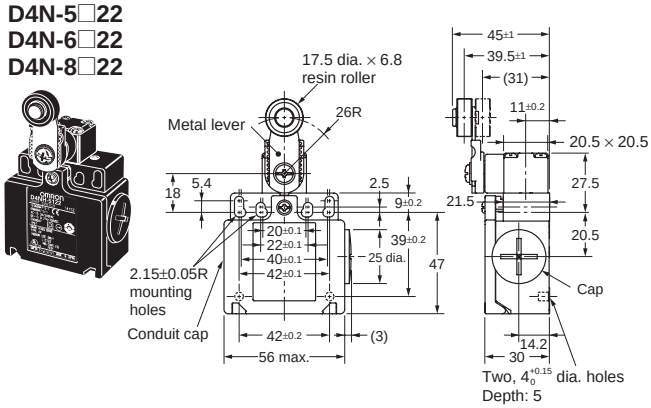
Model	D4N-□□80	D4N-□□87
OF max.	1.5 N	1.5 N
PT max.	15°	15°

2-conduit Models

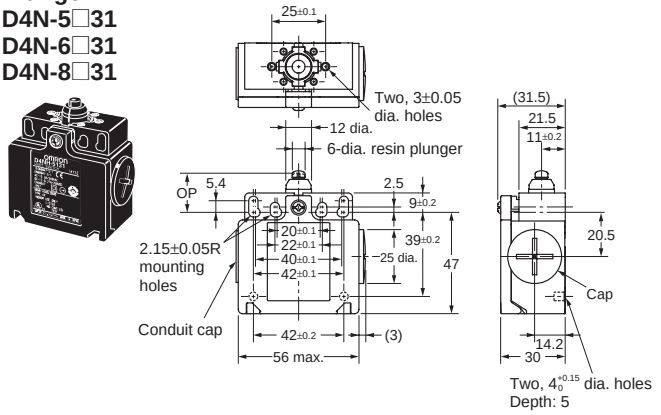
Roller Lever (Resin Lever, Resin Roller)
D4N-5□20
D4N-6□20
D4N-8□20



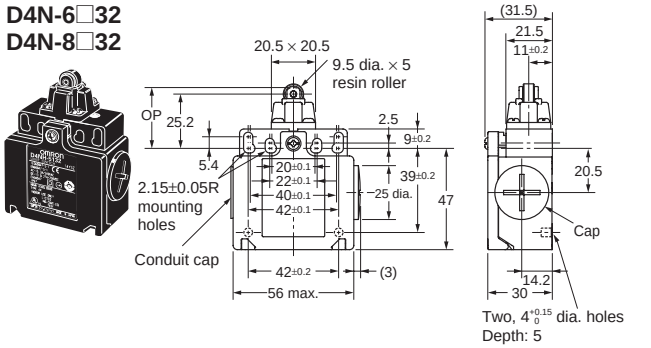
Roller Lever (Metal Lever, Resin Roller)
D4N-5□22
D4N-6□22
D4N-8□22



Plunger
D4N-5□31
D4N-6□31
D4N-8□31



Roller Plunger
D4N-5□32
D4N-6□32
D4N-8□32



Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Snap-action (1NC/1NO) (2NC), Slow-action (2NC) (3NC)

Model	D4N-□120 D4N-□220 D4N-□B20 D4N-□D20	D4N-□122 D4N-□222 D4N-□B22 D4N-□D22	D4N-□131 D4N-□231 D4N-□B31 D4N-□D31	D4N-□132 D4N-□232 D4N-□B32 D4N-□D32
OF max.	5 N	5 N	6.5 N	6.5 N
RF min.	0.5 N	0.5 N	1.5 N	1.5 N
PT	18° to 27°	18° to 27°	2 mm	2 mm
OT min.	40°	40°	4 mm	4 mm
MD max. **(See note 2.)**	14°	14°	1 mm	1 mm
OP	---	---	18 ±0.5 mm	28.2 ±0.8 mm
TT **(See note 3.)**	(80°)	(80°)	(6 mm)	(6 mm)
DOT min. **(See note 4.)**	50°	50°	3.2 mm	3.2 mm
DOF min. **(See note 4.)**	20 N	20 N	20 N	20 N

Note: **1.** Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. Only for snap-action models.
3. Reference value.
4. For safe use, always make sure that the minimum values or greater are provided.

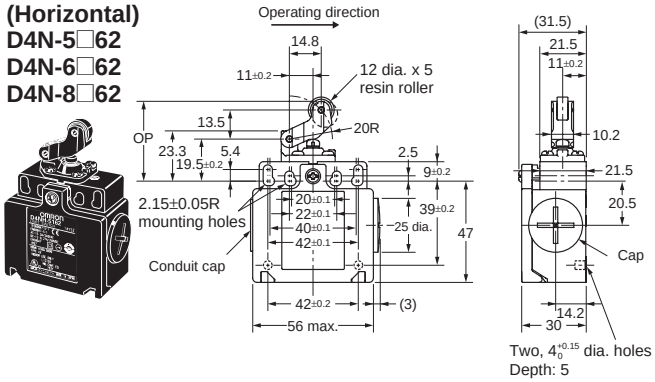
Slow-action (1NC/1NO) (2NC/1NO)

Model	D4N-□A20 D4N-□C20 D4N-□E20 D4N-□F20	D4N-□A22 D4N-□C22 D4N-□E22 D4N-□F22	D4N-□A31 D4N-□C31 D4N-□E31 D4N-□F31	D4N-□A32 D4N-□C32 D4N-□E32 D4N-□F32
OF max.	5 N	5 N	6.5 N	6.5 N
RF min.	0.5 N	0.5 N	1.5 N	1.5 N
PT **(See note 1.)**	18° to 27°	18° to 27°	2 mm	2 mm
PT (2nd) **(See note 2.)**	(44°)	(44°)	(2.9 mm)	(2.9 mm)
PT **(See note 3.)**	27.5° to 36.5°	27.5° to 36.5°	2.8 mm	2.8 mm
PT (2nd) **(See note 4.)**	(18°)	(18°)	(1 mm)	(1 mm)
OT min.	40°	40°	4 mm	4 mm
OP	---	---	18 ±0.5 mm	28.2 ±0.8 mm
OP **(See note 5.)**	---	---	17.4 ±0.5 mm	28 ±0.8 mm
TT **(See note 6.)**	(80°)	(80°)	(6 mm)	(6 mm)
DOT min. **(See note 7.)**	50°	50°	3.2 mm	3.2 mm
DOF min. **(See note 7.)**	20 N	20 N	20 N	20 N

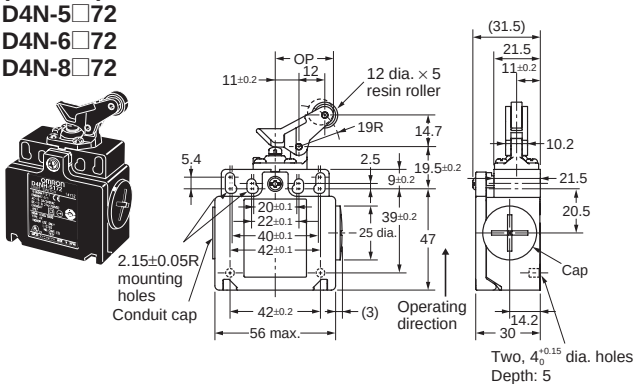
Note: **1.** This PT value is possible when the NC contacts are open (OFF).
2. This PT value is possible when the NO contacts are closed (ON).
3. Only for MBB models.
4. Reference value for MBB models.
5. Only for MBB models.
6. Reference value.
7. For safe use, always make sure that the minimum values or greater are provided.

2-conduit Models

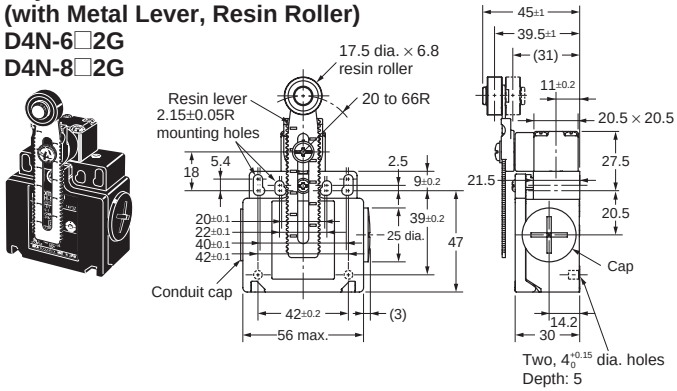
One-way Roller Arm Lever (Horizontal)
D4N-5□62
D4N-6□62
D4N-8□62



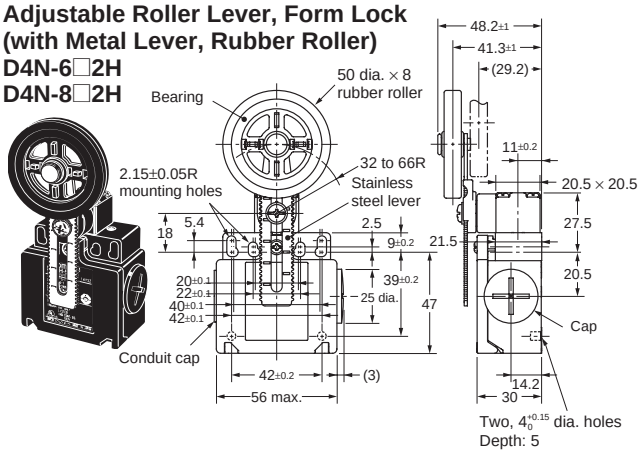
One-way Roller Arm Lever (Vertical)
D4N-5□72
D4N-6□72
D4N-8□72



Adjustable Roller Lever, Form Lock (with Metal Lever, Resin Roller)
D4N-6□2G
D4N-8□2G



Adjustable Roller Lever, Form Lock (with Metal Lever, Rubber Roller)
D4N-6□2H
D4N-8□2H



Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Snap-action (1NC/1NO) (2NC), Slow-action (2NC) (3NC)

Model	D4N-□162 D4N-□262 D4N-□B62 D4N-□D62	D4N-□172 D4N-□272 D4N-□B72 D4N-□D72	D4N-□12G D4N-□22G D4N-□B2G D4N-□D2G (See note 2.)	D4N-□12H D4N-□22H D4N-□B2H D4N-□D2H (See note 3.)
OF max.	5.0 N	5.0 N	4.5 N	4.5 N
RF min.	0.8 N	0.8 N	0.4 N	0.4 N
PT max.	4 mm	4 mm	18° to 27°	18° to 27°
OT min.	5 mm	5 mm	40°	40°
MD max. (See note 4.)	1.5 mm	1.5 mm	14°	14°
OP	37 ±0.8 mm	27 ±0.8 mm	---	---
TT (See note 5.)	(9 mm)	(9 mm)	(70°)	(70°)
DOT min. (See note 6.)	5.8 mm	4.8 mm	50°	50°
DOF min. (See note 6.)	20 N	20 N	20 N	20 N

Note:
1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. The operating characteristics of these Switches were measured with the roller lever set at 30 mm.
3. The operating characteristics of these Switches were measured with the roller lever set at 31 mm.
4. Only for snap-action models.
5. Reference value.
6. For safe use, always make sure that the minimum values or greater are provided.

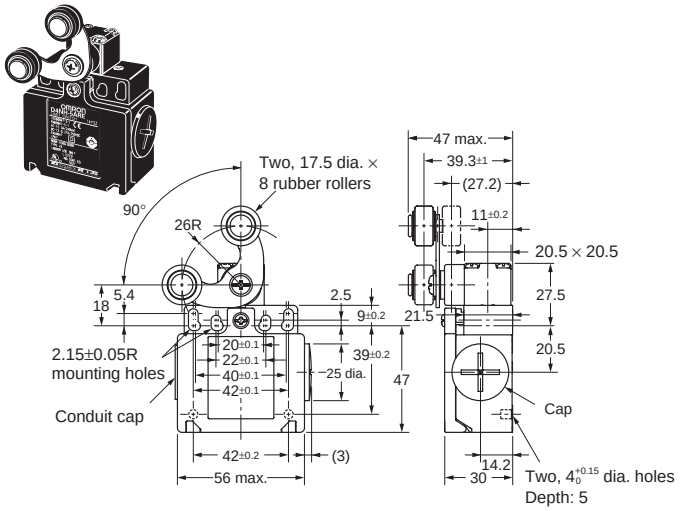
Slow-action (1NC/1NO) (2NC/1NO)

Model	D4N-□A62 D4N-□C62 D4N-□E62 D4N-□F62	D4N-□A72 D4N-□C72 D4N-□E72 D4N-□F72	D4N-□A2G D4N-□C2G D4N-□E2G D4N-□F2G (See note 1.)	D4N-□A2H D4N-□C2H D4N-□E2H D4N-□F2H (See note 2.)
OF max.	5.0 N	5.0 N	4.5 N	4.5 N
RF min.	0.8 N	0.8 N	0.4 N	0.4 N
PT max. (See note 3.)	4 mm	4 mm	18° to 27°	18° to 27°
PT (2nd) (See note 4.)	(5.2 mm)	(4.3 mm)	(44°)	(44°)
PT max. (See note 5.)	4 mm	4 mm	27.5° to 36.5°	27.5° to 36.5°
PT (2nd) (See note 6.)	(1.5 mm)	(1.5 mm)	(18°)	(18°)
OT min.	5 mm	5 mm	40°	40°
OP	37 ±0.8 mm	27 ±0.8 mm	---	---
OP (See note 7.)	36 ±0.8 mm	26.1 ±0.8 mm	---	---
TT (See note 8.)	(9 mm)	(9 mm)	(70°)	(70°)
DOT min. (See note 9.)	5.8 mm	4.8 mm	50°	50°
DOF min. (See note 9.)	20 N	20 N	20 N	20 N

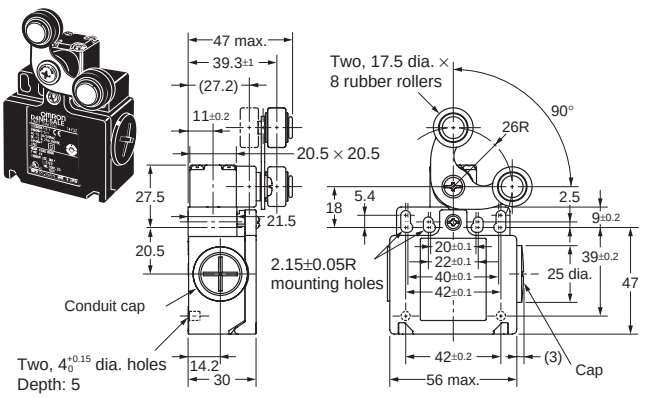
Note:
1. The operating characteristics of these Switches were measured with the roller lever set at 30 mm.
2. The operating characteristics of these Switches were measured with the roller lever set at 31 mm.
3. This PT value is possible when the NC contacts are open (OFF).
4. This PT value is possible when the NO contacts are closed (ON).
5. Only for MBB models.
6. Reference value for MBB models only.
7. Only for MBB models.
8. Reference value.
9. For safe use, always make sure that the minimum values or greater are provided.

2-conduit Models

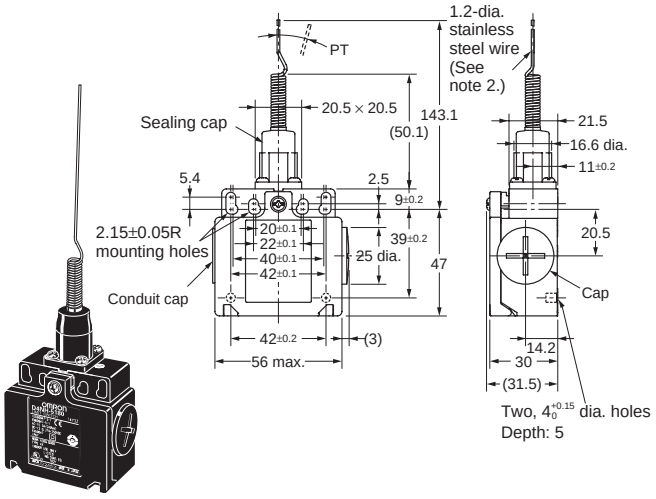
Fork Lever Lock
(Right Operation)
D4N-5□RE D4N-6□RE
D4N-7□RE D4N-8□RE



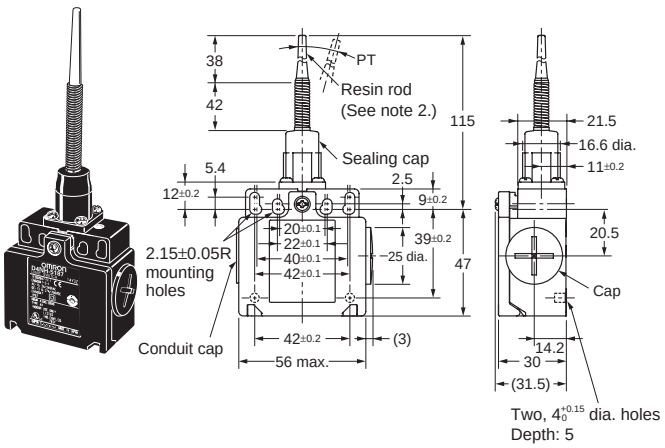
Fork Lever Lock
(Left Operation)
D4N-5□LE D4N-6□LE
D4N-7□LE D4N-8□LE



Cat Whisker
D4N-5□80 D4N-6□80
D4N-7□80 D4N-8□80



Plastic Rod
D4N-5□87 D4N-6□87
D4N-7□87 D4N-8□87



Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. The usable range for stainless steel wires and resin rods is 35 mm max. from the end with a total travel of 70 mm max.

Slow-action (1NC/1NO) (2NC), Slow-action (2NC) (3NC)

Model	D4N-□□RE	D4N-□□LE
Force necessary to reverse the direction of the lever: max.	6.4 N	6.4 N
Movement until the lever reverses	55 ±10°	55 ±10°
Movement until switch operation (NC)	(6.5°)	(6.5°) (MBB: 10°)
Movement until switch operation (NO)	(18.5°)	(18.5°) (MBB: 5°)

Note: Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.

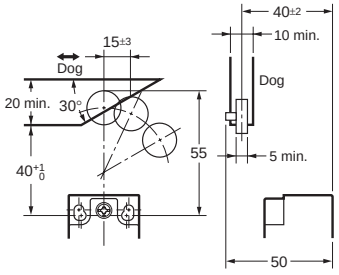
Snap-action (1NC/1NO), Slow-action (2NC) (3NC)

Model	D4N-□□80	D4N-□□87
OF max.	1.5 N	1.5 N
PT max.	15°	15°

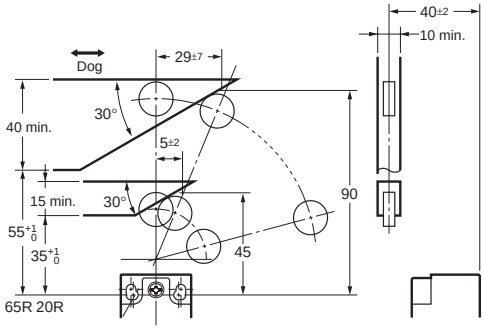
■ Levers

Refer to the following for the angles and positions of the watchdogs (source: EN50047.)

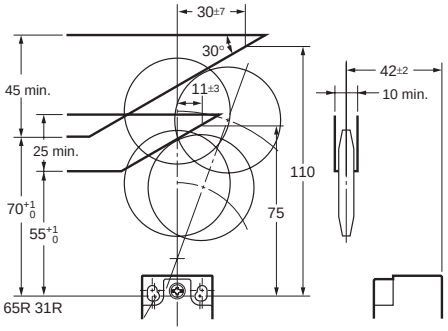
Roller Lever (D4N-□□20)



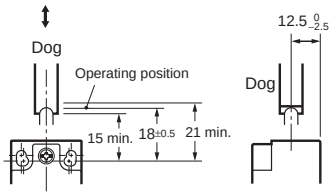
Adjustable Roller Lever, Form Lock (with Metal Lever, Resin Roller) (D4N-□□2G) (Reference Values)



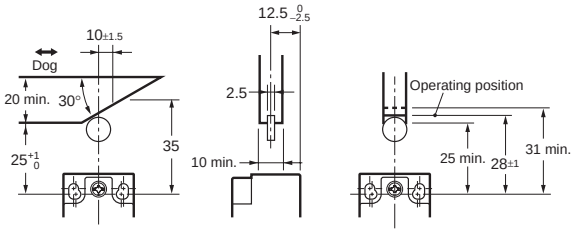
Adjustable Roller Lever, Form Lock (with Metal Lever, Rubber Roller) (D4N-□□2H) (Reference Values)



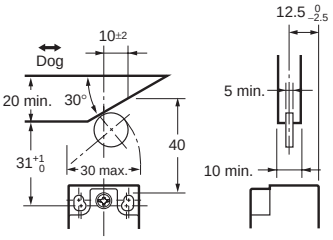
Sealed Plunger (D4N-□□31)



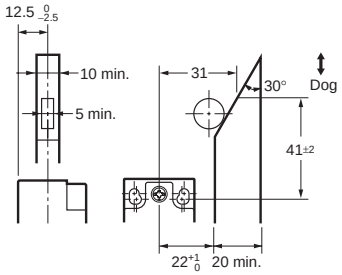
Roller Plunger (D4N-□□32)



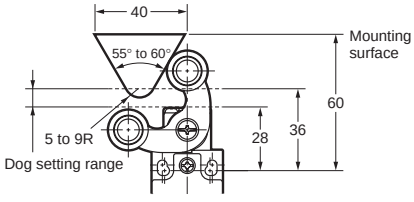
One-way Roller Arm Lever (Horizontal) (D4N-□□62)



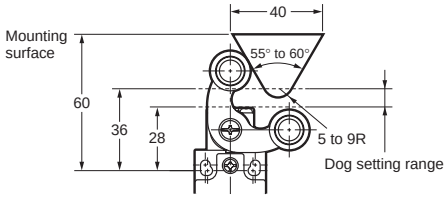
One-way Roller Arm Lever (Vertical) (Reference Values) (D4N-□□72)



Fork Lever Lock (Right Operation) (D4N-□□RE)



Fork Lever Lock (Left Operation) (D4N-□□LE)



Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Limit Switches"* on page 247.

⚠ CAUTION

Do not use metal connectors or conduits. If the Switch is made of resin, damage at the conduit section may cause electric shock.

■ Precautions for Safe Use

- Do not drop the Switch. Doing so may result in the Switch not performing to its full capacity.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- Do not use the Switch where explosive gas or flammable gas may be present.
- Do not use the Switch submerged in oil or water, or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch interior. (The IP67 degree of protection specification for the Switch refers to water penetration while the Switch is submersed in water for a specified period of time.)
- Protect the head from foreign material. Subjecting the head to foreign material may result in premature wear or damage to the Switch. Although the switch body is protected from penetration by dust or water, the head is not protected from penetration by minute particles or water.
- Turn the power OFF before wiring. Not doing so may result in electric shock.
- Install the cover after wiring. Not doing so may result in electric shock.
- Connect a fuse to the Switch in series to protect the Switch from short-circuit damage. Use a fuse with a breaking current 1.5 to 2 times larger than the rated current. To conform to EN ratings, use an IEC60269-compliant 10-A fuse type gI or gG.
- Do not switch circuits for two or more standard loads (250 VAC, 3 A) at the same time. Doing so may adversely affect insulation performance.
- The durability of the Switch is greatly affected by operating conditions. Evaluate the Switch under actual working conditions before permanent installation and use within a number of switching operations that will not adversely affect the Switch's performance.
- Be sure to indicate in the machine manufacturer's instruction manual that the user must not attempt to repair or maintain the Switch and must contact the machine manufacturer for any repairs or maintenance.
- Check the Switches before use and inspect regularly, replacing them when necessary. If a Switch is kept pressed for an extended period of time, the components may deteriorate quickly, and the Switch may not release.

■ Precautions for Correct Use

Environment

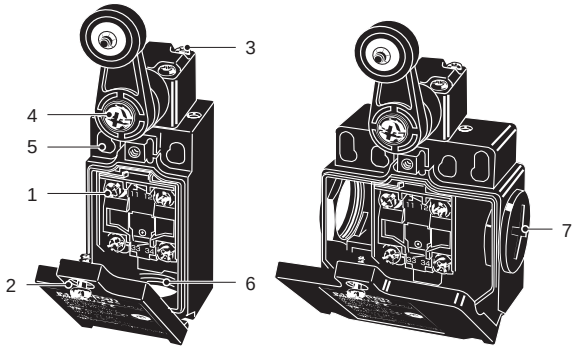
- The Switch is intended for indoor use only.
- Do not use the Switch outdoors. Doing so may cause the Switch to malfunction.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch caused by contact failure or corrosion.
- Do not use the Switches in the following locations.
  - Locations subject to severe temperature changes
  - Locations subject to high temperatures or condensation
  - Locations subject to severe vibration
  - Locations where the interior of the Protective Door may come into direct contact with cutting chips, metal filings, oil, or chemicals
  - Locations where the Switch may come into contact with thinner or detergents

Mounting Method

Mounting Screw Tightening Torque

Tighten each of the screws to the specified torque. Loose screws may result in malfunction of the Switch within a short time.

1	**Terminal screw**	0.6 to 0.8 N·m
2	**Cover clamping screw**	0.5 to 0.7 N·m
3	**Head clamping screw**	0.5 to 0.6 N·m
4	**Lever clamping screw**	1.6 to 1.8 N·m
5	**Body clamping screw**	0.5 to 0.7 N·m
6	**Conduit mounting connection, M12 adaptor**	1.8 to 2.2 N·m (except 1/2-14NPT)
		1.4 to 1.8 N·m (1/2-14NPT)
7	**Cap screw**	1.3 to 1.7 N·m

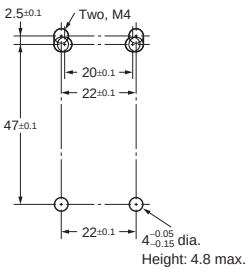


Switch Mounting

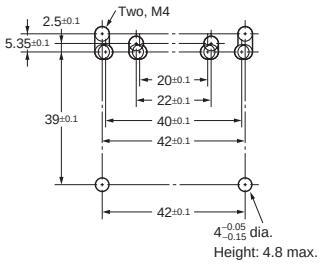
- Mount the Switch using M4 screws and washers and tighten the screws to the specified torque.
- For safety, use screws that cannot be easily removed, or use an equivalent measure to ensure that the Switch is secure.
- Secure the Switch with two M4 bolts and washers. Provide studs with a diameter of $4^{-0.05}_{-0.15}$ and a height of 4.8 mm max. at two places, inserting into the holes at the bottom of the Switch as shown below so that the Switch is firmly fixed at four points.

Switch Mounting Holes

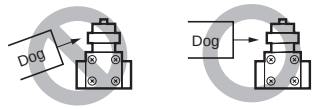
One-conduit Type



Two-conduit Type



- Make sure that the dog contacts the actuator at a right angle. Applying a load to the switch actuator (roller) on a slant may result in deformation or damage of the actuator or rotary shaft.

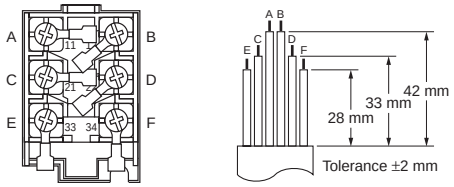


Incorrect **Correct**

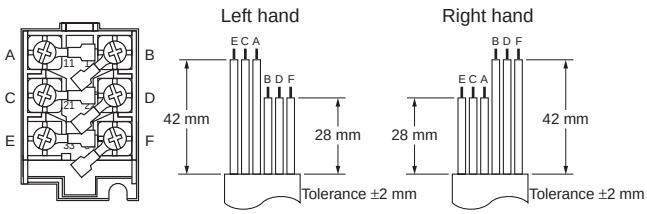
Wiring

- When connecting to the terminals via insulating tube and M3.5 crimp terminals, arrange the crimp terminals as shown below so that they do not rise up onto the case or the cover. Applicable lead wire size: AWG20 to AWG18 (0.5 to 0.75 mm^2).
  Use lead wires of an appropriate length, as shown below. Not doing so may result in excess length causing the cover to rise and not fit properly.

One-conduit Type (3 Poles)



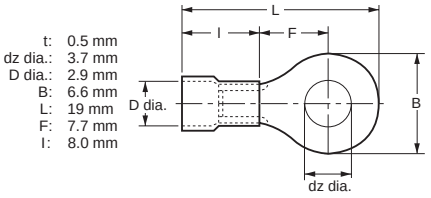
Two-conduit Type (3 Poles)

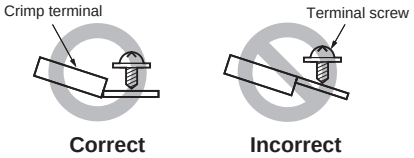


- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.
- Use crimp terminals not more than 0.5 mm in thickness. Otherwise, they will interfere with other components inside the case. The crimp terminals shown below are not more than 0.5 mm thick.

Manufacture	Type
J.S.T.	FV0.5-3.7 (F type) V0.5-3.7 (straight type)

J.S.T. is a Japanese manufacturer.





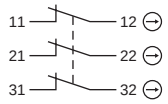
Correct **Incorrect**

Contact Arrangement

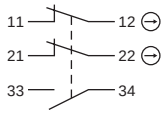
- The following diagrams show the contact arrangements used for screw terminal types and connector types.

Screw Terminal Type

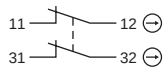
D4N-□D□□ (3NC)



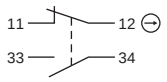
D4N-□C□□ (2NC/1NO)
D4N-□F□□ (2NC/1NO (MBB))



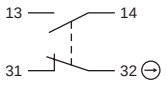
D4N-□B□□ (2NC)
D4N-□2□□ (2NC (SNAP))



D4N-□A□□ (1NC/1NO)
D4N-□E□□ (1NC/1NO (MBB))

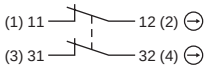


D4N-□1□□ (1NC/1NO (SNAP))

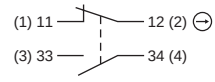


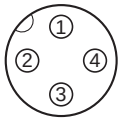
Connector Type

D4N-9B□□ (2NC)
D4N-92□□ (2NC (SNAP))



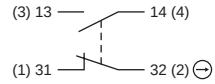
D4N-9A□□ (1NC/1NO)
D4N-9E□□ (1NC/1NO (MBB))





Pin No. (Terminal No.)

D4N-91□□ (1NC/1NO (SNAP))



- Applicable socket: XS2F (OMRON).
- Refer to the *Connector Catalog* for details on socket pin numbers and lead wire colors.

Socket Tightening (Connector Type)

- Turn the socket connector screws by hand and tighten until no space remains between the socket and the plug.
- Make sure that the socket connector is tightened securely. Otherwise, the rated degree of protection (IP67) may not be maintained and vibration may loosen the socket connector.

Conduit Opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the specified torque. The case may be damaged if an excessive tightening torque is applied.
- When using 1/2-14NPT, wind sealing tape around the joint between the connector and conduit opening so that the enclosure will conform to IP67.
- Use a cable with a suitable diameter for the connector.
- Attach and tighten a conduit cap to the unused conduit opening when wiring. Tighten the conduit cap to the specified torque. The conduit cap is provided with the Switch (2-conduit types).

Changing the Lever

The lever mounting screws can be used to set the lever position to any position in a 360° angle at 7.5° increments. Grooves are incised on the lever and rotary shaft that engage to prevent the lever from slipping against the rotary shaft. The screws on adjustable roller lever models can also loosened to change the length of the lever.

Remove the screws from the front of the lever before mounting the lever in reverse (front/back), and set the level so that operation will be completed before exceeding a range of 180° on the horizontal.

Recommended Connectors

Use connectors with screws not exceeding 9 mm, otherwise the screws will protrude into the case interior, interfering with other components in the case. The connectors listed in the following table have connectors with thread sections not exceeding 9 mm. Use the recommended connectors to ensure conformance to IP67.

Size	Manufacturer	Model	Applicable cable diameter
G1/2	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
Pg13.5	LAPP	ST-13.5 5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5 5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2 5301-6030	6.0 to 12.0 mm

Use LAPP connectors together with seal packing (JPK-16, GP-13.5, GPM20, or GPM12), and tighten to the specified tightening torque. Seal packing is sold separately.

LAPP is a German manufacturer.

Before using a 2-conduit 1/2-14NPT type, attach the provided changing adaptor to the Switch and then connect the recommended connector.

Storage

Do not store the Switch in locations where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, Cl_2) or dust is present, or in locations subject to high temperatures and humidity.

Others

- Do not allow the load current to exceed the rated value.
- Confirm that the seal rubber has no defects before use. If the seal rubber is displaced or raised, or has foreign particles adhered to it, the sealing capability of the seal rubber will be adversely affected.
- Use the correct cover mounting screws only, or the sealing capability of the seal rubber will deteriorate.
- Inspect the Switch regularly.
- Make sure that foreign particles do not enter the head when removing the screws from the four corners to change the head position in any of the four directions.
- Use the following recommended countermeasures to prevent telegraphing when using adjustable or long levers.

1. Make the rear edge of the dog smooth with an angle of 15° to 30° or make it in the shape of a quadratic curve.
2. Design the circuit so that no error signal will be generated.
3. Use or set a Switch that is operated in one direction only.

Production Discontinuation

Following the release of the D4N, production of the D4D-N will be discontinued.

Date of Production Discontinuation

Production of the D4D-N Series will be discontinued as of the end of March 2006.

Product Replacement

1. Dimensions

The D4D-N and D4N use the same mounting method, and mounting hole. The multi-contact structure and the extra 4 mm in length, however, are different.

2. Terminal Numbers

For the 2-contact slow-action model, the terminals 21, 22, 23, and 24 on the D4D-N are 31, 32, 33, and 34 on the D4N.

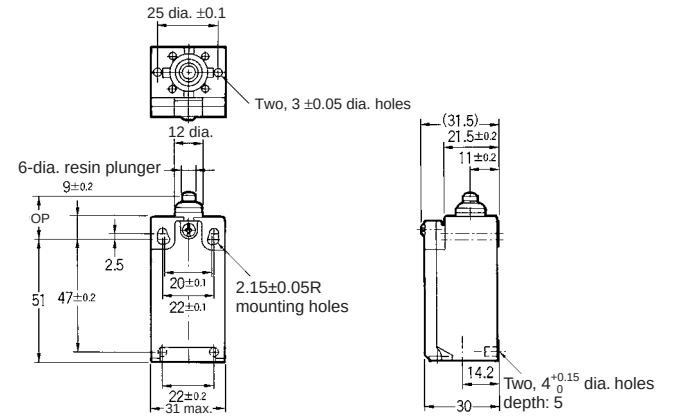
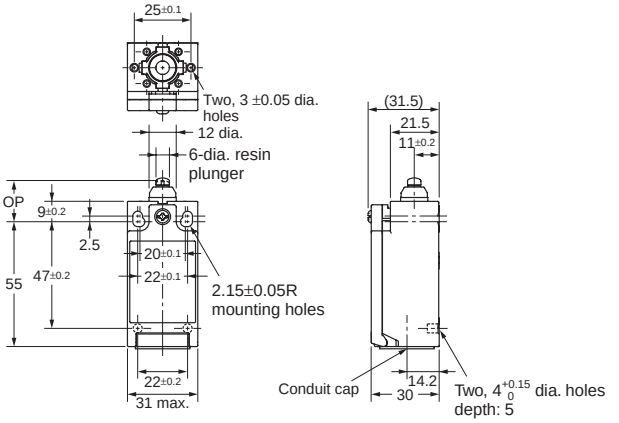
3. Recommended Terminals

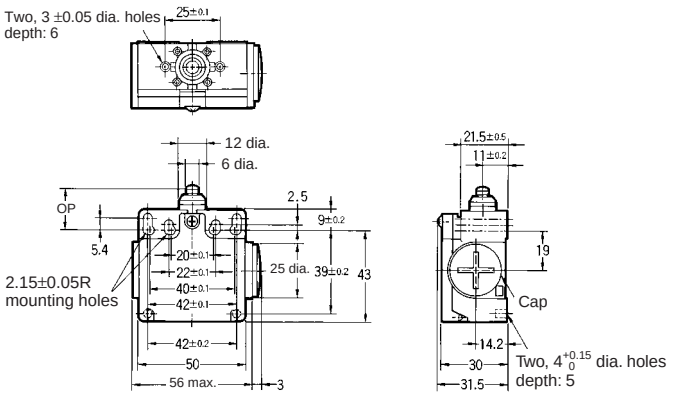
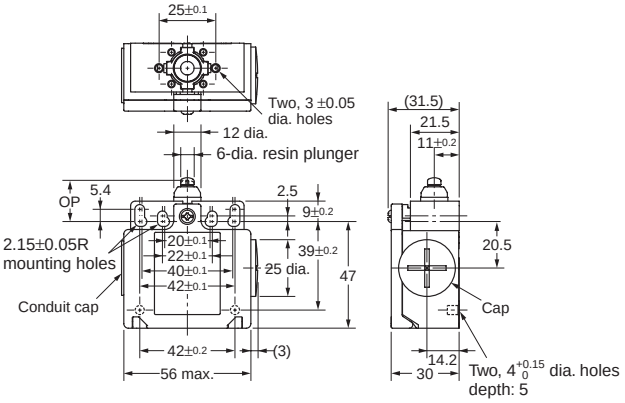
If the recommended terminals are not used, the Switch may not be compatible. Make sure that the Switch is compatible with the terminals.

Comparison of the D4D-N and Substitute Products

Model	D4N
Switch color	Very similar
Dimensions	Very similar
Wiring/connection	Significantly different
Mounting method	Completely compatible
Ratings/performance	Very similar
Operating characteristics	Very similar
Operating method	Completely compatible

Dimensions (Unit: mm)

Discontinued Models (1-conduit Plunger-type D4D-N)	Replacement Products (1-conduit Plunger-type D4N)
	

Discontinued Models (2-conduit Plunger-type D4D-N)	Replacement Products (2-conduit Plunger-type D4N)
	

List of Recommended Substitute Products

: The actuator on the D4D-N is a non-safety type. The D4N is recommended for safety applications (form lock type). Be sure to mount it correctly.

: M screws are recommended to comply with European standards. Therefore, the M20 type is recommended as a substitute when the Pg13.5 conduit-type is not available in a D4N model.

Safety Limit Switches

D4D-N product to be discontinued	Recommended substitute product	D4D-N product to be discontinued	Recommended substitute product	D4D-N product to be discontinued	Recommended substitute product
D4D-1120N	D4N-1120	D4D-1520N	D4N-1A20	D4D-1A20N	D4N-1B20
D4D-2120N	D4N-2120	D4D-2520N	D4N-2A20	D4D-2A20N	D4N-2B20
D4D-3120N	D4N-3120	D4D-3520N	D4N-3A20	D4D-3A20N	D4N-3B20
D4D-5120N	D4N-5120	D4D-5520N	D4N-5A20	D4D-5A20N	D4N-5B20
D4D-6120N	D4N-6120	D4D-6520N	D4N-6A20	D4D-6A20N	D4N-6B20
D4D-1122N	D4N-1122	D4D-1522N	D4N-1A22	D4D-1A22N	D4N-1B22
D4D-2122N	D4N-2122	D4D-2522N	D4N-2A22	D4D-2A22N	D4N-2B22
D4D-3122N	D4N-3122	D4D-3522N	D4N-3A22	D4D-3A22N	D4N-3B22
D4D-5122N	D4N-5122	D4D-5522N	D4N-5A22	D4D-5A22N	D4N-5B22
D4D-6122N	D4N-6122	D4D-6522N	D4N-6A22	D4D-6A22N	D4N-6B22
D4D-1125N	D4N-1125	D4D-1525N	D4N-1A25	D4D-1A25N	D4N-1B25
D4D-2125N	D4N-2125	D4D-2525N	D4N-2A25	D4D-2A25N	D4N-2B25
D4D-3125N	D4N-3125	D4D-3525N	D4N-3A25	D4D-3A25N	D4N-3B25
D4D-1131N	D4N-1131	D4D-1531N	D4N-1A31	D4D-1A31N	D4N-1B31
D4D-2131N	D4N-2131	D4D-2531N	D4N-2A31	D4D-2A31N	D4N-2B31
D4D-3131N	D4N-3131	D4D-3531N	D4N-3A31	D4D-3A31N	D4N-3B31
D4D-5131N	D4N-5131	D4D-5531N	D4N-5A31	D4D-5A31N	D4N-5B31
D4D-6131N	D4N-6131	D4D-6531N	D4N-6A31	D4D-6A31N	D4N-6B31
D4D-1132N	D4N-1132	D4D-1532N	D4N-1A32	D4D-1A32N	D4N-1B32
D4D-2132N	D4N-2132	D4D-2532N	D4N-2A32	D4D-2A32N	D4N-2B32
D4D-3132N	D4N-3132	D4D-3532N	D4N-3A32	D4D-3A32N	D4N-3B32
D4D-5132N	D4N-5132	D4D-5532N	D4N-5A32	D4D-5A32N	D4N-5B32
D4D-6132N	D4N-6132	D4D-6532N	D4N-6A32	D4D-6A32N	D4N-6B32
D4D-1162N	D4N-1162	D4D-1562N	D4N-1A62	D4D-1A62N	D4N-1B62
D4D-2162N	D4N-2162	D4D-2562N	D4N-2A62	D4D-2A62N	D4N-2B62
D4D-3162N	D4N-3162	D4D-3562N	D4N-3A62	D4D-3A62N	D4N-3B62
D4D-5162N	D4N-5162	D4D-5562N	D4N-5A62	D4D-5A62N	D4N-5B62
D4D-6162N	D4N-6162	D4D-6562N	D4N-6A62	D4D-6A62N	D4N-6B62
D4D-1172N	D4N-1172	D4D-1572N	D4N-1A72	D4D-1A72N	D4N-1B72
D4D-2172N	D4N-2172	D4D-2572N	D4N-2A72	D4D-2A72N	D4N-2B72
D4D-3172N	D4N-3172	D4D-3572N	D4N-3A72	D4D-3A72N	D4N-3B72
D4D-5172N	D4N-5172	D4D-5572N	D4N-5A72	D4D-5A72N	D4N-5B72
D4D-6172N	D4N-6172	D4D-6572N	D4N-6A72	D4D-6A72N	D4N-6B72
D4D-112HN	D4N-112H	D4D-152HN	D4N-1A2H	D4D-1A2HN	D4N-1B2H
D4D-212HN	D4N-212H	D4D-252HN	D4N-2A2H	D4D-2A2HN	D4N-2B2H
D4D-312HN	D4N-312H	D4D-352HN	D4N-3A2H	D4D-3A2HN	D4N-3B2H

General-purpose Limit Switches

D4D-N product to be discontinued	Recommended substitute product	D4D-N product to be discontinued	Recommended substitute product	D4D-N product to be discontinued	Recommended substitute product
D4D-1121N	D4N-112G	D4D-15REN	D4N-1ARE	D4D-1AREN	D4N-1BRE
D4D-2121N	D4N-212G	D4D-25REN	D4N-2ARE	D4D-2AREN	D4N-2BRE
D4D-3121N	D4N-312G	D4D-35REN	D4N-3ARE	D4D-3AREN	D4N-3BRE
D4D-5121N	D4N-512G	D4D-55REN	D4N-5ARE	D4D-5AREN	D4N-5BRE
D4D-6121N	D4N-612G	D4D-65REN	D4N-6ARE	D4D-6AREN	D4N-6BRE
D4D-1127N	D4N-112H	D4D-15LEN	D4N-1ALE	D4D-1ALEN	D4N-1BLE
D4D-2127N	D4N-212H	D4D-25LEN	D4N-2ALE	D4D-2ALEN	D4N-2BLE
D4D-3127N	D4N-312H	D4D-35LEN	D4N-3ALE	D4D-3ALEN	D4N-3BLE
D4D-5127N	D4N-512H	D4D-55LEN	D4N-5ALE	D4D-5ALEN	D4N-5BLE
D4D-6127N	D4N-612H	D4D-65LEN	D4N-6ALE	D4D-6ALEN	D4N-6BLE
D4D-1180N	D4N-4180	D4D-1521N	D4N-1A2G	D4D-1A21N	D4N-1B2G
D4D-2180N	D4N-2180	D4D-2521N	D4N-2A2G	D4D-2A21N	D4N-2B2G
D4D-3180N	D4N-3180	D4D-3521N	D4N-3A2G	D4D-3A21N	D4N-3B2G
D4D-5180N	D4N-8180	D4D-5521N	D4N-5A2G	D4D-5A21N	D4N-5B2G
D4D-6180N	D4N-6180	D4D-6521N	D4N-6A2G	D4D-6A21N	D4N-6B2G
D4D-1187N	D4N-4187	D4D-1527N	D4N-1A2H	D4D-1A27N	D4N-1B2H
D4D-2187N	D4N-2187	D4D-2527N	D4N-2A2H	D4D-2A27N	D4N-2B2H
D4D-3187N	D4N-3187	D4D-3527N	D4N-3A2H	D4D-3A27N	D4N-3B2H
D4D-5187N	D4N-8187	D4D-5527N	D4N-5A2H	D4D-5A27N	D4N-5B2H
D4D-6187N	D4N-6187	D4D-6527N	D4N-6A2H	D4D-6A27N	D4N-6B2H
				D4D-1A80N	D4N-4B80
				D4D-2A80N	D4N-2B80
				D4D-3A80N	D4N-3B80
				D4D-5A80N	D4N-8B80
				D4D-6A80N	D4N-6B80
				D4D-1A87N	D4N-4B87
				D4D-2A87N	D4N-2B87
				D4D-3A87N	D4N-3B87
				D4D-5A87N	D4N-8B87
				D4D-6A87N	D4N-6B87

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C130-E1-04

Small Safety Limit Switch
D4F

Smallest Class of Safety Limit Switches in the World

- High-sensitivity safety limit switch.
- Built-in switches with two- or four-contact construction are available.
- Degree of protection: IP67 (EN60947-5-1)
- Certified standards: UL, EN (TÜV), and CCC

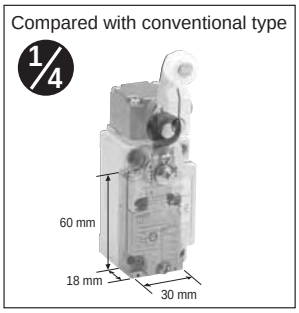
Note: Contact your sales representative for details on models with safety standard certification.

Features

A Dramatic Reduction in Size

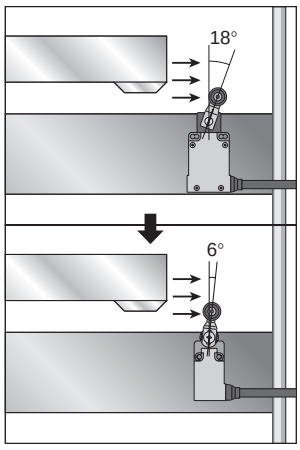
The volume is reduced to one quarter of the volume of our company's conventional types of limit switches (30 (W) × 18 (L) × 60 mm (H)).

Optimal for the downsizing of machinery and equipment.



High-sensitivity and Space-saving

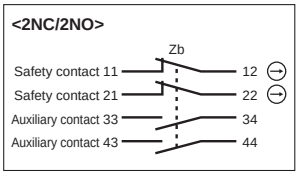
- The conventional types of limit switches with a direct opening mechanism required 18 degrees for a movement until operation because its direct opening point is long (Our company's conventional types of limit switches).
- The D4F requires 6 degrees to respond.
- On the table that allows machine tools etc. to move at an increasing speed, the moment the dog pushes the actuator, the D4F responds.
- With the development of smaller versions of machines, the D4F saves space and fits in a smaller space.



Four-contact Construction is Available

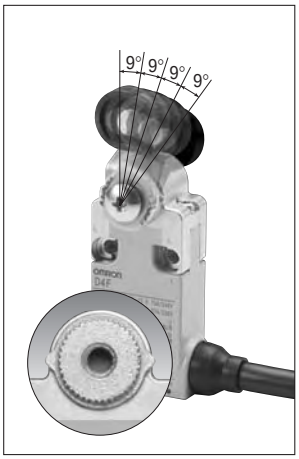
D4F models of two-contact construction (1NC/1NO and 2NC) and those of four-contact construction (2NC/2NO and 4NC) are available.

The auxiliary contact can be used for monitoring input of control circuits and indicator lighting.



Positioning in Steps of 9 Degrees

For a roller lever type of switch, grooves are incised on the body and the cam of the actuator, to allow positioning in steps of 9 degrees.



Model Number Structure

■ Model Number Legend

D4F-□□-□□
1 2 3 4

1. Built-in Switch
1: 1NC/1NO (slow-action)
2: 2NC (slow-action)
3: 2NC/2NO (slow-action)
4: 4NC (slow-action)

2. Actuator
02: Roller plunger (Metal roller)
20: Roller lever (Metal lever, resin roller)

3. Cable Length
1: 1 m
3: 3 m
5: 5 m

4. Pull-outing direction of cable
R: Horizontal
D: Vertical

Ordering Information

■ List of Models

: Models with certified direct opening contacts.

Actuator	Cable length	Cable direction	Built-in switch			
			1NC/1NO (slow-action)	2NC (slow-action)	2NC/2NO (slow-action)	4NC (slow-action)
Roller lever (Metal lever, resin roller) 	1 m	Horizontal	D4F-120-1R	D4F-220-1R	D4F-320-1R	D4F-420-1R
		Vertical	D4F-120-1D	D4F-220-1D	D4F-320-1D	D4F-420-1D
	3 m	Horizontal	D4F-120-3R	D4F-220-3R	D4F-320-3R	D4F-420-3R
		Vertical	D4F-120-3D	D4F-220-3D	D4F-320-3D	D4F-420-3D
	5 m	Horizontal	D4F-120-5R	D4F-220-5R	D4F-320-5R	D4F-420-5R
		Vertical	D4F-120-5D	D4F-220-5D	D4F-320-5D	D4F-420-5D
Roller plunger (Metal roller) 	1 m	Horizontal	D4F-102-1R	D4F-202-1R	D4F-302-1R	D4F-402-1R
		Vertical	D4F-102-1D	D4F-202-1D	D4F-302-1D	D4F-402-1D
	3 m	Horizontal	D4F-102-3R	D4F-202-3R	D4F-302-3R	D4F-402-3R
		Vertical	D4F-102-3D	D4F-202-3D	D4F-302-3D	D4F-402-3D
	5 m	Horizontal	D4F-102-5R	D4F-202-5R	D4F-302-5R	D4F-402-5R
		Vertical	D4F-102-5D	D4F-202-5D	D4F-302-5D	D4F-402-5D

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN60204-1
  EN1088
  EN50047
  EN81
  EN115
  GS-ET-15
  JIS C 8201-5-1

■ Certified Standards

Certification body	Standards	File No.
TÜV Product service	EN60947-5-1 (certified direct opening)	(See note 1.)
UL (See note 2.)	UL508 CSA C22.2 No.14	E76675
CCC (CQC) (See note 3.)	GB14048.5	20030103050 64266

Note: **1.** Contact your OMRON sales representative.
2. Certification has been obtained for CSA C22.2 No. 14 under UL.
3. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item / Utilization category	AC-15	DC-13
Rated operating current (I_e)	0.75 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC269 as a short-circuit protection device.

UL/CSA (UL508, CSA C22.2 No. 14)

C300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	2.5 A	15 A	1.5 A	1,800 VA	180 VA
240 VAC		7.5 A	0.75 A		

Q300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VDC		0.27 A	0.27 A		

■ Characteristics

Degree of protection (See note 3.)		IP67 (EN60947-5-1)
Durability (See note 4.)		Mechanical: 10,000,000 times min. Electrical: 1,000,000 times min. (4-mA resistive load at 24 VDC, 4 circuits) 150,000 times min. (1-A resistive load at 125 VAC, 2 circuits / 4-mA resistive load at 24 VDC, 2 circuits) (See note 5.)
Operating speed		1 mm to 0.5 m/s
Operating frequency		Mechanical: 120 operations/minute Electrical: 30 operations/minute
Insulation resistance		100 MΩ min. (at 500 VDC) between terminals of the same polarities, between terminals of different polarities, between current-carrying metal parts and grounds, and between each terminal and non-current carrying metal parts
Minimum applicable load (See note 6.)		4-mA resistive load at 24 VDC, 4 circuits (Level N reference value)
Contact resistance (See note 7.)		300 mΩ max. (initial value with 1-m cable), 500 mΩ max. (initial value with 3-m cable), 700 mΩ max. (initial value with 5-m cable)
Dielectric strength		Between terminals of same polarities: Uimp 2.5 kV (EN60947-5-1) Between terminals of different polarities: Uimp 4 kV (EN60947-5-1) Between current-carrying metal parts and grounds: Uimp 4 kV (EN60947-5-1) Between each terminal and non-current carrying metal parts: Uimp 4 kV (EN60947-5-1)
Conditional short-circuit current		100 A (EN60947-5-1)
Pollution degree (operating environment)		3 (EN60947-5-1)
Conventional free air thermal current (Ith)		2.5 A (EN60947-5-1)
Protection against electric shock		Class I (with a ground wire)
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude
Shock resistance	**Destruction**	1,000 m/s^2 min.
	Malfunction	300 m/s^2 min.
Ambient temperature		Operating: −30°C to 70°C (with no icing)
Ambient humidity		Operating: 95% max.
Cable		UL2464 No. 22 AWG, finishing O.D.: 8.3 mm
Weight		Approx. 190 g (D4F-102-1R, with 1-m cable) Approx. 220 g (D4F-120-1R, with 1-m cable)

Note: **1.** The above values are initial values.
2. Once the contact is opened or closed with an ordinary load, it cannot be used for a load smaller than that. The contact surface may be rough, which impairs the reliability of contacting.
3. The degree of protection shown above is based on the test method specified in EN60947-5-1. Be sure to confirm in advance the sealing performance under the actual operating environment and conditions.
4. Durability values are calculated at an operating temperature of 5°C to 35°C, and an operating humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.
5. When the ambient temperature is 35°C or higher, do not apply 1 A at 125 VAC to more than two circuits.
6. The value will vary depending on factors such as the switching frequency, the ambient environment, and the reliability level. Be sure to confirm correct operation with the actual load before application.
7. The contact resistance was measured with 0.1 A at 5 to 8 VDC with a fall-of-potential method.

■ Operating Characteristics

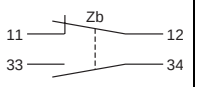
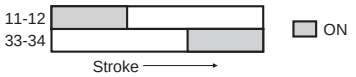
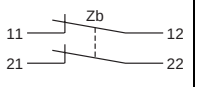
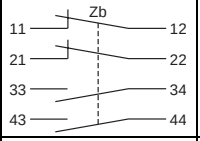
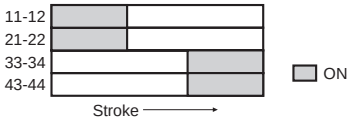
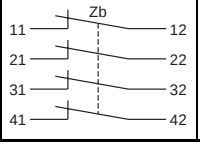
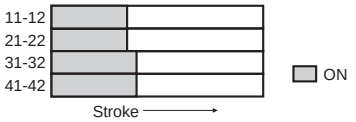
Slow-action (1NC/1NO, 2NC, 2NC/2NO, and 4NC)

Model / Operating Characteristics	D4F-□20-□R D4F-□20-□D	D4F-□02-□R D4F-□02-□D
OF max. (See note 2.)	5 N	12 N
RF min. (See note 3.)	0.5 N	1.5 N
PT1 (11-12 and 21-22) **PT1 (31-32 and 41-42)** **PT2 (See note 4.)**	6±3° (NC) 9±3° (NC) (12°) (NO)	1 mm max. (NC) 1.3 mm max. (NC) (1.2 mm) (NO)
OT min.	40°	3.2 mm
OP (11-12 and 21-22) **OP (31-32 and 41-42)**	--- ---	29.4±1 mm 29±1 mm
TT (See note 4.)	(55°)	(4.5 mm)
DOT min. (See note 5.)	18°	1.8 mm
DOF min.	20 N	20 N

Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/2NO, and 4NC contacts. Check contact operation.
2. The OF value is the maximum load that opens an NC contact (11-12, 21-22, 31-32, 41-42).
3. The RF value is the minimum load that closes an NC contact (11-12, 21-22, 31-32, 41-42).
4. The PT2 and TT values are reference values.
5. The D4F is used in accordance with EN81 and EN115 at a minimum DOT of 30° and 2.8 mm.

Connections

■ Contact Form

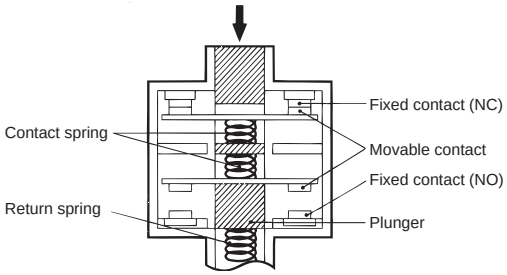
Model	Contact		Operating pattern	Remarks
D4F-1□-□□	1NC/1NO (slow-action)			Only NC contact 11-12 has a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4F-2□-□□	2NC (slow-action)			NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 21-22 can be used as unlike poles.
D4F-3□-□□	2NC/2NO (slow-action)			NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, 33-34 and 43-44 can be used as unlike poles.
D4F-4□-□□	4NC (slow-action)			NC contacts 11-12, 21-22, 31-32 and 41-42 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, 31-32 and 41-42 can be used as unlike poles.

Note: Terminal numbers are according to EN50013; contact symbols are according to IEC60947-5-1.

Operation

■ Direct Opening Mechanism

1NC/1NO Contact (slow-action)



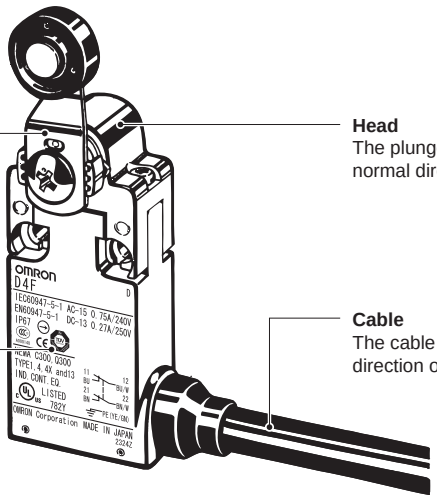
Conforms to EN60947-5-1 Direct Opening ⊖.

(Only the NC contacts have a direct opening function.)
When contact welding occurs, the NC contacts are separated from each other by pushing in the plunger.

Nomenclature

Lever
Improved safety of the lever-setting (Form lock configuration). Many grooves are incised on the lever and the rotating shaft that mesh with each other to prevent a slip between the lever and the rotating shaft.
The lever can be set for positioning in steps of 9 degrees.

Built-in Switch
Has a direct opening mechanism separating the contacts when the NC contacts are welded.



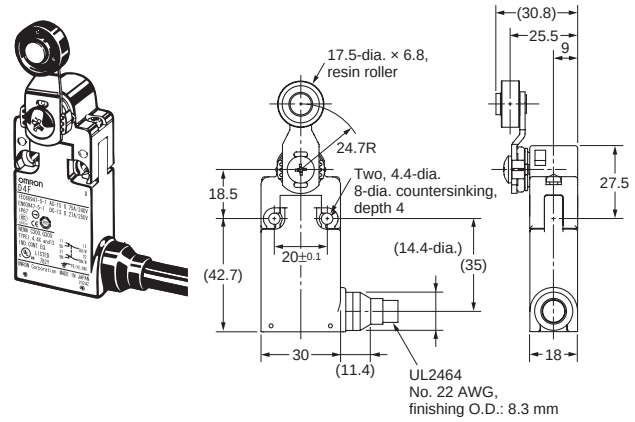
Head
The plunger type of actuator can be used in a normal direction and reverse direction.

Cable
The cable can be pulled out in a horizontal direction or in a vertical direction.

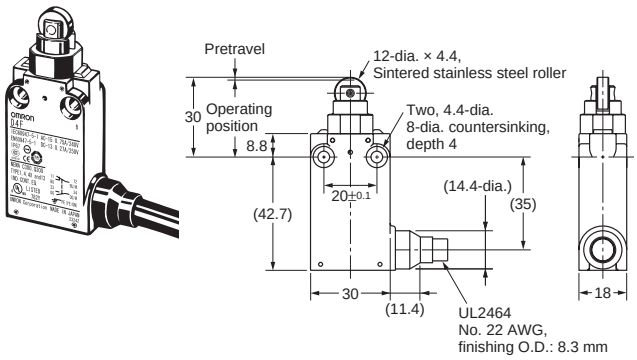
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Each dimension has a tolerance of 0.4 mm unless otherwise specified.

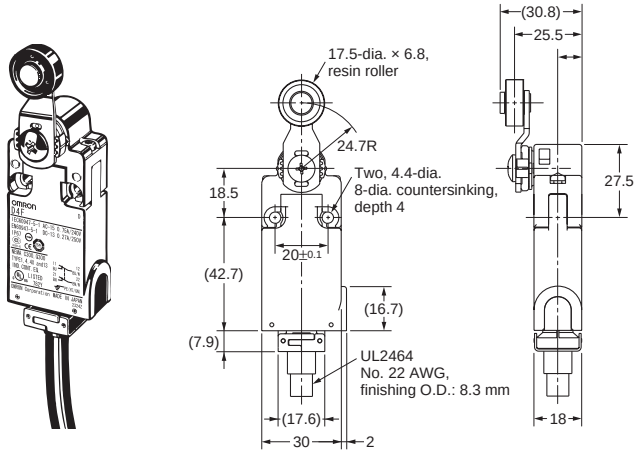
Roller lever (Metal lever, resin roller)
D4F-□20-□R



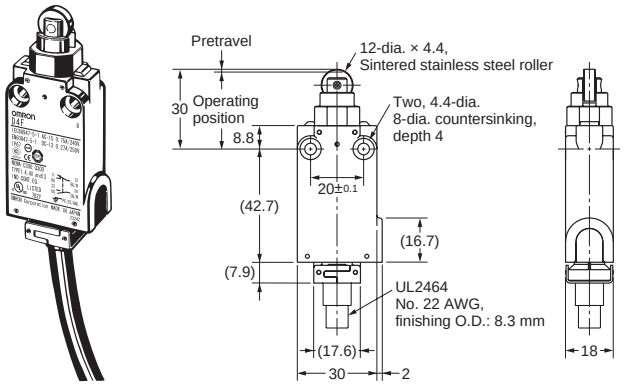
Roller plunger (Metal roller)
D4F-□02-□R



Roller lever (Metal lever, resin roller)
D4F-□20-□D



Roller plunger (Metal roller)
D4F-□02-□D



Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Limit Switches"* on page 247.

■ Precaution for Safe Use

Do not use the Switch in locations where explosive or flammable gases may be present.

Be sure to connect a ground line, otherwise an electric shock may occur.

If the D4F is to be used as a switch in an emergency stop circuit or in a safety circuit for preventing accidents resulting in injuries or deaths, use NC contacts with a forced release mechanism and set the D4F so that it will operate in direct opening mode.
For safety, install the Switch using one-way rotational screws or other similar means to prevent it from easily coming off. Protect the D4F with an appropriate cover and post a warning sign near the D4F in order to ensure the safety.

To prevent the D4F from damage due to circuit short-circuiting, connect a fuse with a breaking current 1.5 to 2 times larger than the rated current of the D4F in series to the D4F.

If the D4F is used under EN-certified conditions, use a gI or gG 10-A fuse certified by IEC269.

Actuation of the Switch over a long time may deteriorate parts of the Switch and a return failure may result. Be sure to check the condition of the Switch regularly.

Do not supply electric power when wiring.

Do not use the Switch where explosive gas, flammable gas, or any other dangerous gas may be present.

Keep the electrical load below the rated value.

Never wire to a wrong terminal.

Be sure to evaluate the Switch under actual working conditions after installation.

Do not drop or disassemble the D4F.

Do not use the D4F in closely contacted mounting.

Conduct periodic inspections.

Do not use more than one D4F side-by-side.

Do not use the Switch as a stopper.

Do not switch circuits for two or more standard loads (250 VAC, 3 A) at the same time. Doing so may adversely affect insulation performance.

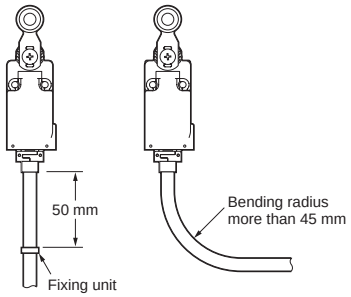
Handling of Cables

Cables cannot be flexed repeatedly.

The cable is fixed with sealing materials on the bottom of the switch. When excessive force may be imposed on the cable, fasten the cable with a fixing unit at a distance of 50 mm from the bottom of the switch as shown.

Do not pull or press the cable at an excessive force (50 N max.).

When bending the cable, secure the cable with more than 45-mm bending radius so as not to cause damage to the insulator or sheath of the cable. Doing so may result in current leakage or burning.



When wiring, be sure to prevent penetration of a liquid such as water or oil through the cable end.

Operating Environment

Keep the D4F away from oil and water, as these may enter the casing. (Though the switch construction complies with IP67 and prevents immersion of water even when held in water for a specified time, its use is not guaranteed when it is immersed in a liquid.)

Make sure in advance that the environment is suitable, with the presence of oil, water, or chemicals, as these may cause the seal to deteriorate, resulting in contact failure, faulty isolation, current leakage, or burning.

■ Precautions for Correct Use

Operating Environment

- This Switch is designed for use indoors. Using the Switch outdoors may damage it.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch as a result of contact failure or corrosion.
- Do not use the Switch in any of the following locations.
  - Locations subject to extreme temperature changes
  - Locations subject to high humidity or condensation
  - Locations subject to excessive vibration
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door
  - Locations subject to detergents, thinners, or other solvents

Contacts of the D4F can be used both for standard load and microload; however, once the contact is opened or closed with an standard load, it cannot be used for a load smaller than that. The contact surface may be rough, which impairs the reliability of contacting.

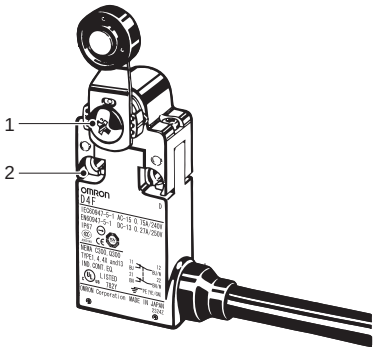
Durability

The life of the D4F will vary with the switching conditions. Before applying the D4F, test the D4F under actual operating conditions and be sure to use the D4F in actual operation within switching times that will not lower the performance of the D4F.

Tightening Torque

Be sure to tighten each screw of the D4F properly, otherwise the D4F may soon malfunction.

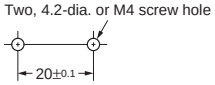
No.	Type	Proper tightening torque
1	Lever mounting screw (M5)	2.4 to 2.8 N·m
2	Body mounting screw (M4)	1.18 to 1.37 N·m



Mounting

Use two M4 screws and washers to mount the D4F securely. The D4F can be mounted more securely with proper tightening torque.

Mounting Holes (Unit: mm)



Changing the Lever Angle

Unfasten the screw that holds the lever to set the position of the lever at any angle through 360° (in steps of 9°).

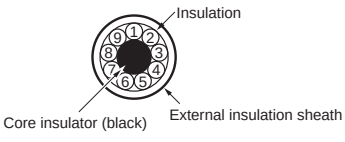
After unfastening the screws that hold the lever, mount the lever the other way (normal side or reverse side). Set an angle of the lever to complete adjustment within a range in which the lever does not touch the switch body.

Wiring

Identifying Wires

Identify wires according to the color (with or without white lines) of the insulation on the wire.

Cross section



Wire Colors

No.	Color of insulation	No.	Color of insulation
1	Blue/white	6	Brown
2	Orange /white	7	Pink
3	Pink/white	8	Orange
4	Brown/white	9	Blue
5	Green/yellow		

Note: "Blue/white, orange/white, pink/white, or brown/white" means that the cover is blue, orange, pink, or brown with a white line.

Terminal Numbers

Identify terminal numbers based on the color (with or without white lines) of the insulation on the wire.

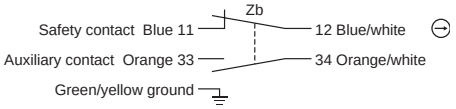
The safety and auxiliary contacts of D4F models of four-terminal contact construction and those of two-terminal contact construction are described below.

The safety contacts are direct-opening NC contacts (11-12 and 21-22); they are used for safety circuits, and each of them is indicated with the appropriate mark ⊖.

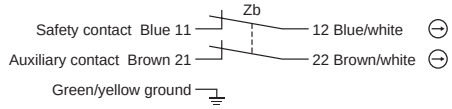
Auxiliary contacts are used to check (to monitor) the operating state of the switch, which are equivalent to NO contacts (33-34 and 43-44) or NC contacts (31-32 and 41-42).

The NC contacts 31-32 and 41-42 of auxiliary contacts (orange or pink) can be used as safety contacts.

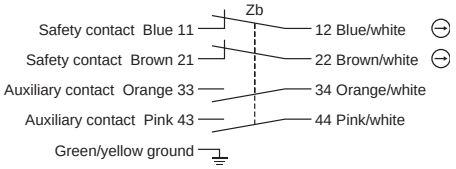
<1NC/1NO>



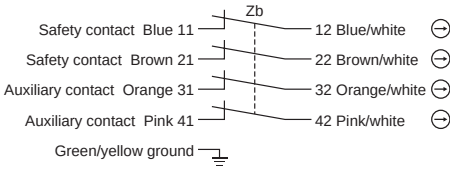
<2NC>



<2NC/2NO>



<4NC>

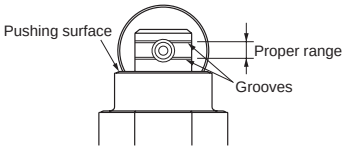


Note: The safety contacts are direct opening contacts certified by EN and each of them is indicated with the mark ⊖.

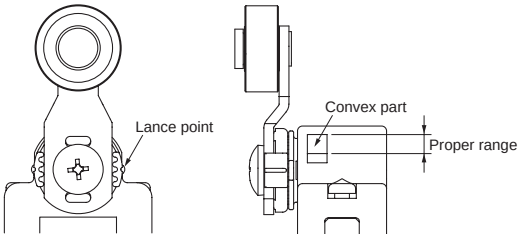
Cut the black core insulator and all unused wires at the end of the external insulation sheath when wiring the cable.

Operating

To set the plunger stroke correctly, press-fit the plunger until the top of the pushing surface comes between two grooves on the plunger.

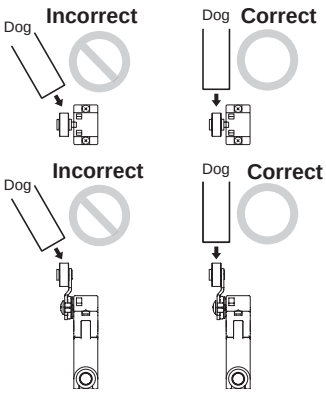


To set the roller lever stroke correctly, push the dog and cam until the the lance point comes within the range of the convex part that is the correct setting position.



Others

Actuating the switch from an angle other than 90 degrees to the switch face may deform or damage the actuator, or deform or damage the rotary spindle, so make sure that the dog is straight.



Do not remove the head. Otherwise, a failure may occur.

To avoid telegraphing, take the following precautions.

1. Set the switch to operate in one direction.
2. Modify the rear end of the dog to an angle of 15° to 30° as shown below or to a secondary-degree curve.

3. Modify the circuit so as not to detect the wrong operating signals.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C124-E1-05

Safety Limit Switch
D4B-□N

Snap-action contact with certified direct opening operation certification ⊖.

Maintenance, seal, and resistance to shock increased and direct opening mechanism added.

Three-conduit switches and 2NC switches are also available.

- Direct opening mechanism (NC contacts only) added to enable opening contacts when faults occur, such as fused contacts.
- Wide standard operating temperature range: –40°C to 80°C (standard type).
- Safety of lever settings ensured using a mechanism that engages a gear between the operating position indicator plate and the lever.
- Equipped with a mechanism that indicates the applicable operating zone, as well as push-button switching to control left and right motion.
- Certified standards: UL, CSA, EN (TÜV), SUVA, BIA, and CCC.
- Head seal structure strengthened to improve seal properties (TÜV: IEC IP67, UL: NEMA 3, 4, 4X, 6P, and 13).
- Models with gold-plated contacts added to the series to enable handling microloads.

Note: Contact your sales representative for details on models with safety standard certification.

Model Number Structure

■ Model Number Legend

D4B-□□□□N

1 2 3

1. Conduit
- 1: PG13.5 (1-conduit)
- 2: G1/2 (PF1/2) (1-conduit)
- 3: 1/2-14NPT (1-conduit)
- 5: PG13.5 (3-conduit)
- 6: G1/2 (PF1/2) (3-conduit)
- 7: 1/2-14NPT (3-conduit)

2. Built-in Switch
- 1: 1NC/1NO (snap-action)
- 3: 1NC/1NO (slow-action) gold-plated contacts
- 5: 1NC/1NO (slow-action) (see note)
- 6: 1NC/1NO (slow-action) gold-plated contacts (see note)
- A: 2NC (slow-action)
- B: 2NC (slow-action) gold-plated contacts

Note: Excluding D4B-□□81N and D4B-□□87N models.

3. Actuator
- 00: Switch box (without head)
- 11: Roller lever (resin roller)
- 15: Roller lever (stainless steel roller)
- 1R: Roller lever (conventional D4B-compatible)
- 16: Adjustable roller lever
- 17: Adjustable rod lever
- 70: Top plunger
- 71: Top roller plunger
- 81: Coil spring
- 87: Plastic rod

Ordering Information

■ Set Model Numbers

Safety Limit Switches

Actuator	Conduit openings	Model		
		1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)
Roller lever (resin roller) 	Pg13.5	D4B-1111N	D4B-1511N	D4B-1A11N
	G1/2 (PF1/2)	D4B-2111N	D4B-2511N	D4B-2A11N
	1/2-14NPT	D4B-3111N	D4B-3511N	D4B-3A11N
	Pg13.5 (3-conduit)	D4B-5111N	D4B-5511N	D4B-5A11N
	G1/2 (3-conduit)	D4B-6111N	D4B-6511N	D4B-6A11N
	1/2-14NPT (3-conduit)	D4B-7111N	D4B-7511N	D4B-7A11N
Roller lever (stainless steel roller) 	Pg13.5	D4B-1115N	D4B-1515N	D4B-1A15N
	G1/2 (PF1/2)	D4B-2115N	D4B-2515N	D4B-2A15N
	1/2-14NPT	D4B-3115N	D4B-3515N	D4B-3A15N
	Pg13.5 (3-conduit)	D4B-5115N	D4B-5515N	D4B-5A15N
Top plunger 	Pg13.5	D4B-1170N	D4B-1570N	D4B-1A70N
	G1/2 (PF1/2)	D4B-2170N	D4B-2570N	D4B-2A70N
	1/2-14NPT	D4B-3170N	D4B-3570N	D4B-3A70N
	Pg13.5 (3-conduit)	D4B-5170N	D4B-5570N	D4B-5A70N
	G1/2 (3-conduit)	D4B-6170N	D4B-6570N	D4B-6A70N
	1/2-14NPT (3-conduit)	D4B-7170N	D4B-7570N	D4B-7A70N
Top roller plunger 	Pg13.5	D4B-1171N	D4B-1571N	D4B-1A71N
	G1/2 (PF1/2)	D4B-2171N	D4B-2571N	D4B-2A71N
	1/2-14NPT	D4B-3171N	D4B-3571N	D4B-3A71N
	Pg13.5 (3-conduit)	D4B-5171N	D4B-5571N	D4B-5A71N
	G1/2 (3-conduit)	D4B-6171N	D4B-6571N	D4B-6A71N
	1/2-14NPT (3-conduit)	D4B-7171N	D4B-7571N	D4B-7A71N

General-purpose Limit Switches

Actuator	Conduit openings	Model		
		1NC/1NO (Snap-action)	1NC/1NO (Slow-action)	2NC (Slow-action)
Adjustable roller lever 	Pg13.5	D4B-1116N	D4B-1516N	D4B-1A16N
	G1/2 (PF1/2)	D4B-2116N	D4B-2516N	D4B-2A16N
	1/2-14NPT	D4B-3116N	D4B-3516N	D4B-3A16N
	Pg13.5 (3-conduit)	D4B-5116N	D4B-5516N	D4B-5A16N
	G1/2 (3-conduit)	D4B-6116N	D4B-6516N	D4B-6A16N
	1/2-14NPT (3-conduit)	D4B-7116N	D4B-7516N	D4B-7A16N
Adjustable rod lever 	Pg13.5	D4B-1117N	D4B-1517N	D4B-1A17N
	G1/2 (PF1/2)	D4B-2117N	D4B-2517N	D4B-2A17N
	1/2-14NPT	D4B-3117N	D4B-3517N	D4B-3A17N
	Pg13.5 (3-conduit)	D4B-5117N	D4B-5517N	D4B-5A17N
	G1/2 (3-conduit)	D4B-6117N	D4B-6517N	D4B-6A17N
	1/2-14NPT (3-conduit)	D4B-7117N	D4B-7517N	D4B-7A17N
Coil spring (non-directional) 	Pg13.5	D4B-1181N	---	D4B-1A81N
	G1/2 (PF1/2)	D4B-2181N		D4B-2A81N
	1/2-14NPT	D4B-3181N		D4B-3A81N
	Pg13.5 (3-conduit)	D4B-5181N		D4B-5A81N
	G1/2 (3-conduit)	D4B-6181N		D4B-6A81N
	1/2-14NPT (3-conduit)	D4B-7181N		D4B-7A81N
Plastic rod (non-directional) 	Pg13.5	D4B-1187N		D4B-1A87N
	G1/2 (PF1/2)	D4B-2187N		D4B-2A87N
	1/2-14NPT	D4B-3187N		D4B-3A87N
	Pg13.5 (3-conduit)	D4B-5187N		D4B-5A87N
	G1/2 (3-conduit)	D4B-6187N		D4B-6A87N
	1/2-14NPT (3-conduit)	D4B-7187N		D4B-7A87N

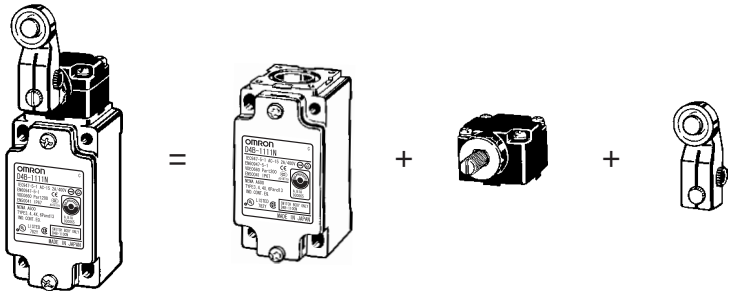
Note: In addition to the above models, models compatible with the previous D4B Switches (with standard rotary levers) are available.
Model number examples: D4B-1□1RN(Pg13.5) or D4B-2□1RN(PF1/2)

■ Ordering Switches

Because the D4B-□N employs a block mounting construction, parts may be ordered as a complete assembled set or individually as replacement parts. Switches ordered as sets are assembled before shipping.

Note: Do not order combinations of only a Side Rotary Lever and Head or a Side Rotary Lever and Switch Box.

		Part model numbers				
Set model number	=	Switch box	+	Head	+	Lever (side rotary type only)
Ex.: D4B-2111N	=	D4B-2100N	+	D4B-0010N	+	D4B-0001N



■ Replacement Parts

Switch Boxes

	1-conduit type			3-conduit type		
	PG13.5	**G1/2**	**1/2-14NPT**	**PG13.5**	**G1/2**	**1/2-14NPT**
1NC/1NO (Snap-action)	D4B-1100N	D4B-2100N	D4B-3100N	D4B-5100N	D4B-6100N	D4B-7100N
1NC/1NO (Slow-action)	D4B-1500N	D4B-2500N	D4B-3500N	D4B-5500N	D4B-6500N	D4B-7500N
2NC (Slow-action)	D4B-1A00N	D4B-2A00N	D4B-3A00N	D4B-5A00N	D4B-6A00N	D4B-7A00N

Operating Heads

Actuator	Type	Model
Side rotary	**Standard**	D4B-0010N
Top plunger	**Plain**	D4B-0070N
	Roller	D4B-0071N
Wobble lever	**Coil spring**	D4B-0081N
	Plastic rod	D4B-0087N

Levers (for Side Rotary Switches)

Actuator	Length (mm)	Diameter of roller	Model
Standard	31.5	17.5 dia.	D4B-0001N
Stainless steel roller lever	31.5	17.5 dia.	D4B-0005N
Adjustable roller lever	25 to 89	19 dia.	D4B-0006N
Adjustable rod lever	145 max.	---	D4B-0007N
Interchangeable with D4B-0001	33.7	19 dia.	D4B-000RN

Note: Other types of lever are also available.

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN1088
  EN50041

■ Certified Standards

Snap-action Models

Certification body	Standard	File No.
TÜV Rheinland	EN60947-5-1 (certified direct opening mechanism)	J9851083
	EN60947-5-1 (uncertified direct opening mechanism)	J50005477 (See note 1.)
UL	UL508	E76675
CSA	C22.2 No. 14	LR45746
BIA (See note 2.)	GS-ET-15	1-conduit: 9202158 3-conduit: 9309655
CQC (CCC)	GB14048.5	2003010305077612

Note: 1. Adjustable roller lever, adjustable rod lever, coil spring, and plastic rod models only.
2. Not including adjustable roller lever, adjustable rod lever, coil spring, and plastic rod models.

Slow-action Models

Certification body	Standard	File No.
TÜV Rheinland	EN60947-5-1 (certified direct opening mechanism)	J9851083
	EN60947-5-1 (uncertified direct opening mechanism)	J50005477 (See note 1.)
UL	UL508	E76675
CSA	C22.2 No. 14	LR45746
BIA (See note 2.)	GS-ET-15	1-conduit: 9202158 3-conduit: 9309655
SUVA (See note 2.)	SUVA	1-conduit: E6188/1.d 3-conduit: E6189/1.d
CQC (CCC)	GB14048.5	2003010305077612

Note: 1. Adjustable roller lever, adjustable rod lever, coil spring, and plastic rod models only.
2. Not including adjustable roller lever, adjustable rod lever, coil spring, and plastic rod models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Utilization category	AC-15
Rated operating current (I_e)	2 A
Rated operating voltage (U_e)	400 V

Note: As protection against short-circuiting, use either a gI-type or gG-type 10-A fuse that conforms to IEC60269.

UL/CSA: (UL508, CSA C22.2 No. 14)

A600

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC 240 VAC 480 VAC 600 VAC	10 A	60 A 30 A 15 A 12 A	6 A 3 A 1.5 A 1.2 A	7,200 VA	720 VA

■ Ratings

Rated voltage (V)	Non-inductive load (A)				Inductive load (A)			
	Resistive load		Lamp load		Inductive load		Motor load	
	NC	NO	NC	NO	NC	NO	NC	NO
125 VAC	10		3	1.5	10		5	2.5
250	10		2	1	10		3	1.5
400	10		1.5	0.8	3		1.5	0.8
8 VDC	10		6	3	10		6	
14	10		6	3	10		6	
30	6		4	3	6		4	
125	0.8		0.2	0.2	0.8		0.2	
250	0.4		0.1	0.1	0.4		0.1	

Note: 1. The above values are continuous currents.
2. Inductive loads have a power factor of 0.4 or higher (AC) or a time constant of 7 ms or lower (DC).
3. Lamp loads have a inrush current of 10 times the normal current.
4. Motor loads have a inrush current of 6 times the normal current.

Inrush current	30 A max.

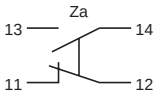
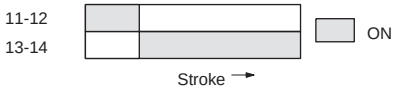
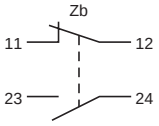
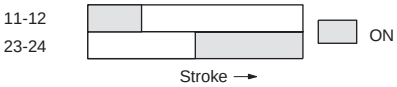
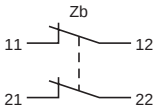
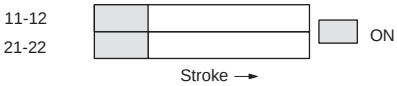
■ Characteristics

Item		Snap-action	Slow-action
Degree of protection (See note 3.)		IP67 (EN60947-5-1)	
Durability (see note 4)	**Mechanical**	30,000,000 operations min.	10,000,000 operations min.
	Electrical	500,000 operations min. (at a 250 VAC, 10-A resistive load)	
Operating speed		1 mm/s to 0.5 m/s	
Operating frequency		Mechanical: 120 operations/min Electrical: 30 operations/min	
Rated frequency		50/60 Hz	
Insulation resistance		100 MΩ min. (at 500 VDC) between terminals of the same polarity and between each terminal and non-current-carrying part	
Contact resistance		25 mΩ max. (initial value)	
Dielectric strength (U_{imp})			
	Between terminals of same polarity	U_{imp} 2.5 kV	U_{imp} 4 kV
	Between terminals of different polarity	---	U_{imp} 4 kV
	Between current-carrying metal parts and ground	U_{imp} 4 kV	U_{imp} 4 kV
	Between each terminal and non-current-carrying parts	U_{imp} 4 kV	U_{imp} 4 kV
Rated insulation voltage (U_i)		600 VAC (EN60947-5-1)	
Counter electromotive voltage at switching		1,500 VAC max. (EN60947-5-1)	
Operating environmental pollution level		3 (EN60947-5-1)	
Conditional short-circuit current		100 A (EN60947-5-1)	
Conventional enclosed thermal current (I_{the})		20 A (EN60947-5-1)	
Electric shock protection class		Class I (with ground terminal)	
Vibration resistance		Malfunction: 10 to 55 Hz, 0.75 mm single amplitude	
Shock resistance		Destruction: 1,000 m/s^2 min. Malfunction: 300 m/s^2 min.	
Ambient temperature		Operating: –40°C to 80°C (with no icing) (see note 5)	
Ambient humidity		Operating: 95% max.	
Weight		Approx. 250 g	

Note: 1. The above values are initial values.
2. The above values may vary depending on the model. Consult your OMRON sales representative for details.
3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand.
4. The durability is for an ambient temperature of 5°C to 35°C and ambient humidity of 40% to 70%. For further conditions, consult your OMRON sales representative.
5. –25°C to 80°C for the flexible-rod type.

Connections

■ Contact Form (EN50013)

Model	Contact		Diagrams	Explanation
D4B-□1□N	1NC/1NO (Snap-action)			Only NC contact 11-12 has a certified direct opening mechanism. ⊖ Terminal numbers 11-12 and 13-14 cannot be used as unlike poles.
D4B-□5□N	1NC/1NO (Slow-action)			Only NC contact 11-12 has a certified direct opening mechanism. ⊖ Terminal numbers 11-12 or 23-24 can be used as unlike poles.
D4B-□A□N	2NC (Slow-action)			Both NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ Terminal numbers 11-12 and 21-22 can be used as unlike poles.

Note: Terminal numbers are according to EN50013; contact symbols are according to IEC60947-5-1.

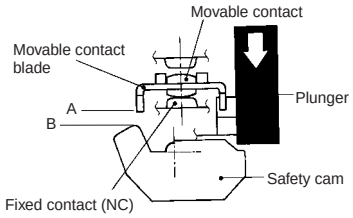
Operation

■ Direct Opening Mechanism

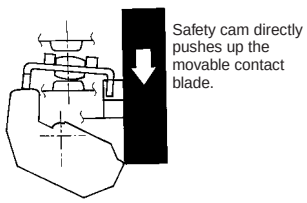
1NO/1NC Contact (Snap-action)

Conforms to EN60947-5-1 Direct Opening ⊖ (Only NC contact has a direct opening mechanism.)

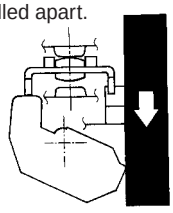
1. When contact welding occurs.



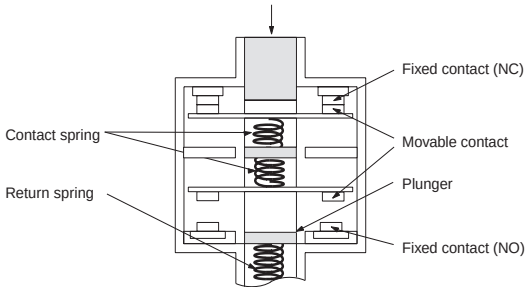
2. When contacts are being pulled apart.



3. When contacts are completely pulled apart.

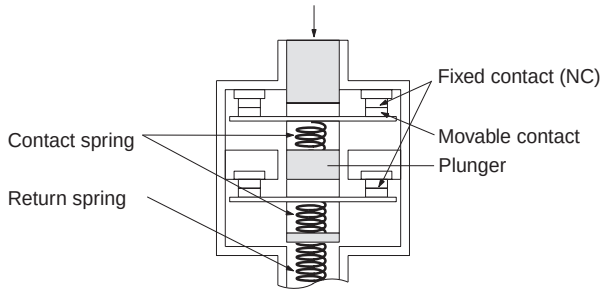


1NC/1NO Contact (Slow-action)



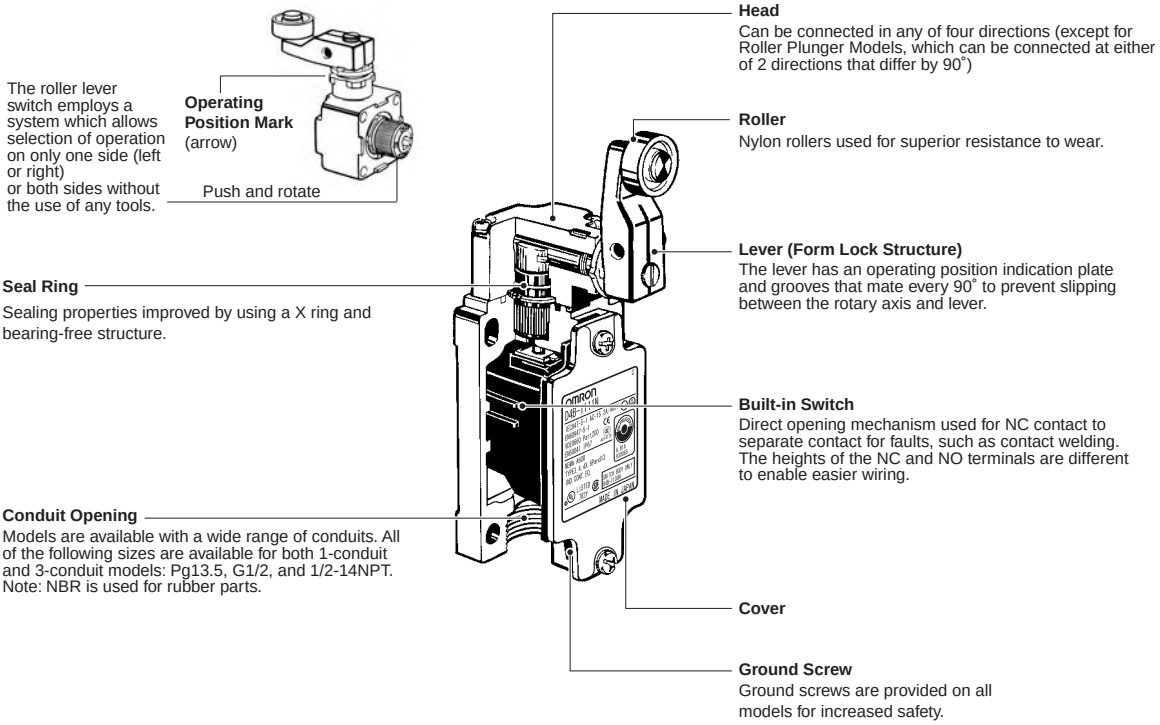
Conforms to EN60947-5-1 Direct Opening ⊖
(Only NC contact has a direct opening mechanism.)
When contact welding occurs, the contacts are separated from each other by the plunger being pushed in.

2NC Contact (Slow-action)



Conforms to EN60947-5-1 Direct Opening ⊖
(Only NC contact has a direct opening mechanism.)

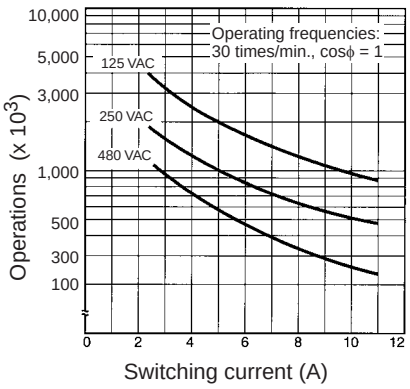
Nomenclature



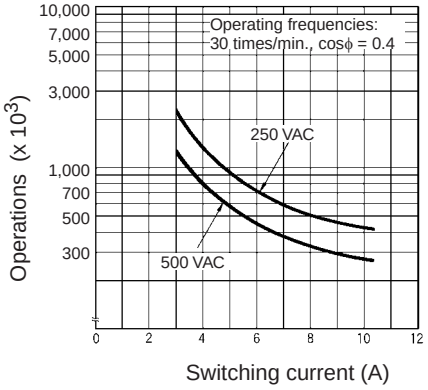
Engineering Data

Electrical Durability (Snap-action)

(cosϕ = 1)



(cosϕ = 0.4)



Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

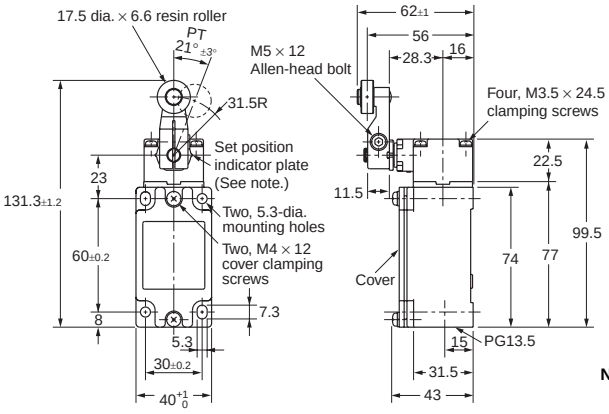
3. When placing your order, specify the conduit type by adding a code from the list below to the blank box of the following model numbers as shown below.

Standard Switches	3-conduit Switches
1: PG 13.5	5: PG 13.5
2: G 1/2	6: G 1/2
3: 1/2-14NPT	7: 1/2-14NPT

4. Omitted dimensions are the same as those for the Rotary Level Type Models D4B-1□□□N and D4B-5□□□N have a PG13.5 conduit opening. D4B-2□□□N and D4B-6□□□N have a G1/2 conduit opening. D4B-3□□□N and D4B-7□□□N have a 1/2-14NPT conduit opening.

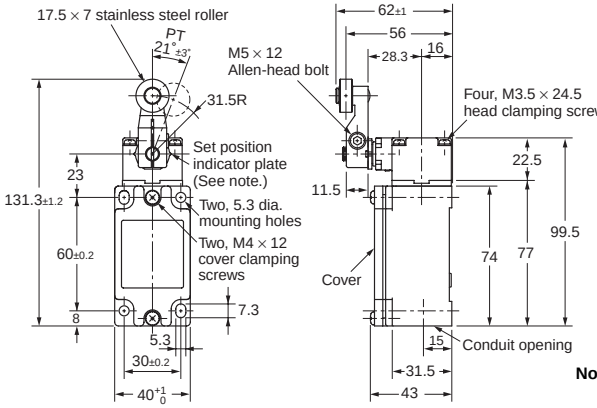
■ Switches

Roller Lever D4B-□□11N



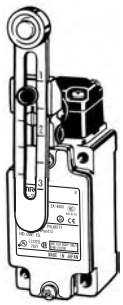
Note: The lever can be set to any desired position by turning the operating position indicator.

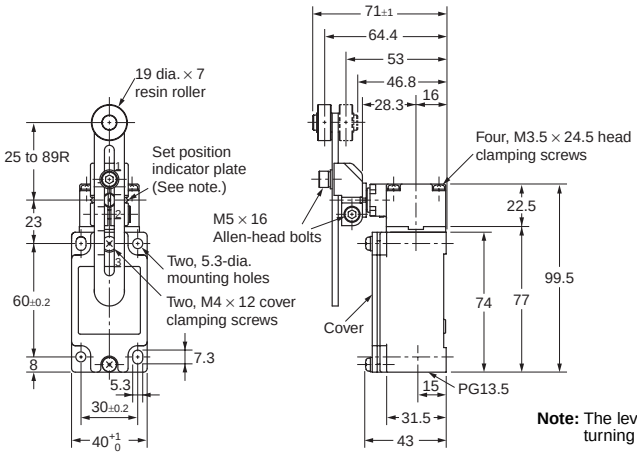
Roller Lever D4B-□□15N



Note: The lever can be set to any desired position by turning the operating position indicator.

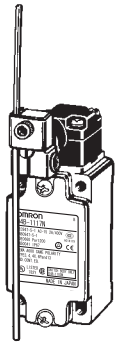
Adjustable Roller Lever D4B-□□16N

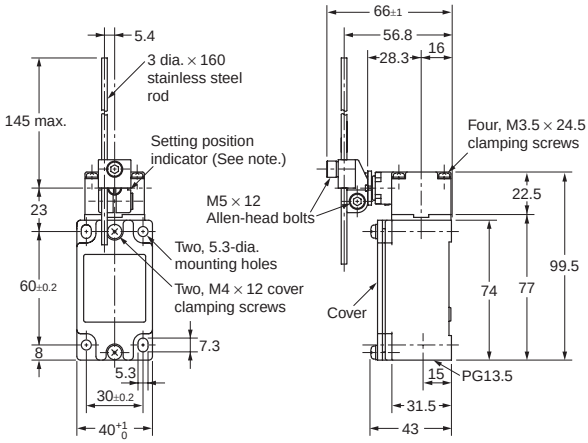




Note: The lever can be set to any desired position by turning the operating position indicator.

Adjustable Rod Lever
D4B-□□17N





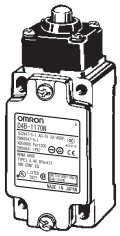
Note: The lever can be set to any desired position by turning the operating position indicator.

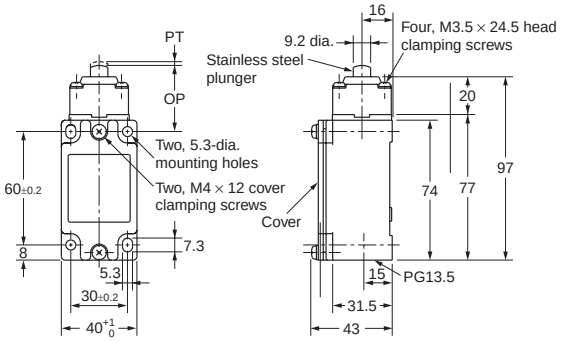
Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristic	D4B-□□11N	D4B-□□15N	D4B-□□16N (See note 2.)	D4B-□□17N (See note 3.)
OF max.	9.41N	9.41N	9.41N	2.12N
RF min.	1.47N	1.47N	1.47N	0.29N
PT	21°±3°	21°±3°	21°±3°	21°±3°
PT (2nd) (See notes 4, 6.)	(45°)	(45°)	(45°)	(45°)
OT min.	50°	50°	50°	50°
MD max. (See note 5.)	12°	12°	12°	12°
DOT min. (See notes 4, 7.)	35°	35°	35°	35°
(See notes 5, 7.)	55°	55°	55°	55°
DOF min. (See note 7.)	19.61N	19.61N	19.61N	19.61N
TT (See note 6.)	(75°)	(75°)	(75°)	(75°)

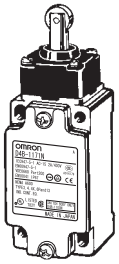
Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC contacts. Check contact operation.
2. The operating characteristics of these Switches were measured with the roller level set at 31.5 mm.
3. The operating characteristics of these Switches were measured with the rod level set at 140 mm.
4. Only for slow-action models.
5. Only for snap-action models.
6. Reference values.
7. Must be provided to ensure safe operation.

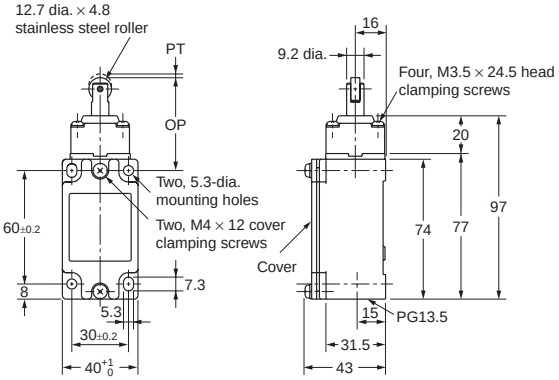
Top Plunger
D4B-□□70N





Top Roller Plunger
D4B-□□71N





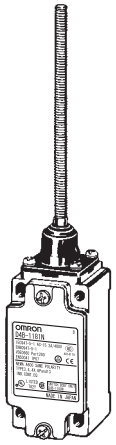
Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

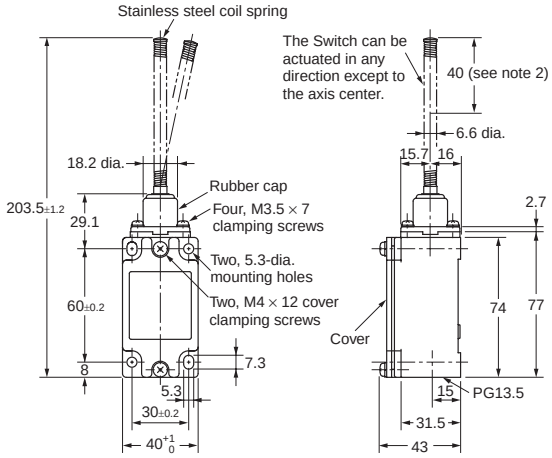
Operating characteristic	D4B-□□70N	D4B-□□71N
OF max.	18.63 N	18.63 N
RF min.	1.96 N	1.96 N
PT	2 mm	2 mm
PT (2nd) (See notes 2, 4.)	(3 mm)	(3 mm)
OT min.	5 mm	5 mm
MD max. (See note 3.)	1 mm	1 mm
DOT min. (See notes 5.)	3.2 mm	3.2 mm
DOF min. (See note 5.)	49.03 N	49.03N
TT (See note 4.)	(7 mm)	(7 mm)
FP max.	38 mm	51 mm
OP	35±1 mm	48±1 mm

Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC contacts. Check contact operation.
2. Only for slow-action models.
3. Only for snap-action models.
4. Reference values.
5. Must be provided to ensure safe operation.

Coil Spring (Non-directional) D4B-□□81N

Mechanically speaking, these models are general limit switches and not safety limit switches.

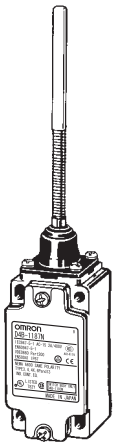


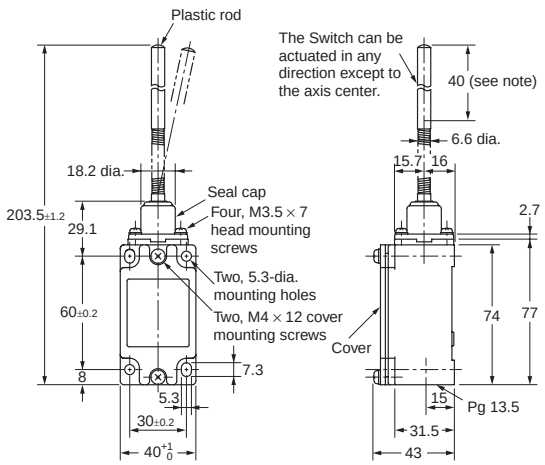


Note: Be sure to adjust the dog to within 40 mm from the top end of the coil spring.

Plastic Rod (Non-directional) D4B-□□87N

Mechanically speaking, these models are general limit switches and not safety limit switches.





Note: Be sure to adjust the dog to within 40 mm from the top end of the plastic rod.

Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

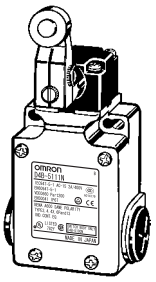
Operating characteristic	D4B-□□81N	D4B-□□87N
OF max.	1.47 N	1.47 N
PT max.	15°	15°

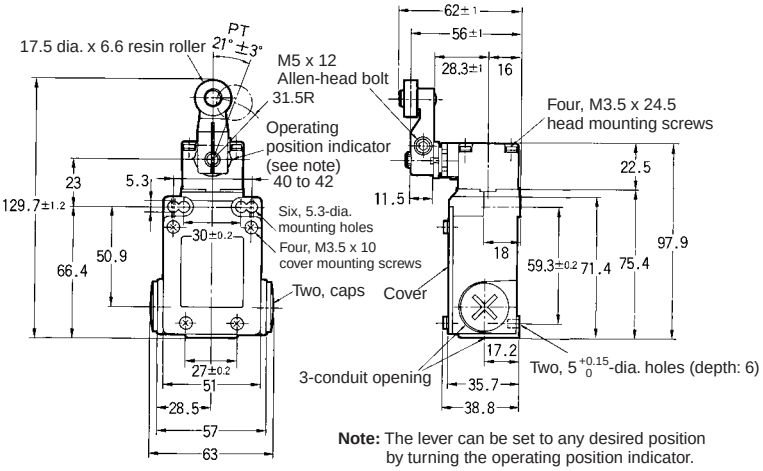
Note: Variation occurs in the simultaneity of contact opening/closing operations of 2NC contacts. Check contact operation.

3-conduit Switches

Roller Lever

D4B-□□11N

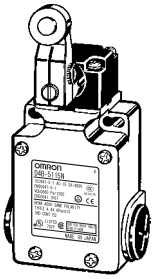


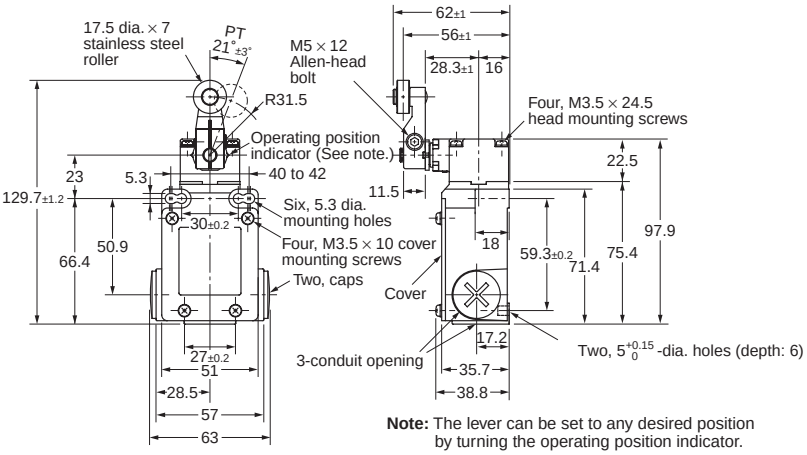


Note: The lever can be set to any desired position by turning the operating position indicator.

Roller Lever

D4B-□□15N

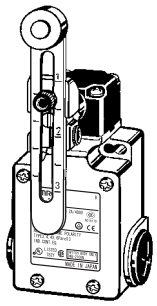


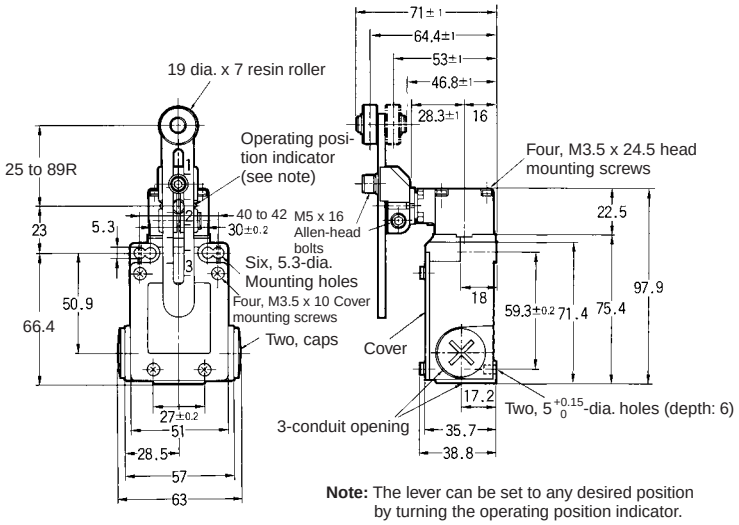


Note: The lever can be set to any desired position by turning the operating position indicator.

Adjustable Roller Lever

D4B-□□16N

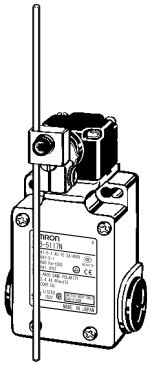


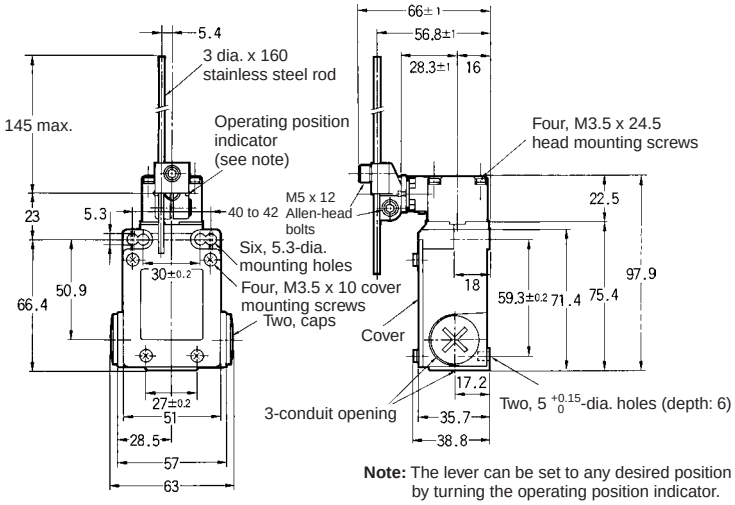


Note: The lever can be set to any desired position by turning the operating position indicator.

Adjustable Rod Lever

D4B-□□17N





Note: The lever can be set to any desired position by turning the operating position indicator.

Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristic	D4B-□□11N	D4B-□□15N	D4B-□□16N (See note 2.)	D4B-□□17N (See note 3.)
OF max.	9.41 N	9.41 N	9.41 N	2.12 N
RF min.	1.47 N	1.47 N	1.47 N	0.29 N
PT	21°±3°	21°±3°	21°±3°	21°±3°
PT (2nd) (See notes 4, 6.)	(45°)	(45°)	(45°)	(45°)
OT min.	50°	50°	50°	50°
MD max. (See note 5.)	12°	12°	12°	12°
DOT min. (See notes 4, 7.)	35°	35°	35°	35°
(See notes 5, 7.)	55°	55°	55°	55°
DOF min. (See note 7.)	19.61 N	19.61 N	19.61 N	19.61 N
TT (See note 6.)	(75°)	(75°)	(75°)	(75°)

Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC contacts. Check contact operation.

2. The operating characteristics of these Switches were measured with the roller level set at 31.5 mm.

3. The operating characteristics of these Switches were measured with the rod level set at 140 mm.

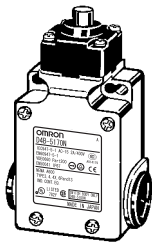
4. Only for slow-action models.

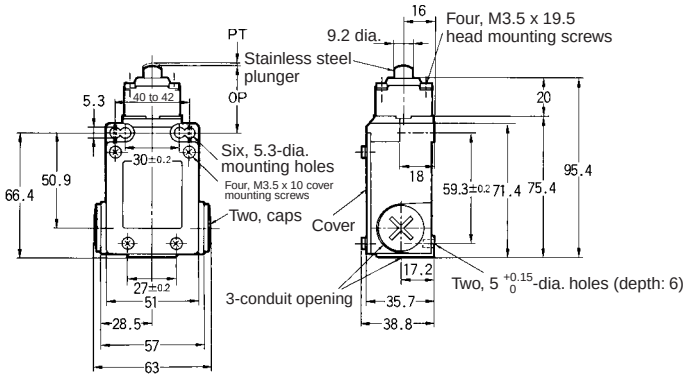
5. Only for snap-action models.

6. Reference values.

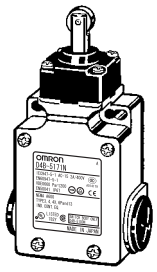
7. Must be provided to ensure safe operation.

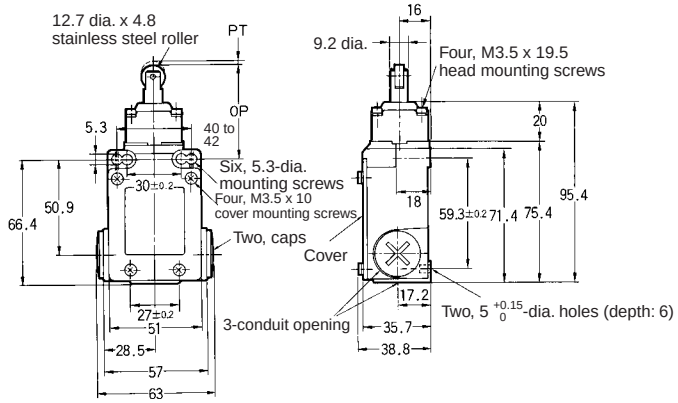
Top Plunger
D4B-□□70N





Top Roller Plunger
D4B-□□71N



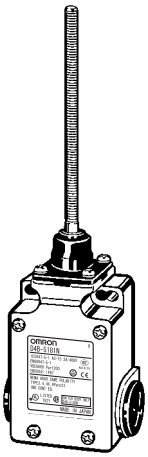


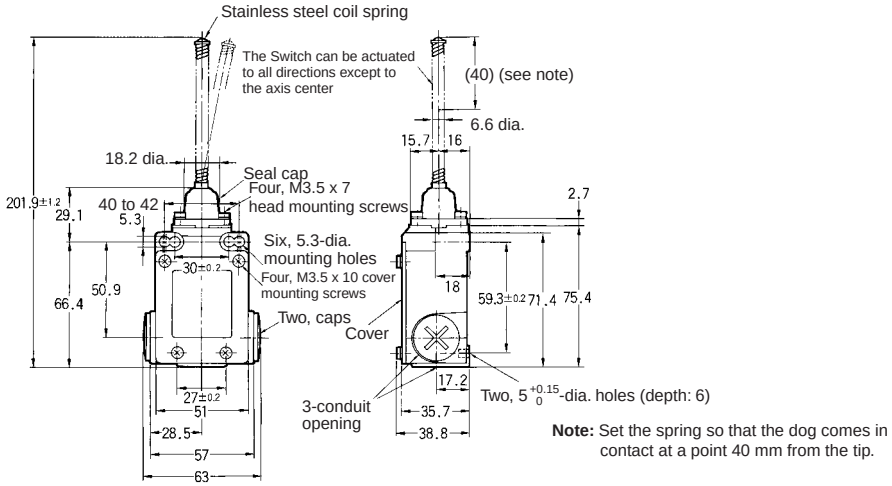
Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristic	D4B-□□70N	D4B-□□71N
OF max.	18.63 N	18.63 N
RF min.	1.96 N	1.96 N
PT	2 mm	2 mm
PT (2nd) (See notes 2, 4.)	(3 mm)	(3 mm)
OT min.	5 mm	5 mm
MD max. (See note 3.)	1 mm	1 mm
DOT min. (See notes 5.)	3.2 mm	3.2 mm
DOF min. (See note 5.)	49.03 N	49.03N
TT (See note 4.)	(7 mm)	(7 mm)
FP max.	38 mm	51 mm
OP	35±1 mm	48±1 mm

Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC contacts. Check contact operation.
2. Only for slow-action models.
3. Only for snap-action models.
4. Reference values.
5. Must be provided to ensure safe operation.

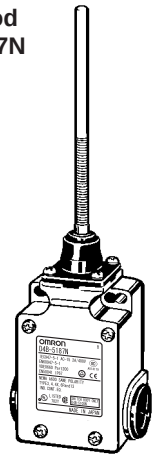
Coil Spring
D4B-□□81N

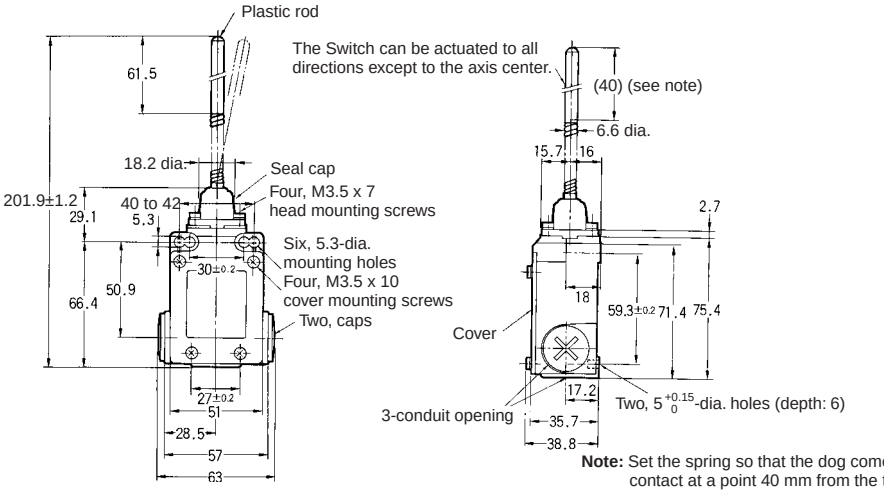




Note: Set the spring so that the dog comes in contact at a point 40 mm from the tip.

Plastic Rod
D4B-□□87N





Note: Set the spring so that the dog comes in contact at a point 40 mm from the tip.

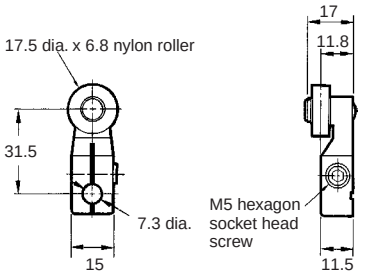
Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Operating characteristic	D4B-□□81N	D4B-□□87N
OF max.	1.47 N	1.47 N
PT max.	15°	15°

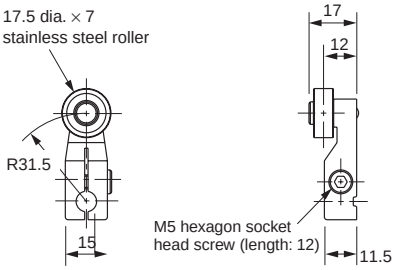
Note: Variation occurs in the simultaneity of contact opening/closing operations of 2NC contacts. Check contact operation.

Levers

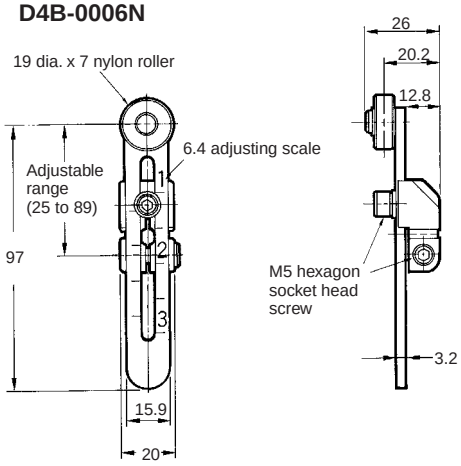
Roller Lever
D4B-0001N



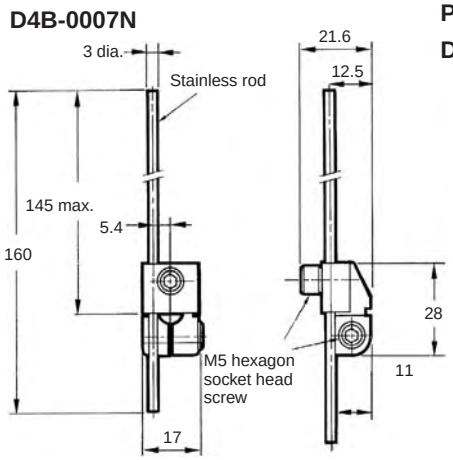
Roller Lever (Stainless Steel Roller)
D4B-0005N



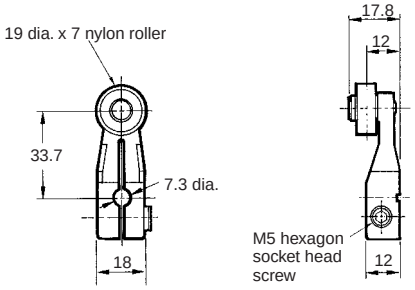
Adjustable Roller Lever
D4B-0006N



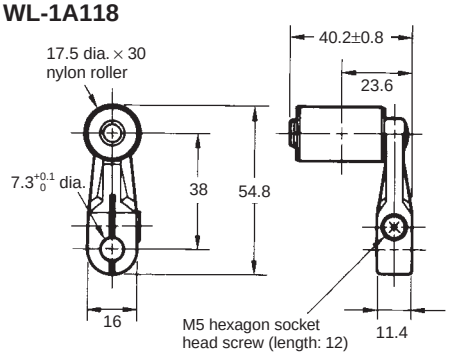
Adjustable Rod Lever
D4B-0007N



Roller Lever (Compatible with Previous D4B Model)
D4B-000RN

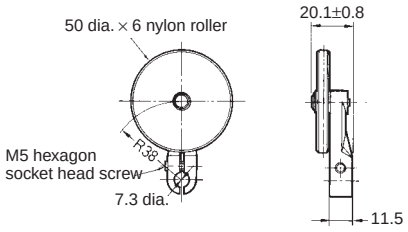


Roller Lever
WL-1A118



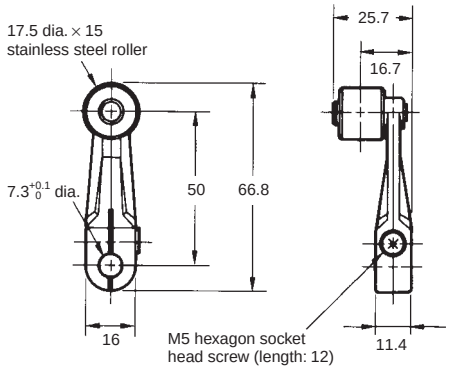
Note: Reverse the indicator plate when mounting.

Roller Lever
WL-1A106



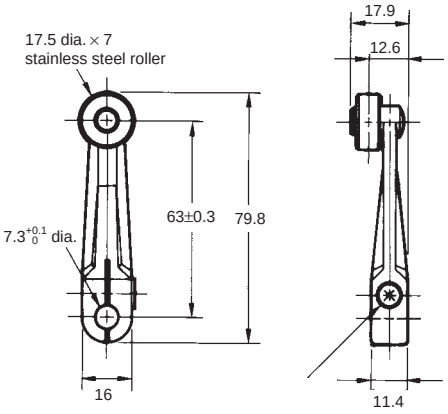
Note: Reverse the indicator plate when mounting.

Roller Lever
WL-1A206



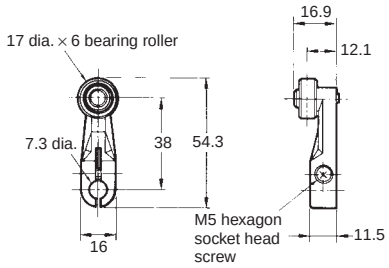
Note: Reverse the indicator plate when mounting.

Roller Lever
WL-1A300



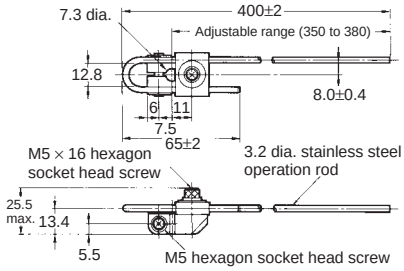
Note: Reverse the indicator plate when mounting.

Roller Lever
WL-1A400



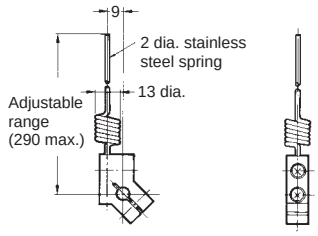
Note: Reverse the indicator plate when mounting.

Adjustable Rod Lever
WL-3A100



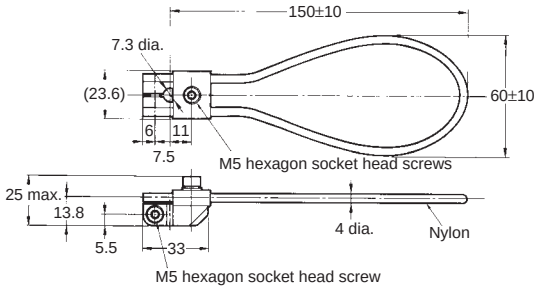
Note: Reverse the indicator plate when mounting.

Spring Rod Lever
WL-4A201



Note: Reverse the indicator plate when mounting.

Resin Loop Lever
D4A-F00



Note: Reverse the indicator plate when mounting.

Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

2. Safety Limit Switch specifications are satisfied with D4B-□□□□AN Levers only (example: D4B-0001N).

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Limit Switches"* on page 247.

■ Precautions for Safe Use

If the D4B-□N is applied to a safety category circuit for prevention of injury, use the D4B-□N model that has an NC contact equipped with a direct opening mechanism, and make sure that the D4B-□N operates in the direct opening mode. Furthermore, secure the D4B-□N with screws or equivalent parts that are tightened in a single direction so that the D4B-□N cannot be easily removed. Then provide a protection cover for the D4B-□N and post a warning label near the D4B-□N.

In order to protect the D4B-□N from damage due to short-circuiting, connect a fuse breaking a current 1.5 to 2 times higher than the rated current in parallel with the D4B-□N.

If an application satisfying EN standards is to employ the D4BL, apply the 10-A gI or gG fuse certified by IEC269.

Do not apply the D4B-□N to the door without applying a stopper to the door.

If the D4B-□N is used with the actuator normally pressed, the D4B-□N may malfunction or may soon have reset failures. Be sure to check and replace the D4B-□N regularly.

- Do not use the Switch in locations where explosive or flammable gases may be present.
- Do not use the Switch submerged in oil or water, or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch interior. (The IP67 degree of protection specification for the Switch refers to water penetration while the Switch is submersed in water for a specified period of time.)
- Protect the head from foreign material. Subjecting the head to foreign material may result in premature wear or damage to the Switch. Although the switch body is protected from penetration by dust or water, the head is not protected from penetration by minute particles or water.
- Install the cover after wiring. Not doing so may result in electric shock.
- Do not use a Switch as a stopper.

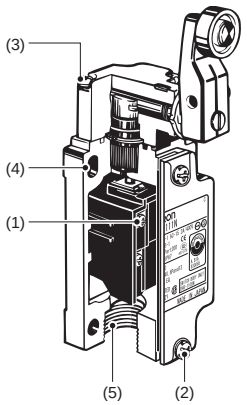
■ Precautions for Correct Use

Operating Environment

- This Switch is designed for use indoors. Using the Switch outdoors may damage it.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch as a result of contact failure or corrosion.
- Do not use the Switch in any of the following locations.
  - Locations subject to extreme temperature changes
  - Locations subject to high humidity or condensation
  - Locations subject to excessive vibration
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door
  - Locations subject to detergents, thinners, or other solvents

Tightening Torque

Be sure to tighten each screw of the D4B-□N properly, otherwise the D4B-□N may malfunction.



	Type	Torque
1	M3.5 terminal screw	0.59 to 0.78 N·m
2	Cover-mounting screw (see note)	1.18 to 1.37 N·m
3	Head mounting screw	0.78 to 0.88 N·m
4	M5 body mounting screw	4.90 to 5.88 N·m
5	Connector	1.77 to 2.16 N·m
6	Cap screw (for three-conduit models)	1.27 to 1.67 N·m

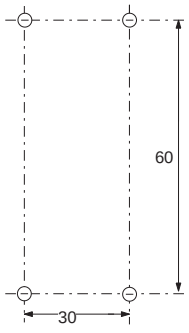
Note: Apply a tightening torque of 0.78 to 0.88 N·m to three-conduit models.

Mounting

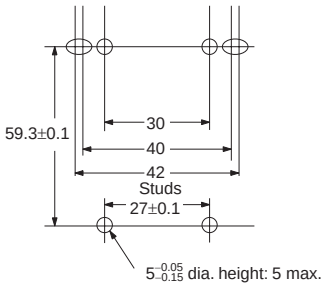
Use four M5 screws with washers to mount the standard model. Be sure to apply the proper torque to tighten each screw. The 3-conduit models can be mounted more securely by using the four screws plus two $5^{-0.05}_{-0.15}$-mm diameter studs, each of which has a maximum height of 4.8 mm as shown below.

Mounting Dimensions (M5)

Standard Model



3-conduit Model



Changes in Actuator Mounting Position

To change the angle of the lever, loosen the Allen-head bolts on the side of the lever.

The operating position indicator plate has protruding parts which engage with the lever, thus allowing changes to the lever position by 90°.

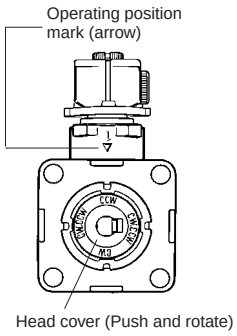
The back of the operating position indicator plate has no protruding parts. If this plate is turned over and attached, any angle within a 360° range can be set. Do not turn over the place, however, when using the D4B-□N for an SUVA- or BIA-certified application. For an SUVA- or BIA-certified application, make sure that the lever engages with the operating position indicator plate securely so that the lever will not slip.

Changes in Head Mounting Position

By removing the screws on the four corners of the head, the head can be reset in any of four directions. Make sure that no foreign materials will penetrate through the head.

Changes in the Operating Direction for Rotary Lever Switches

The head of Rotary Lever Switches can be converted in seconds to CW, CCW, or two-way operation without using any tools. The conversion procedure follows.



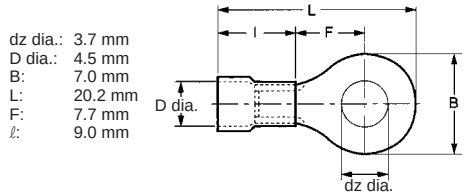
Procedure

1. Dismount the head by loosening the four screws that secure it.
2. Turn over the head to set the desired operation (CW, CCW, or both). The desired operation can be selected by setting the mode selector knob shown in the figure. This knob is factory set to the “CW + CCW” (two-way operation) position.
3. Set the CW hole on the head at the operation position mark (arrow) for clockwise operation or set the CCW hole right at the arrow for counterclockwise operation. In either case, be sure to set the hole position exactly at the arrow point.

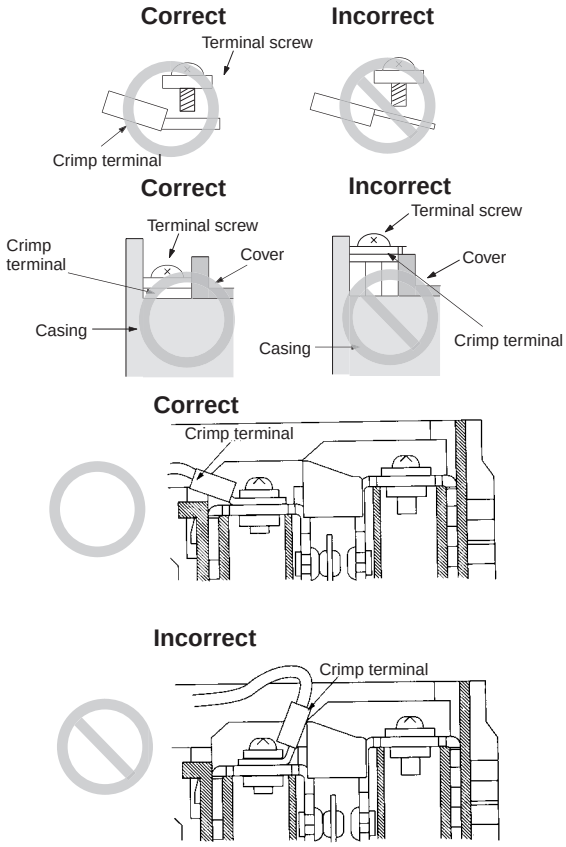
Wiring

Do not connect the bare lead wires directly to the terminals but be sure to connect each of them by using an insulation tube and M3.5 round crimp terminals and tighten each terminal screw within the specified torque range.

The proper lead wire is 20 to 14 AWG (0.5 to 2.5 mm^2) in size.



Make sure that all crimp terminals come into contact with the casing or cover as shown below, otherwise the cover may not be mounted properly or the D4B-□N may malfunction.



Conduit Opening

Make sure that each connector is tightened within the specified torque range. The casing may be damaged if the connector is tightened excessively.

If the 1/2-14NPT is used, cover the cable and conduit end with sealing tape in order to ensure IP67.

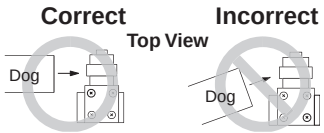
The Pg13.5 connector must be Nippon Flex’s ABS-08Pg13.5 or ABS-12 Pg13.5.

Use an OMRON SC-series Connector (sold separately) that is suited to the cable in diameter.

Properly attach the provided conduit cap to the unused conduit opening and securely tighten the cap screw within the specified torque when wiring the D4B-□N.

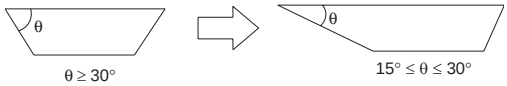
Others

The load for the actuator (roller) of the Switch must be imposed on the actuator in the horizontal direction, otherwise the actuator or the rotating axis may be deformed or damaged.



When using a long lever model like the D4B-□□16N or D4B-□□17N, the Switch may telegraph. To avoid telegraphing, take the following precautions.

1. Set the lever to operate in one direction. For details, see *"Changes in the Operating Direction for Rotary Lever Switches"* on page 299.
2. Modify the rear end of the dog to an angle of 15° to 30° as shown below or to a secondary-degree curve.



3. Modify the circuit so as not to detect the wrong operating signals.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

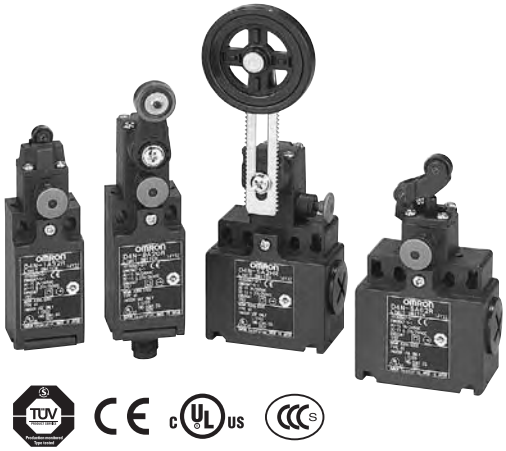
Cat. No. C005-E1-13 In the interest of product improvement, specifications are subject to change without notice.

Pull-reset Safety Limit Switch
D4N-□R

A Series of Pull-reset Models Now Available

- Lineup includes three contact models with 2NC/1NO and 3NC contact forms in addition to the previous contact forms 1NC/1NO and 2NC.
- M12-connector models are available, saving on labor and simplifying replacement.
- Standardized gold-clad contacts provide high contact reliability. Can be used with both standard loads and microloads.
- Conforms to EN115 and EN81-2.
- Certified standards: UL, EN (TÜV), and CCC

Note: Be sure to read the *"Safety Precautions"* on page 312.



Note: Contact your sales representative for details on models with safety standard certification.

Model Number Structure

■ Model Number Legend

D4N-□□□□R
1 2 3

1. Conduit/Connector size
- 1: Pg13.5 (1-conduit)
- 2: G1/2 (1-conduit)
- 3: 1/2-14NPT (1-conduit)
- 4: M20 (1-conduit)
- 5: Pg13.5 (2-conduit)
- 6: G1/2 (2-conduit)
- 7: 1/2-14NPT (M20 2-conduit with 1/2-14NPT changing adaptor included)
- 8: M20 (2-conduit)
- 9: M12 connector (1-conduit)

2. Built-in Switch
- A: 1NC/1NO (slow-action)
- B: 2NC (slow-action)
- C: 2NC/1NO (slow-action)
- D: 3NC (slow-action)

3. Head and Actuator
- 20: Roller lever (resin lever, resin roller)
- 2G: Adjustable roller lever, form lock (metal lever, resin roller)
- 2H: Adjustable roller lever, form lock (metal lever. rubber roller)
- 31: Top plunger
- 32: Top roller plunger
- 62: One-way roller arm lever (horizontal)
- 72: One-way roller arm lever (vertical)

Ordering Information

■ List of Models

Actuator	Conduit size		Built-in switch mechanism			
			1NC/1NO (Slow-action)	2NC (Slow-action)	2NC/1NO (Slow-action)	3NC (Slow-action)
Roller lever (resin lever, resin roller) 	1-conduit	Pg13.5	D4N-1A20R	D4N-1B20R	D4N-1C20R	D4N-1D20R
		G1/2	D4N-2A20R	D4N-2B20R	D4N-2C20R	D4N-2D20R
		1/2-14NPT	D4N-3A20R	D4N-3B20R	D4N-3C20R	D4N-3D20R
		M20	D4N-4A20R	D4N-4B20R	D4N-4C20R	D4N-4D20R
		M12 connector	D4N-9A20R	D4N-9B20R	---	---
	2-conduit	Pg13.5	D4N-5A20R	D4N-5B20R	D4N-5C20R	D4N-5D20R
		G1/2	D4N-6A20R	D4N-6B20R	D4N-6C20R	D4N-6D20R
		1/2-14NPT (See note 2.)	D4N-7A20R	D4N-7B20R	D4N-7C20R	D4N-7D20R
		M20	D4N-8A20R	D4N-8B20R	D4N-8C20R	D4N-8D20R
Adjustable roller lever, form lock (metal lever, resin roller) 	1-conduit	Pg13.5	D4N-1A2GR	D4N-1B2GR	D4N-1C2GR	D4N-1D2GR
		G1/2	D4N-2A2GR	D4N-2B2GR	D4N-2C2GR	D4N-2D2GR
		1/2-14NPT	D4N-3A2GR	D4N-3B2GR	D4N-3C2GR	D4N-3D2GR
		M20	D4N-4A2GR	D4N-4B2GR	D4N-4C2GR	D4N-4D2GR
		M12 connector	D4N-9A2GR	D4N-9B2GR	---	---
	2-conduit	Pg13.5	D4N-5A2GR	D4N-5B2GR	D4N-5C2GR	D4N-5D2GR
		G1/2	D4N-6A2GR	D4N-6B2GR	D4N-6C2GR	D4N-6D2GR
		1/2-14NPT (See note 2.)	D4N-7A2GR	D4N-7B2GR	D4N-7C2GR	D4N-7D2GR
		M20	D4N-8A2GR	D4N-8B2GR	D4N-8C2GR	D4N-8D2GR
Adjustable roller lever, form lock (metal lever, rubber roller) 	1-conduit	Pg13.5	D4N-1A2HR	D4N-1B2HR	D4N-1C2HR	D4N-1D2HR
		G1/2	D4N-2A2HR	D4N-2B2HR	D4N-2C2HR	D4N-2D2HR
		1/2-14NPT	D4N-3A2HR	D4N-3B2HR	D4N-3C2HR	D4N-3D2HR
		M20	D4N-4A2HR	D4N-4B2HR	D4N-4C2HR	D4N-4D2HR
		M12 connector	D4N-9A2HR	D4N-9B2HR	---	---
	2-conduit	Pg13.5	D4N-5A2HR	D4N-5B2HR	D4N-5C2HR	D4N-5D2HR
		G1/2	D4N-6A2HR	D4N-6B2HR	D4N-6C2HR	D4N-6D2HR
		1/2-14NPT (See note 2.)	D4N-7A2HR	D4N-7B2HR	D4N-7C2HR	D4N-7D2HR
		M20	D4N-8A2HR	D4N-8B2HR	D4N-8C2HR	D4N-8D2HR
Plunger 	1-conduit	Pg13.5	D4N-1A31R	D4N-1B31R	D4N-1C31R	D4N-1D31R
		G1/2	D4N-2A31R	D4N-2B31R	D4N-2C31R	D4N-2D31R
		1/2-14NPT	D4N-3A31R	D4N-3B31R	D4N-3C31R	D4N-3D31R
		M20	D4N-4A31R	D4N-4B31R	D4N-4C31R	D4N-4D31R
		M12 connector	D4N-9A31R	D4N-9B31R	---	---
	2-conduit	Pg13.5	D4N-5A31R	D4N-5B31R	D4N-5C31R	D4N-5D31R
		G1/2	D4N-6A31R	D4N-6B31R	D4N-6C31R	D4N-6D31R
		1/2-14NPT (See note 2.)	D4N-7A31R	D4N-7B31R	D4N-7C31R	D4N-7D31R
		M20	D4N-8A31R	D4N-8B31R	D4N-8C31R	D4N-8D31R
Roller plunger 	1-conduit	Pg13.5	D4N-1A32R	D4N-1B32R	D4N-1C32R	D4N-1D32R
		G1/2	D4N-2A32R	D4N-2B32R	D4N-2C32R	D4N-2D32R
		1/2-14NPT	D4N-3A32R	D4N-3B32R	D4N-3C32R	D4N-3D32R
		M20	D4N-4A32R	D4N-4B32R	D4N-4C32R	D4N-4D32R
		M12 connector	D4N-9A32R	D4N-9B32R	---	---
	2-conduit	Pg13.5	D4N-5A32R	D4N-5B32R	D4N-5C32R	D4N-5D32R
		G1/2	D4N-6A32R	D4N-6B32R	D4N-6C32R	D4N-6D32R
		1/2-14NPT (See note 2.)	D4N-7A32R	D4N-7B32R	D4N-7C32R	D4N-7D32R
		M20	D4N-8A32R	D4N-8B32R	D4N-8C32R	D4N-8D32R

Actuator	Conduit size		Built-in switch mechanism			
			1NC/1NO (Slow-action)	2NC (Slow-action)	2NC/1NO (Slow-action)	3NC (Slow-action)
One-way roller arm lever (horizontal) 	1-conduit	Pg13.5	D4N-1A62R	D4N-1B62R	D4N-1C62R	D4N-1D62R
		G1/2	D4N-2A62R	D4N-2B62R	D4N-2C62R	D4N-2D62R
		1/2-14NPT	D4N-3A62R	D4N-3B62R	D4N-3C62R	D4N-3D62R
		M20	D4N-4A62R	D4N-4B62R	D4N-4C62R	D4N-4D62R
		M12 connector	D4N-9A62R	D4N-9B62R	---	---
	2-conduit	Pg13.5	D4N-5A62R	D4N-5B62R	D4N-5C62R	D4N-5D62R
		G1/2	D4N-6A62R	D4N-6B62R	D4N-6C62R	D4N-6D62R
		1/2-14NPT (See note 2.)	D4N-7A62R	D4N-7B62R	D4N-7C62R	D4N-7D62R
		M20	D4N-8A62R	D4N-8B62R	D4N-8C62R	D4N-8D62R
One-way roller arm lever (vertical) 	1-conduit	Pg13.5	D4N-1A72R	D4N-1B72R	D4N-1C72R	D4N-1D72R
		G1/2	D4N-2A72R	D4N-2B72R	D4N-2C72R	D4N-2D72R
		1/2-14NPT	D4N-3A72R	D4N-3B72R	D4N-3C72R	D4N-3D72R
		M20	D4N-4A72R	D4N-4B72R	D4N-4C72R	D4N-4D72R
		M12 connector	D4N-9A72R	D4N-9B72R	---	---
	2-conduit	Pg13.5	D4N-5A72R	D4N-5B72R	D4N-5C72R	D4N-5D72R
		G1/2	D4N-6A72R	D4N-6B72R	D4N-6C72R	D4N-6D72R
		1/2-14NPT (See note 2.)	D4N-7A72R	D4N-7B72R	D4N-7C72R	D4N-7D72R
		M20	D4N-8A72R	D4N-8B72R	D4N-8C72R	D4N-8D72R

Note: 1. It is recommended that M20 be used for Switches to be exported to Europe and 1/2-14NPT be used for Switches to be exported to North American countries.

2. The 1/2-14NPT 2-conduit models include an M20-to-1/2-14NPT changing adaptor.

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN50047
  EN60204-1
  EN1088
  GS-ET-15

■ Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN60947-5-1 (certified direct opening)	(See note 1.)
UL (See note 2.)	UL508, CSA C22.2 No.14	E76675
CCC (CQC) (See note 3.)	GB14048.5	2004010305105973

Note: 1. Consult your OMRON representative for details.

2. Certification for CSA C22.2 No. 14 is authorized by the UL mark.

3. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item / Utilization category	AC-15	DC-13
Rated operating current (I_e)	3 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC269 as a short-circuit protection device. This fuse is not built into the Switch.

UL/CSA (UL508, CSA C22.2 No. 14)

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

Q300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VDC		0.27 A	0.27 A		

■ Characteristics

Degree of protection (See note 3.)		IP67 (EN60947-5-1)
Durability (See note 4.)	**Mechanical**	1,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC (See note 5.) 300,000 operations min. for a resistive load of 10 A at 250 VAC
Operating speed		1 to 500 mm/s (D4N-1A20R)
Operating frequency		30 operations/minute max.
Contact resistance		25 mΩ max.
Minimum applicable load (See note 6.)		Resistive load of 1 mA at 5 VDC (N-level reference value)
Rated insulation voltage (U_i)		300 V
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		Level 3 (EN60947-5-1)
Impulse withstand voltage (EN60947-5-1)		Between terminals of the same polarity: 2.5 kV
		Between terminals of different polarities: 4 kV
		Between other terminals and uncharged metallic parts: 6 kV
Insulation resistance		100 MΩ min.
Contact gap		Snap-action: 2 x 0.5 mm min Slow-action: 2 x 2 mm min
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude
Shock resistance	**Destruction**	1,000 m/s^2
	Malfunction	300 m/s^2
Conditional short-circuit current		100 A (EN60947-5-1)
Rated open thermal current (I_{th})		10 A (EN60947-5-1)
Ambient temperature		Operating: –30°C to 70°C with no icing
Ambient humidity		Operating: 95% max.
Weight		Approx. 92 g (D4N-1A20R)

Note: 1. The above values are initial values.

2. Once a contact has been used to switch a standard load, it cannot be used for a load of a smaller capacity. Doing so may result in roughening of the contact surface and contact reliability may be lost.

3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4N-□R in places where foreign material such as dust, dirt, oil, water, or chemicals may penetrate through the head. Otherwise, premature wear, Switch damage or malfunctioning may occur.

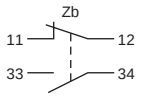
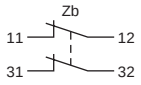
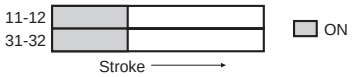
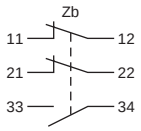
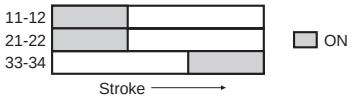
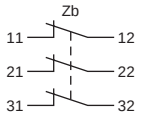
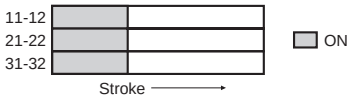
4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.

5. Do not pass the 3-A, 250-VAC load through more than 2 circuits.

6. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

Connections

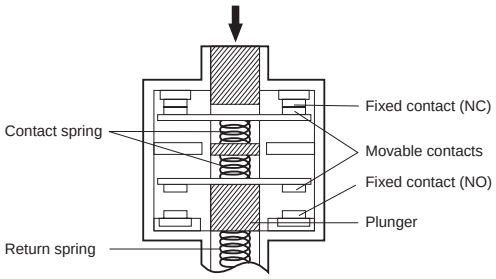
■ Contact Form

Model	Contact	Contact form	Operating pattern	Remarks
D4N-□A□R	1NC/1NO			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4N-□B□R	2NC			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 31-32 can be used as unlike poles.
D4N-□C□R	2NC/1NO			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 33-34 can be used as unlike poles.
D4N-□D□R	3NC			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 31-32 can be used as unlike poles.

Operation

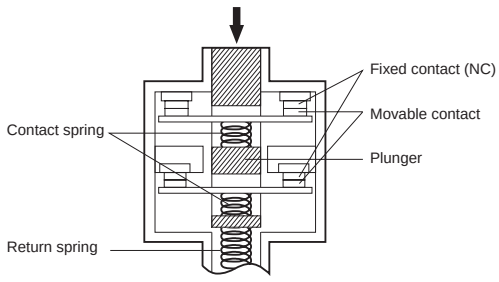
■ Direct Opening Mechanism

1NC/1NO Contact (Slow-action)



Only the NC contact side has a direct opening mechanism.
When contact welding occurs, the contacts are separated from each other by the plunger being pushed in.
(Conforms to EN60947-5-1 Direct Opening Operation.)

2NC Contact (Slow-action)



Both NC contacts have a direct opening mechanism.
When contact welding occurs, the contacts are separated from each other by the plunger being pushed in.
(Conforms to EN60947-5-1 Direct Opening Operation.)

Nomenclature

■ Structure

Safety-oriented Lever Setting

Grooves which engage the lever are cut in the lever and rotary shaft to prevent the lever from slipping against the rotary shaft. The actuator locks (self-holding) when it moves to the lock position.

Reset Head (Blue)

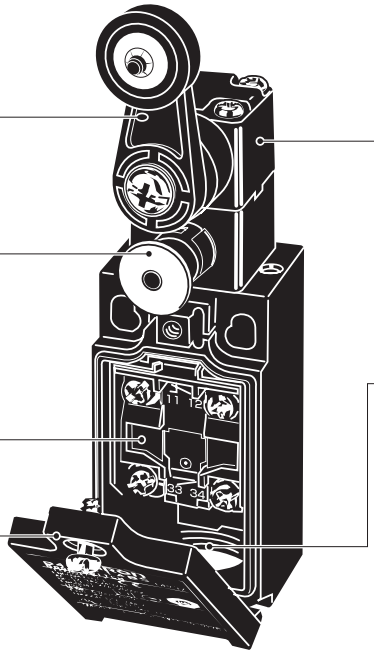
The direction of the reset head can be adjusted to any of the four directions.

Built-in Switch

The built-in switch has a direct opening mechanism that forcibly separates the NC contact even when there is contact deposit.

Cover

The cover, with a hinge on its lower part, can be opened by removing the screw of the cover, which ensures ease of maintenance and wiring.



Head

With roller lever models, the direction of the switch head can be adjusted to any of the four directions by loosening the roller lever switch screws at the four corners of the head.

Conduit

A wide variety of conduits is available.

Size / Box	1-conduit model	2-conduit model
Pg13.5	Yes	Yes
G1/2	Yes	Yes
1/2-14NPT	Yes	Yes
M20	Yes	Yes
M12 connector	Yes	---

Note: M12 connector types are not available for Switches with three contacts.

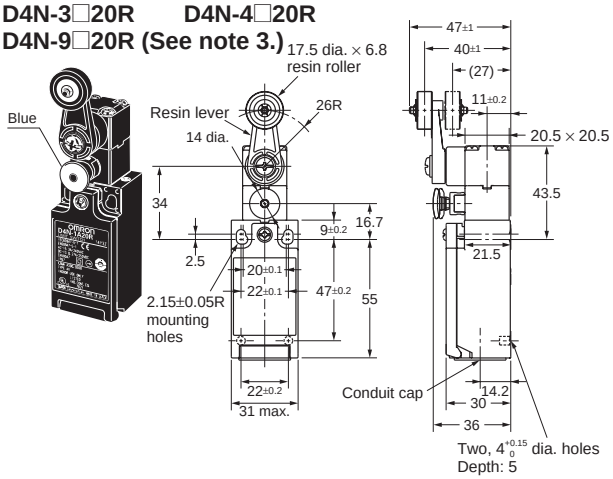
Dimensions

■ Switches

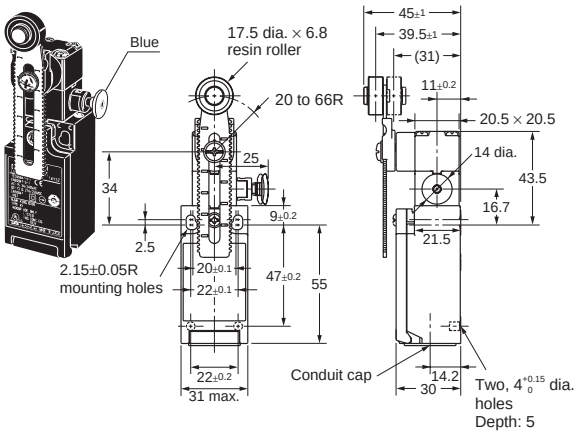
Note: All units are in millimeters unless otherwise indicated.

1-conduit Models

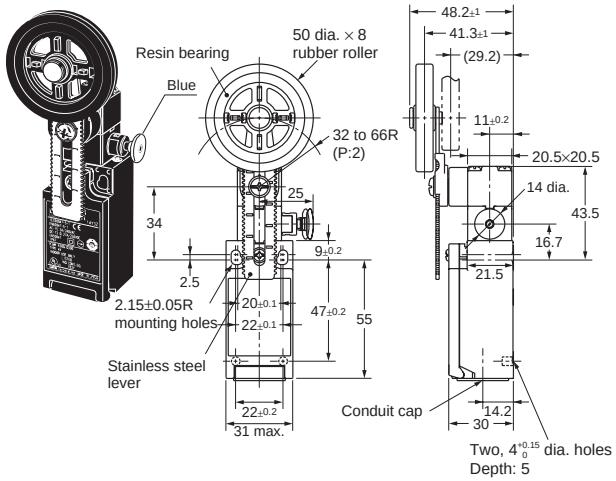
Roller Lever (Resin Lever, Resin Roller)
D4N-1□20R D4N-2□20R
D4N-3□20R D4N-4□20R
D4N-9□20R (See note 3.)



Adjustable Roller Lever, Form Lock (with Metal Lever, Resin Roller)
D4N-1□2GR D4N-2□2GR
D4N-3□2GR D4N-4□2GR
D4N-9□2GR (See note 3.)



Adjustable Roller Lever, Form Lock (with Metal Lever, Rubber Roller)
D4N-1□2HR D4N-2□2HR
D4N-3□2HR D4N-4□2HR
D4N-9□2HR (See note 3.)

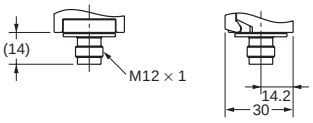


Model	D4N-□□20R	D4N-□□2GR (See note 2.)	D4N-□□2HR
LF max.	6.4 N	5.6 N	5.4 N
LT max.	55°	55°	55°
PT 1 (See note 3.)	18 to 27°	18 to 27°	18 to 27°
(PT 2) (See note 4.)	(44°)	(44°)	(44°)
(TT) (See note 5.)	80°	80°	80°
DOF min. (See note 6.)	20 N	20 N	20 N
DOT min. (See note 6.)	50°	50°	50°

Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
3. Refer to the following diagram for details on 1-conduit M12 connectors.

1-conduit M12 Connectors

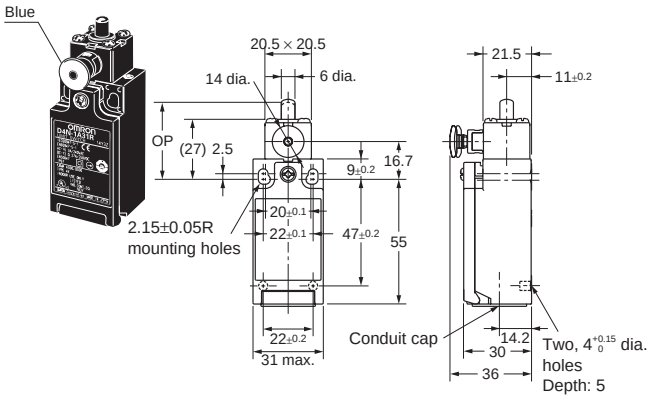
D4N-9□□□R



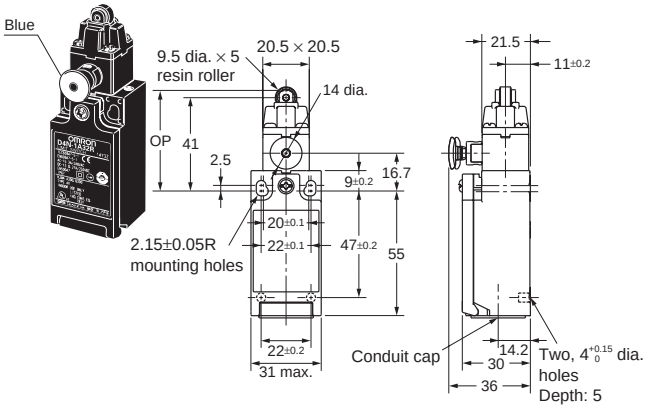
Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. The operating characteristics of these Switches were measured with the roller lever set at 32 mm.
3. These PT values are possible when the NC contacts are open (OFF).
4. These PT values are reference values possible when the NO contacts are closed (ON). (1NC/1NO models only)
5. Reference value.
6. Load and stroke values for the direct opening mechanism. For safe use, always make sure that the minimum values or greater are provided.

1-conduit Models

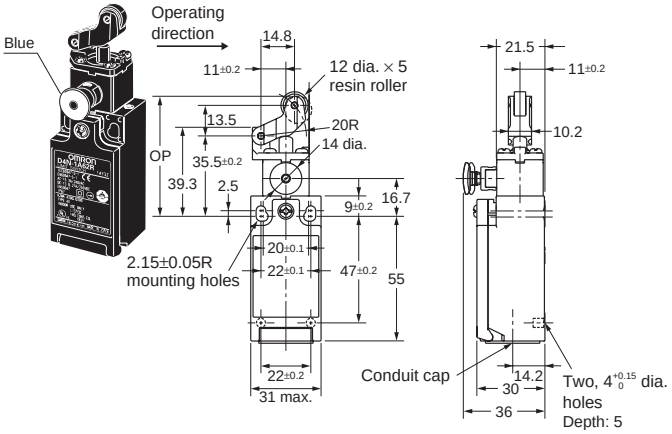
Plunger
D4N-1□31R D4N-2□31R
D4N-3□31R D4N-4□31R
D4N-9□31R (See note 3.)



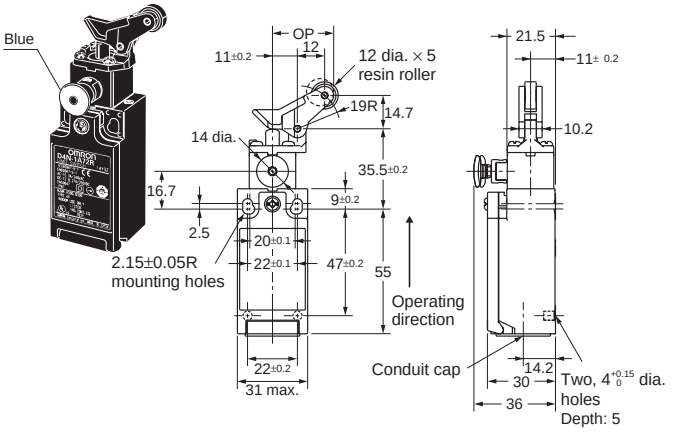
Roller Plunger
D4N-1□32R D4N-2□32R
D4N-3□32R D4N-4□32R
D4N-9□32R (See note 3.)



One-way Roller Arm Lever (Horizontal)
D4N-1□62R D4N-2□62R
D4N-3□62R D4N-4□62R
D4N-9□62R (See note 3.)



One-way Roller Arm Lever (Vertical)
D4N-1□72R D4N-2□72R
D4N-3□72R D4N-4□72R
D4N-9□7R2 (See note 3.)



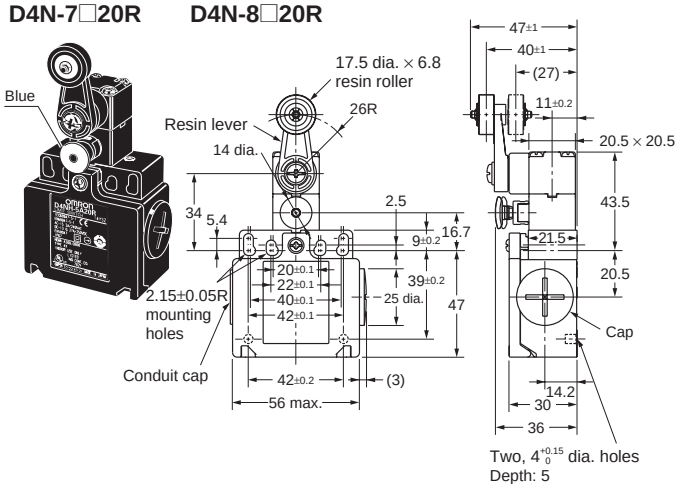
Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Variation occurs in the simultaneity of contact opening/closing operations of 2NC and 3NC contacts. Check contact operation.
3. Refer to page 307 for details on 1-conduit M12 connectors.

Model	D4N-□□31R	D4N-□□32R	D4N-□□62R	D4N-□□72R
LF max.	10.8 N	10.8N	7.5 N	7.9 N
LT max.	4.5 mm	4.5 mm	7 mm	7 mm
PT 1 (See note 2.)	2 mm	2 mm	4 mm	4 mm
(PT 2) (See note 3.)	(2.9 mm)	(2.9 mm)	(5.2 mm)	(4.3 mm)
OP	34 ±0.5 mm	44.4 ±0.8 mm	53 ±0.8 mm	27 ±0.8 mm
(TT) (See note 4.)	(6 mm)	(6 mm)	(9 mm)	(9 mm)
DOF min. (See note 5.)	20 N	20 N	20 N	20 N
DOT min. (See note 5.)	3.2 mm	3.2 mm	5.8 mm	4.8 mm

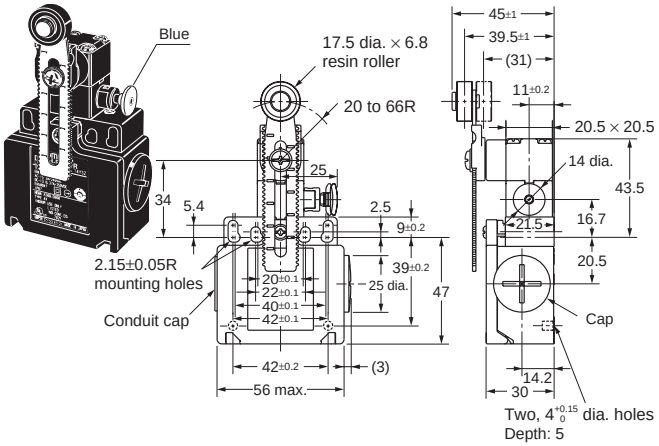
Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. These PT values are possible when the NC contacts are open (OFF).
3. These PT values are reference values possible when the NO contacts are closed (ON). (1NC/1NO models only)
4. Reference value.
5. Load and stroke values for the direct opening mechanism. For safe use, always make sure that the minimum values or greater are provided.

2-conduits Models

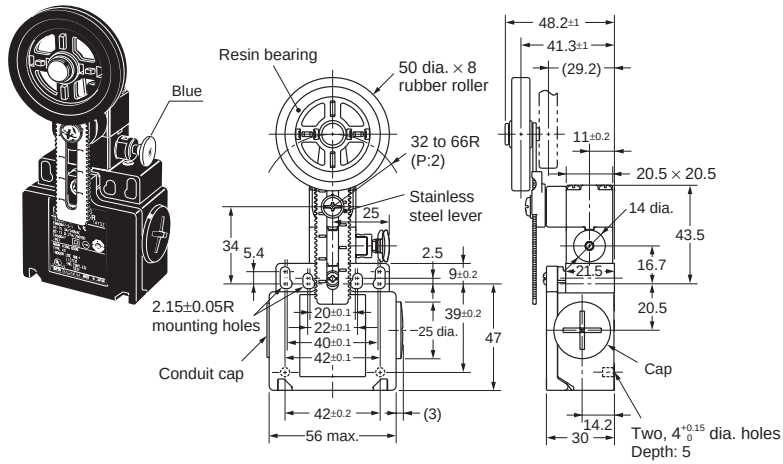
Roller Lever (Resin Lever, Resin Roller)
D4N-5□20R D4N-6□20R
D4N-7□20R D4N-8□20R



Adjustable Roller Lever, Form Lock (with Metal Lever, Resin Roller)
D4N-5□2GR D4N-6□2GR
D4N-7□2GR D4N-8□2GR



Adjustable Roller Lever, Form Lock (with Metal Lever, Rubber Roller)
D4N-5□2HR D4N-6□2HR
D4N-7□2HR D4N-8□2HR



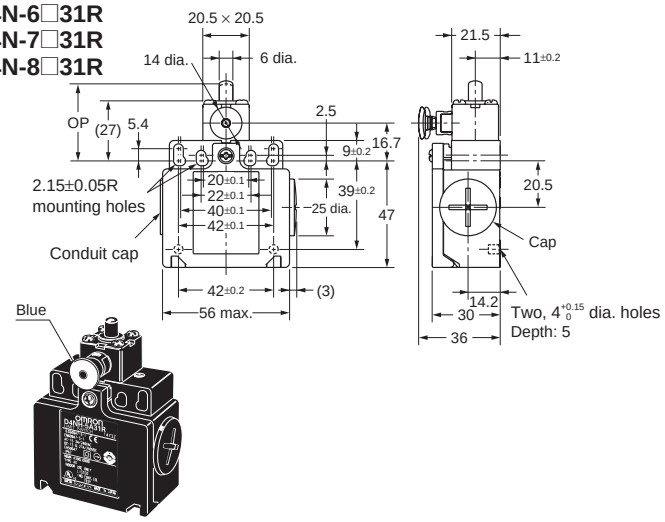
Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Variation occurs in the simultaneity of contact opening/closing operations of 2NC and 3NC contacts. Check contact operation.

Model	D4N-□□20R	D4N-□□2GR	D4N-□□2HR
LF max.	6.4 N	5.6 N	5.4 N
LT max.	55°	55°	55°
PT 1 (See note 2.)	18° to 27°	18° to 27°	18° to 27°
(PT 2) (See note 3.)	(44°)	(44°)	(44°)
(TT) (See note 4.)	80°	80°	80°
DOF min. (See note 5.)	20 N	20 N	20 N
DOT min. (See note 5.)	50°	50°	50°

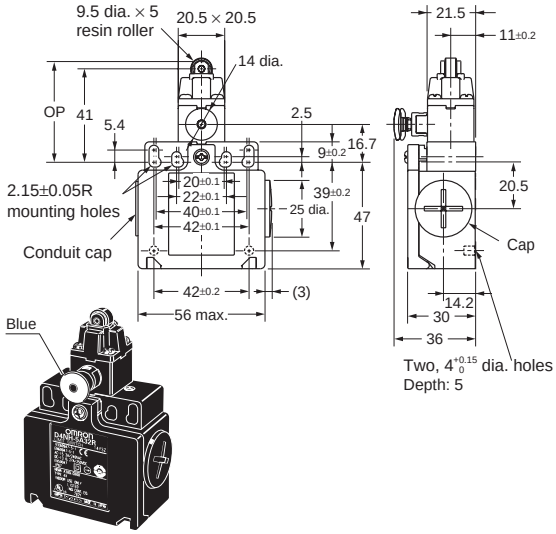
Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. These PT values are possible when the NC contacts are open (OFF).
3. These PT values are reference values possible when the NO contacts are closed (ON). (1NC/1NO models only)
4. Reference value.
5. Load and stroke values for the direct opening mechanism. For safe use, always make sure that the minimum values or greater are provided.

2-conduits Models

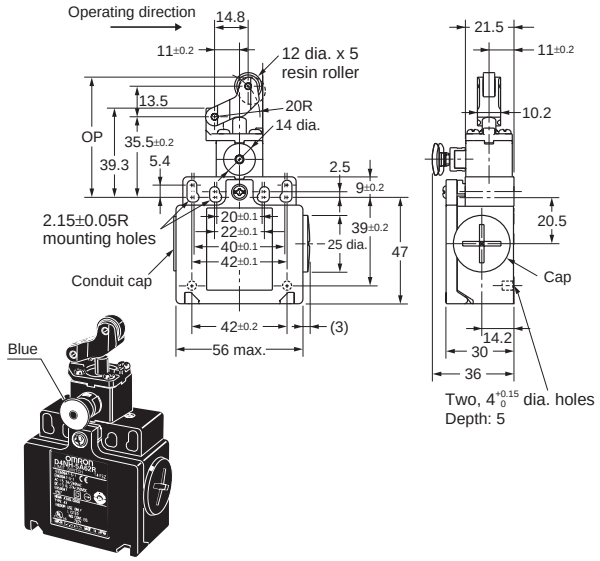
Plunger
D4N-5□31R
D4N-6□31R
D4N-7□31R
D4N-8□31R



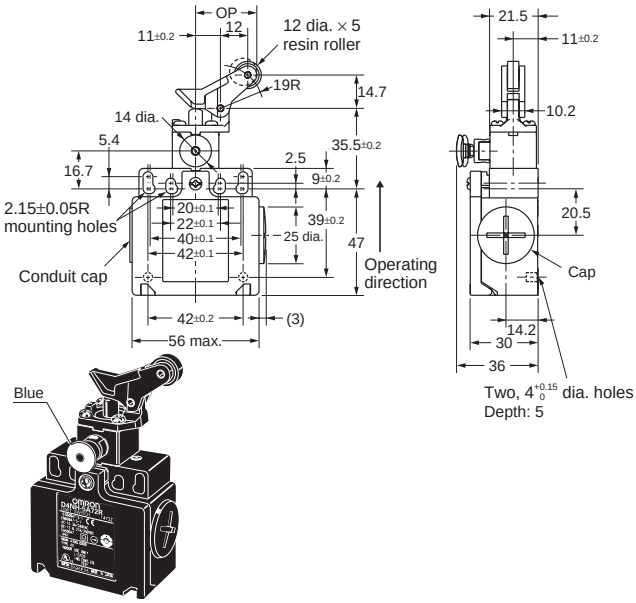
Roller Plunger
D4N-5□32R **D4N-6□32R**
D4N-7□32R **D4N-8□32R**



One-way Roller Arm Lever (Horizontal)
D4N-5□62R **D4N-6□62R**
D4N-7□62R **D4N-8□62R**



One-way Roller Arm Lever (Vertical)
D4N-5□72R **D4N-6□72R**
D4N-7□72R **D4N-8□72R**



Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Variation occurs in the simultaneity of contact opening/closing operations of 2NC and 3NC contacts. Check contact operation.

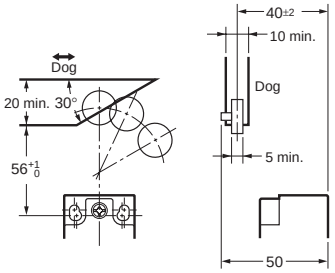
Model	D4N-□□31R	D4N-□□32R	D4N-□□62R	D4N-□□72R
LF max.	10.8 N	10.8N	7.5 N	7.9 N
LT max.	4.5 mm	4.5 mm	7 mm	7 mm
PT 1 max. (See note 2.)	2 mm	2 mm	4 mm	4 mm
(PT 2) (See note 3.)	(2.9 mm)	(2.9 mm)	(5.2 mm)	(4.3 mm)
OP	34 ±0.5 mm	44.4 ±0.8 mm	53 ±0.8 mm	27 ±0.8 mm
(TT) (See note 4.)	(6 mm)	(6 mm)	(9 mm)	(9 mm)
DOF min. (See note 5.)	20 N	20 N	20 N	20 N
DOT min. (See note 5.)	3.2 mm	3.2 mm	5.8 mm	4.8 mm

Note: 1. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
2. These PT values are possible when the NC contacts are open (OFF).
3. These PT values are reference values possible when the NO contacts are closed (ON). (1NC/1NO models only)
4. Reference value.
5. Load and stroke values for the direct opening mechanism. For safe use, always make sure that the minimum values or greater are provided.

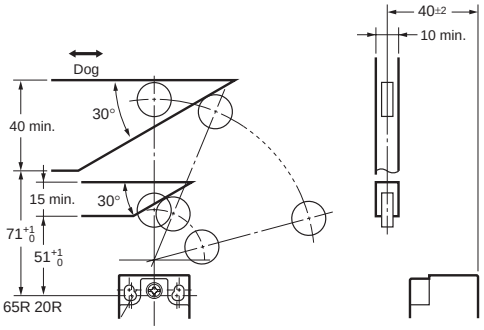
■ Levers

Refer to the following diagrams for the angles and positions of the dogs.

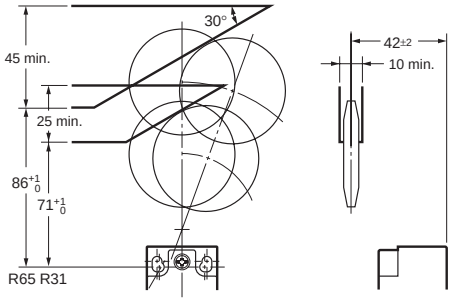
Roller Lever (D4N-□□20R)



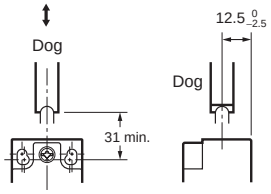
Adjustable Roller Lever, Form Lock (with Metal Lever, Resin Roller) (D4N-□□2GR)



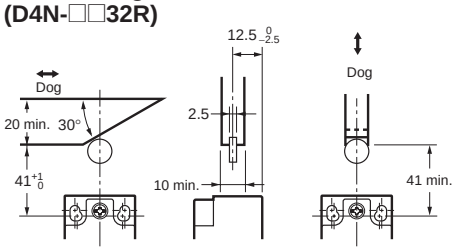
Adjustable Roller Lever, Form Lock (with Metal Lever, Rubber Roller) (D4N-□□2HR)



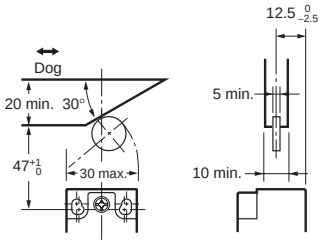
Sealed Plunger (D4N-□□31R)



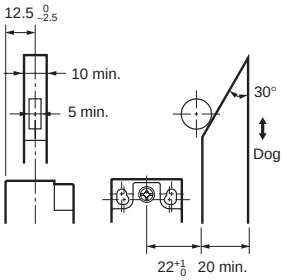
Roller Plunger (D4N-□□32R)



One-way Roller Arm Lever (Horizontal) (D4N-□□62R)



One-way Roller Arm Lever (Vertical) (D4N-□□72R)



Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Limit Switches"* on page 247.

⚠ CAUTION

Do not use metal connectors or metal conduits. If the Switch is made of resin, damage at the conduit section may cause electric shock.

■ Precautions for Safe Use

- Do not drop the Switch. Doing so may result in the Switch not performing to its full capacity.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- Do not use the Switch where explosive gas or flammable gas may be present.
- Install the Switch in a location away from close body contact. Not doing so may result in malfunction.
- Do not use the Switch submerged in oil or water, or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch interior. (The IP67 degree of protection specification for the Switch refers to water penetration while the Switch is submersed in water for a specified period of time.)
- Protect the head from foreign material. Subjecting the head to foreign material may result in premature wear or damage to the Switch. Although the switch body is protected from penetration by dust or water, the head is not protected from penetration by minute particles or water.
- Turn the power OFF before wiring. Doing so may result in electric shock.
- Install the cover after wiring. Not doing so may result in electric shock.
- Connect a fuse to the Switch in series to protect the Switch from short-circuit damage. Use a fuse with a breaking current 1.5 to 2 times larger than the rated current. To conform to EN ratings, use an IEC60269-compliant 10-A fuse type gI or gG.
- Do not switch circuits for two or more standard loads (250 VAC, 3 A) at the same time. Doing so may adversely affect insulation performance.
- The durability of the Switch is greatly affected by operating conditions. Evaluate the Switch under actual working conditions, before permanent installation and use within a number of switching operations that will not adversely affect the Switch's performance.
- Be sure to indicate in the machine manufacturer's instruction manual that the user must not attempt to repair or maintain the Switch and must contact the machine manufacturer for any repairs or maintenance.
- If the Switch is to be used in an emergency stop circuit or in a safety circuit for preventing accidents resulting in injuries or deaths, use a model that has an NC contact equipped with a direct opening mechanism and make sure that the Switch operates in the direct opening mode. Furthermore, secure the Switch with screws or equivalent parts that are tightened in a single direction so that the Switch cannot be easily removed. Then provide a protection cover for the Switch and post a warning label near the Switch.
- Make sure that the actuator is pushed into the lock position. Not doing so may result in the actuator becoming unlocked, causing an accident.
- Always reset the Switch manually. Not doing so may result in damage to the reset function.
- When the Switch locks due to a fault in the system, be sure to reset the Switch manually before resupplying power after confirming the safety of the system.
- Check the Switches before use and inspect regularly, replacing them when necessary. If a Switch is kept pressed for an extended period of time, the components may deteriorate quickly, and the Switch may not release.
- When using the Switch as a safety component, be sure to check the system design for both operational and circuit safety.

■ Precautions for Correct Use

Environment

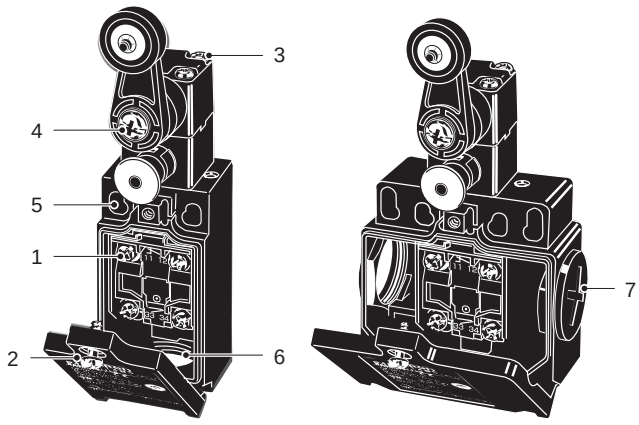
- The Switch is intended for indoor use only.
- Do not use the Switch outdoors. Doing so may cause the Switch to malfunction.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch caused by contact failure or corrosion.
- Do not use the Switches in the following locations.
  - Locations subject to severe temperature changes
  - Locations subject to high temperatures or condensation
  - Locations subject to severe vibration
  - Locations where the interior of the Protective Door may come into direct contact with cutting chips, metal filings, oil, or chemicals
  - Locations where the Switch may come into contact with thinner or detergents

Mounting Method

Mounting Screw Tightening Torque

Tighten each of the screws to the specified torque. Loose screws may result in malfunction of the Switch within a short time.

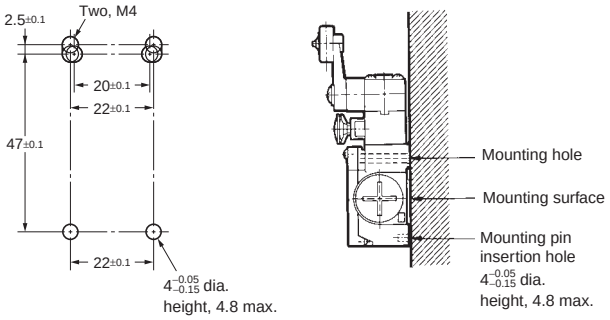
1	**Terminal screw**	0.6 to 0.8 N·m
2	**Cover clamping screw**	0.5 to 0.7 N·m
3	**Head clamping screw**	0.5 to 0.6 N·m
4	**Lever clamping screw**	1.6 to 1.8 N·m
5	**Body clamping screw**	0.5 to 0.7 N·m
6	**Conduit mounting connection, M12 adaptor**	1.8 to 2.2 N·m (except 1/2-14NPT)
		1.4 to 1.8 N·m (1/2-14NPT)
7	**Cap screw**	1.3 to 1.7 N·m



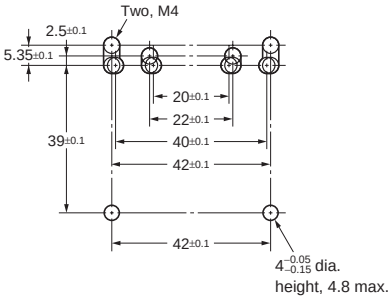
Switch Mounting

- Mount the Switch using M4 screws and washers and tighten the screws to the specified torque.
- For safety, use screws that cannot be easily removed, or use an equivalent measure to ensure that the Switch is secure.
- Secure the Switch with two M4 bolts and washers. Provide studs with a diameter of $4^{-0.05}_{-0.15}$ and a height of 4.8 mm max. at two places, inserting into the holes at the bottom of the Switch as shown below so that the Switch is firmly fixed at four points.

Switch Mounting Holes
One-conduit Type



Two-conduit Type



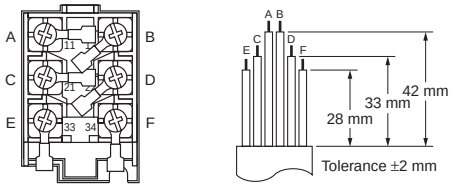
Changing the Head Direction

By removing the four screws of the head, the mounting direction of the head can be changed. The head can be mounted in four directions. Be sure that no foreign material will enter the head during a change in direction.

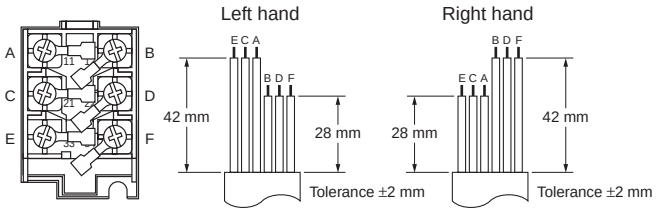
Wiring

- When connecting to the terminals via insulating tube and M3.5 crimp terminals, arrange the crimp terminals as shown below so that they do not rise up onto the case or the cover. Applicable lead wire size: AWG20 to AWG18 (0.5 to 0.75 mm^2).
  Use lead wires of an appropriate length, as shown below. Not doing so may result in excess length causing the cover to rise and not fit properly.

One-conduit Type (3 Poles)



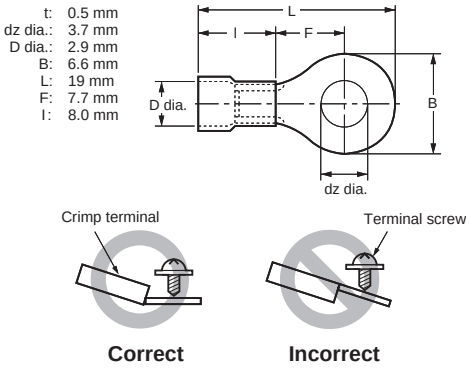
Two-conduit Type (3 Poles)



- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.
- Use crimp terminals not more than 0.5 mm in thickness. Otherwise, they will interfere with other components inside the case. The crimp terminals shown below are not more than 0.5 mm thick.

Manufacture	Type
J.S.T.	FV0.5-3.7 (F type) V0.5-3.7 (straight type)

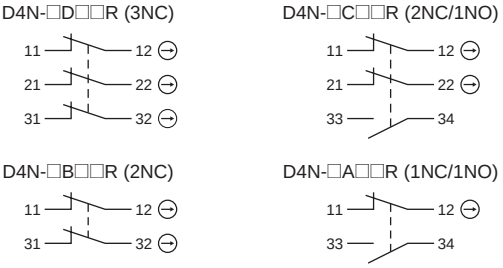
J.S.T is a Japanese manufacturer.



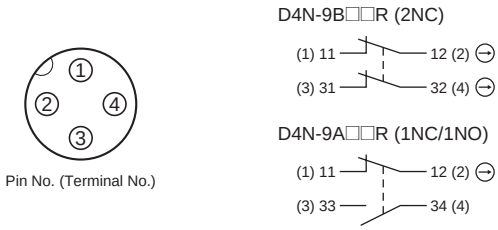
Contact Arrangement

- The following diagrams show the contact arrangements used for screw terminal types and connector types.

Screw Terminal Type



Connector Type



- Applicable socket: XS2F (OMRON).
- Refer to the *Connector Catalog* for details on socket pin numbers and lead wire colors.

Socket Tightening (Connector Type)

- Turn the socket connector screws by hand and tighten until no space remains between the socket and the plug.
- Make sure that the socket connector is tightened securely. Otherwise, the rated degree of protection (IP67) may not be maintained and vibration may loosen the socket connector.

Conduit Opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the specified torque. The case may be damaged if an excessive tightening torque is applied.
- When using 1/2-14NPT, wind sealing tape around the joint between the connector and conduit opening so that the enclosure will conform to IP67.
- Use a cable with a suitable diameter for the connector.
- Attach and tighten a conduit cap to the unused conduit opening when wiring. Tighten the conduit cap to the specified torque. The conduit cap is provided with the Switch (2-conduit types).

Recommended Connectors

Use connectors with screws not exceeding 9 mm, otherwise the screws will protrude into the case interior, interfering with other components in the case. The connectors listed in the following table have connectors with thread sections not exceeding 9 mm. Use the recommended connectors to ensure conformance to IP67.

Size	Manufacturer	Model	Applicable cable diameter
G1/2	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
Pg13.5	LAPP	S-13.5 5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5 5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2 5301-6030	6.0 to 12.0 mm

Use LAPP connectors together with seal packing (JPK-16, GP-13.5, GPM20, or GPM12), and tighten to the specified tightening torque. Seal packing is sold separately.

LAPP is a German manufacturer.

Before using a 2-conduit 1/2-14NPT type, attach the provided changing adaptor to the Switch and then connect the recommended connector.

Storage

Do not store the Switch in locations where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, Cl_2) or dust is present, or in locations subject to high temperatures and humidity.

Others

- Do not allow the load current to exceed the rated value.
- Confirm that the seal rubber has no defects before use. If the seal rubber is displaced or raised, or has foreign particles adhered to it, the sealing capability of the seal rubber will be adversely affected.
- Use the correct cover mounting screws only, or the sealing capability of the seal rubber will deteriorate.
- Inspect the Switch regularly.
- With rubber roller lever models, the rubber roller may turn white over time, but this will not affect the quality of operation.
- Use the following recommended countermeasures to prevent telegraphing when using adjustable or long levers.

1. Make the rear edge of the dog smooth with an angle of 15° to 30° or make it in the shape of a quadratic curve.
2. Design the circuit so that no error signal will be generated.
3. Use or set a Switch that is operated in one direction only.

Production Discontinuation

Following the release of the D4N-R, production of the D4D-R will be discontinued.

Date of Production Discontinuation

Production of the D4D-R Series will be discontinued as of the end of March 2006.

Product Replacement

1. Dimensions

   The D4D-R and D4N-R use the same mounting method, and mounting hole. The multi-contact structure and the extra 4 mm in length, however, are different.
2. Terminal Numbers

   For the 2-contact model, the terminals 21, 22, 23, and 24 on the D4D-R are 31, 32, 33, and 34 on the D4N-R.
3. Recommended Terminals

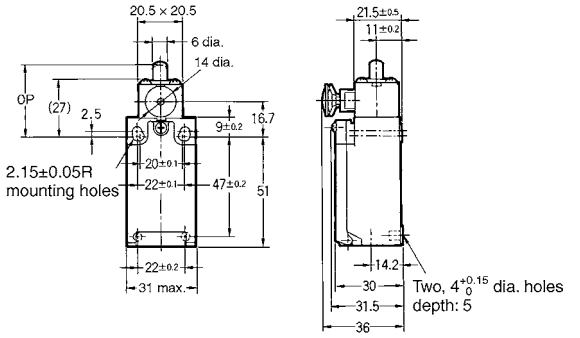
   If the recommended terminals are not used, the Switch may not be compatible. Make sure that the Switch is compatible with the terminals.

Comparison of the D4D-R and Substitute Products

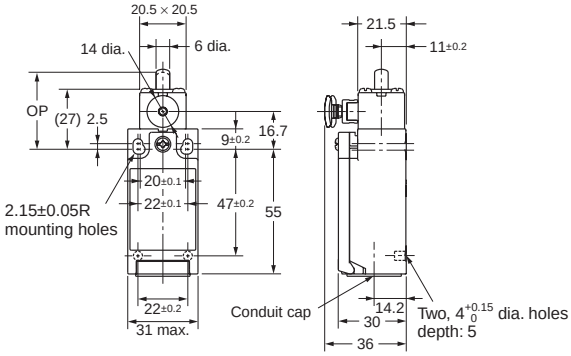
Model	D4N-R
Switch color	Very similar
Dimensions	Very similar
Wiring/connection	Significantly different
Mounting method	Completely compatible
Ratings/performance	Very similar
Operating characteristics	Very similar
Operating method	Completely compatible

Dimensions (Unit: mm)

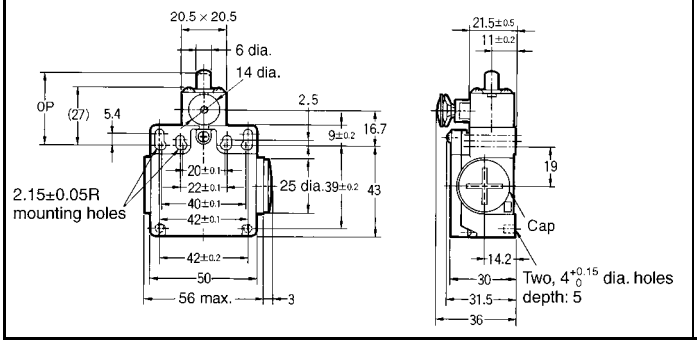
Discontinued Models (1-conduit Plunger-type D4D-R)



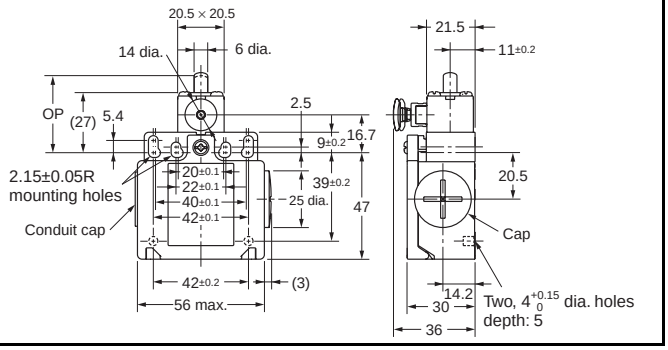
Replacement Products (1-conduit Plunger-type D4N-R)



Discontinued Models (2-conduit Plunger Type D4D-R)



Replacement Products (2-conduit Plunger Type D4N-R)



List of Recommended Substitute Products

: The actuator on the D4D-R is a non-safety type. The D4N-R is recommended for safety applications (form lock type). Be sure to mount it correctly. Using M screws is recommended to comply with European standards. Therefore, the M20 conduit model is recommended for use in new designs.

Safety Limit Switch

D4D-R product to be discontinued	Recommended substitute product
D4D-1520R	D4N-1A20R
D4D-2520R	D4N-2A20R
D4D-3520R	D4N-3A20R
D4D-5520R	D4N-5A20R
D4D-6520R	D4N-6A20R
D4D-1531R	D4N-1A31R
D4D-2531R	D4N-2A31R
D4D-3531R	D4N-3A31R
D4D-5531R	D4N-5A31R
D4D-6531R	D4N-6A31R
D4D-1532R	D4N-1A32R
D4D-2532R	D4N-2A32R
D4D-3532R	D4N-3A32R
D4D-5532R	D4N-5A32R
D4D-6532R	D4N-6A32R
D4D-1562R	D4N-1A62R
D4D-2562R	D4N-2A62R
D4D-3562R	D4N-3A62R
D4D-5562R	D4N-5A62R
D4D-6562R	D4N-6A62R
D4D-1572R	D4N-1A72R
D4D-2572R	D4N-2A72R
D4D-3572R	D4N-3A72R
D4D-5572R	D4N-5A72R
D4D-6572R	D4N-6A72R
D4D-152HR	D4N-1A2HR
D4D-252HR	D4N-2A2HR
D4D-352HR	D4N-3A2HR
D4D-1521R	D4N-1A2GR
D4D-2521R	D4N-2A2GR
D4D-3521R	D4N-3A2GR
D4D-5521R	D4N-5A2GR
D4D-6521R	D4N-6A2GR
D4D-1527R	D4N-1A2HR
D4D-2527R	D4N-2A2HR
D4D-3527R	D4N-3A2HR
D4D-5527R	D4N-5A2HR
D4D-6527R	D4N-6A2HR

D4D-R product to be discontinued	Recommended substitute product
D4D-1A20R	D4N-1B20R
D4D-2A20R	D4N-2B20R
D4D-3A20R	D4N-3B20R
D4D-5A20R	D4N-5B20R
D4D-6A20R	D4N-6B20R
D4D-1A31R	D4N-1B31R
D4D-2A31R	D4N-2B31R
D4D-3A31R	D4N-3B31R
D4D-5A31R	D4N-5B31R
D4D-6A31R	D4N-6B31R
D4D-1A32R	D4N-1B32R
D4D-2A32R	D4N-2B32R
D4D-3A32R	D4N-3B32R
D4D-5A32R	D4N-5B32R
D4D-6A32R	D4N-6B32R
D4D-1A62R	D4N-1B62R
D4D-2A62R	D4N-2B62R
D4D-3A62R	D4N-3B62R
D4D-5A62R	D4N-5B62R
D4D-6A62R	D4N-6B62R
D4D-1A72R	D4N-1B72R
D4D-2A72R	D4N-2B72R
D4D-3A72R	D4N-3B72R
D4D-5A72R	D4N-5B72R
D4D-6A72R	D4N-6B72R
D4D-1A2HR	D4N-1B2HR
D4D-2A2HR	D4N-2B2HR
D4D-3A2HR	D4N-3B2HR
D4D-1A21R	D4N-1B2GR
D4D-2A21R	D4N-2B2GR
D4D-3A21R	D4N-3B2GR
D4D-5A21R	D4N-5B2GR
D4D-6A21R	D4N-6B2GR
D4D-1A27R	D4N-1B2HR
D4D-2A27R	D4N-2B2HR
D4D-3A27R	D4N-3B2HR
D4D-5A27R	D4N-5B2HR
D4D-6A27R	D4N-6B2HR

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C132-E1-04

Precautions for All Safety Door Switches

Note: Refer to the *Safety Precautions* section for each Switch for specific precautions applicable to each Switch.

⚠ CAUTION

Do not insert the Operation Key when the door is open. The machine may operate, possibly causing injury.

Do not use metal connectors or conduits. If the Switch is made of resin, damage at the conduit section may cause electric shock.

Lock Strength for Guard Lock Safety-door Switches

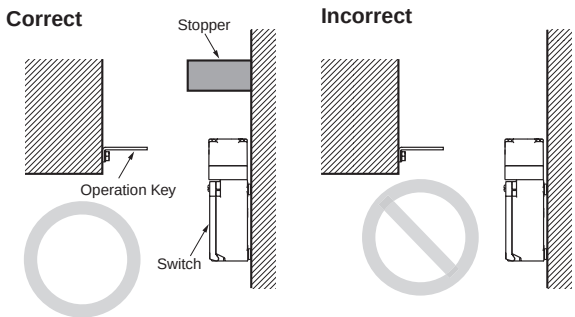
- Do not apply force exceeding the lock strength. The Switch may be broken and the system may continue to operate.
- Either install another locking component (e.g., a stopper) in addition to the Switch, or use a warning sticker or an indicator showing the lock status so that a force exceeding the lock strength is not applied.

Precautions for Safe Use

- Do not disassemble the Switch or touch any interior parts while power is being supplied. Electric shock may occur.
- Mount the Operation Key so that it will not come into contact with persons in the area when the door is opened and closed. Injury may result.
- Do not apply excessive force to the end of the Operation Key when it is inserted in the Switch and do not drop the Operation Key. The Key may be deformed or the Switch may be damaged.
- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.
- Do not use the Switch in a startup circuit. Use it instead for a safety confirmation signal.
- When using the Switch in an emergency stop circuit or a safety circuit related to personnel accidents, use an NC contact with a positive opening mechanism and set it to operate in positive mode. Also, mount the Switch and the Operation Keys with screws that cannot be easily removed or a similar means to prevent them from being easily removed. Attach protective covers and warning indications.
- Connect a fuse in series with the D4NS to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%. When using the D4NS for an EN rating, use a 10-A fuse of type gI or gG that complies with IEC 60269.
- Never perform wiring while power is being supplied. Always attach the cover after completing wiring.
- Do not allow the load current to exceed the rated value.
- Do not wire terminals incorrectly.
- Confirm operation after completing installation and adjustment.
- Do not drop the package or the product. Do not alter the interior of the product.
- Do not use the Switch in atmospheres containing explosive or flammable gases.
- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capability.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head.
  Otherwise, accelerated wear or breaking may result.
- Always attach the cover after completing wiring and before using the Switch. Electric shock may occur if the Switch is used without the cover attached.

Stopper Installation

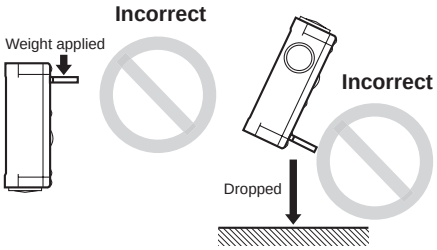
Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.



Precautions for Correct Use

Operation Key

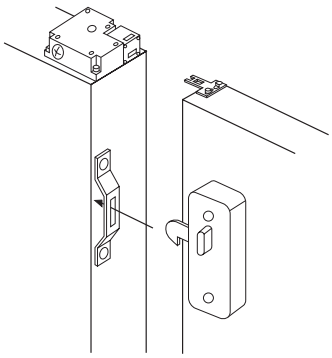
- Be sure to use the designated Operation Key only. The Head has been designed so that operation is not possible with a screwdriver or other tools. Do not operate the Switch with anything other than the special OMRON Operation Key, otherwise the Switch may break or the safety of the system may not be maintained.
- Do not impose excessive force on the Operation Key inserted into the Switch or drop the Switch with the Operation Key inserted, otherwise the Operation Key may deform or break.



Secure the Operation Key with a one-way screw, or an equivalent, so that the Operation Key cannot be easily removed.

Securing the Door

If the Operation Key on the closed door is pulled outside the set zone by force caused by vibration, the door's weight, or the door cushion rubber, the Switch may be damaged. Also, it may not be possible to unlock the Switch if weight is placed on the Operation Key. Secure the door with hooks so that it will remain within the set zone.



Operating Environment

- Safety Door Switches are designed for use indoors. Using a Switch outdoors may damage it.

Do not use the Switch in the following locations:

- Locations subject to severe temperature changes
- Locations subject to high temperatures or condensation
- Locations subject to severe vibration
- Locations where the interior of the Protective Door may come into direct contact with cutting chips, metal filings, oil, or chemicals
- Locations where the Switch may come into contact with thinner or detergents
- Locations where explosive or flammable gases are present

Switch Durability

The durability of the Switch is greatly influenced by the switching conditions. Always test the Switch under actual conditions before application and use it in a switching circuit for which there are no problems with performance.

Processing the Conduit Opening

- Use the recommended connector and tighten the connector to the appropriate torque. Excessive tightening torque may damage the casing.
- To satisfy IP67, apply sealing tape to the connector conduit.
- The diameter of the cable must be suitable for the corresponding connector.
- Insert a cap screw into any unused conduit opening and tighten the cap screw to the appropriate torque.

Maintenance and Repairs

The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.

Storing Switches

Do not store Switches where any of the following are present: sulfuric gas (H_2S or SO_2), ammonium gas (NH_3), nitric gas (HNO_3), chlorine gas (Cl_2), high temperatures, or high humidity.

Other Precautions

- When attaching a cover, be sure that the seal rubber is in place and that there is no foreign material present. If the cover is attached with the seal rubber out of place or if foreign material is stuck to the rubber, a proper seal will not be obtained. Also, check the tightening torque and be sure that all screws are tightened evenly. If the tightening torque is not suitable, a proper seal will not be obtained.
- A Guard Lock Safety-door Switch will heat when power is supplied to the solenoid. Do not touch these Switches.
- We recommend the OMRON D4BL or D4BS for environments that require strength, superior seal characteristics, or oil resistance.
- Perform maintenance inspections periodically.
- Use the Switch with a load current that does not exceed the rated current.
- Do not use any screws to connect the cover other than the specified ones. The seal characteristics may be reduced.

Safety-door Switch
D4NS

Multi-contact, Labor-saving, Environment-friendly, Next-generation Safety-door Switch

- Lineup includes three contact models with 2NC/1NO and 3NC contact forms and MBB models in addition to the previous contact forms 1NC/1NO, and 2NC.
- M12-connector models are available, saving on labor and simplifying replacement.
- Standardized gold-clad contacts provide high contact reliability.
- Applicable to both standard loads and microloads.

Note: Be sure to read the *"Safety Precautions"* on page 327 and the *"Precautions for All Safety Door Switches"* on page 317.

Model Number Structure

■ Model Number Legend

Switch

D4NS-□□□
1 2 3

1. Conduit/Connector size
- 1: Pg13.5 (1-conduit)
- 2: G1/2 (1-conduit)
- 3: 1/2-14NPT (1-conduit)
- 4: M20 (1-conduit)
- 5: Pg13.5 (2-conduit)
- 6: G1/2 (2-conduit)
- 7: 1/2-14NPT compatible (2-conduit model with M20 conduit size includes an M20-to-1/2-14NPT conversion adapter)
- 8: M20 (2-conduit)
- 9: M12 connector (1-conduit)

2. Built-in Switch
- A: 1NC/1NO (slow-action)
- B: 2NC (slow-action)
- C: 2NC/1NO (slow-action)
- D: 3NC (slow-action)
- E: 1NC/1NO (MBB contact)
- F: 2NC/1NO (MBB contact)

3. Head Mounting Direction
- F: Four mounting directions possible (Front-side mounting at shipping)

Note: An order for the head part or the switch part alone cannot be accepted. The Operation Key is sold separately.

Operation Key

D4DS-K□
1

1. Operation Key Type
- 1: Horizontal mounting
- 2: Vertical mounting
- 3: Adjustable mounting (Horizontal)
- 5: Adjustable mounting (Horizontal/ Vertical)

Ordering Information

■ List of Models

Switches (Operation Keys are sold separately.)

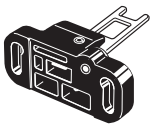
: Models with certified direct opening contacts.

Type	Contact configuration		Conduit opening/Connector	Model
1-Conduit	Slow-action	1NC/1NO	Pg13.5	D4NS-1AF
			G1/2	D4NS-2AF
			1/2-14NPT	D4NS-3AF
			M20	D4NS-4AF
		2NC	Pg13.5	D4NS-1BF
			G1/2	D4NS-2BF
			1/2-14NPT	D4NS-3BF
			M20	D4NS-4BF
		2NC/1NO	Pg13.5	D4NS-1CF
			G1/2	D4NS-2CF
			1/2-14NPT	D4NS-3CF
			M20	D4NS-4CF
		3NC	Pg13.5	D4NS-1DF
			G1/2	D4NS-2DF
			1/2-14NPT	D4NS-3DF
			M20	D4NS-4DF
	Slow-action MBB contact	1NC/1NO	Pg13.5	D4NS-1EF
			G1/2	D4NS-2EF
			1/2-14NPT	D4NS-3EF
			M20	D4NS-4EF
		2NC/1NO	Pg13.5	D4NS-1FF
			G1/2	D4NS-2FF
			1/2-14NPT	D4NS-3FF
			M20	D4NS-4FF
2-Conduit	Slow-action	1NC/1NO	Pg13.5	D4NS-5AF
			G1/2	D4NS-6AF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7AF
			M20	D4NS-8AF
		2NC	Pg13.5	D4NS-5BF
			G1/2	D4NS-6BF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7BF
			M20	D4NS-8BF
		2NC/1NO	Pg13.5	D4NS-5CF
			G1/2	D4NS-6CF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7CF
			M20	D4NS-8CF
		3NC	Pg13.5	D4NS-5DF
			G1/2	D4NS-6DF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7DF
			M20	D4NS-8DF
	Slow-action MBB contact	1NC/1NO	Pg13.5	D4NS-5EF
			G1/2	D4NS-6EF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7EF
			M20	D4NS-8EF
		2NC/1NO	Pg13.5	D4NS-5FF
			G1/2	D4NS-6FF
			M20, includes M20-to-1/2-14NPT conversion adapter	D4NS-7FF
			M20	D4NS-8FF
1-Conduit, with connector	Slow-action	1NC/1NO	M12 connector	D4NS-9AF
		2NC		D4NS-9BF
	Slow-action MBB contact	1NC/1NO		D4NS-9EF

Note: 1. The recommended models for equipment and machinery being exported to Europe are those with an M20 or Pg13.5 conduit sizes, and for North America, the recommended models are those with a 1/2-14NPT conduit sizes.

2. Resin is used as the material for the D4NS housing and head. Use the metal D4BS Safety-door Switch for applications requiring greater mechanical strength.

Operation Keys

Type	Model
Horizontal mounting 	D4DS-K1
Vertical mounting 	D4DS-K2
Adjustable mounting (Horizontal) 	D4DS-K3
Adjustable mounting (Horizontal/Vertical) 	D4DS-K5

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN50047
  EN60204-1
  EN1088
  GS-ET-15

■ Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN60947-5-1 (certified direct opening)	(See note 1.)
UL (See note.)	UL508, CSA C22.2 No.14	E76675
CQC (CCC)	GB14048.5	2003010305077330

Note: 1. Consult your OMRON representative for details.
2. Certification for CSA C22.2 No. 14 is authorized by the UL mark.
3. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item / Utilization category	AC-15	DC-13
Rated operating current (I_e)	3 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC60269 as a short-circuit protection device. This fuse is not built into the Switch.

UL/CSA (UL508, CSA C22.2 No. 14)

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

Q300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VDC		0.27 A	0.27 A		

■ Characteristics

Degree of protection (See note 3.)		IP67 (EN60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)	
Durability (See note 4.)	**Mechanical**	1,000,000 operations min.	
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC (See note 5.) 300,000 operations min. for a resistive load of 10 A at 250 VAC	
Operating speed		0.05 to 0.5 m/s	
Operating frequency		30 operations/minute max.	
Direct opening force (See note 6.)		60 N min.	
Direct opening travel (See note 6.)		10 mm min.	
Contact resistance		25 mΩ max. (initial value)	
Minimum applicable load (See note 7.)		Resistive load of 1 mA at 5 VDC (N-level reference value)	
Rated insulation voltage (U_i)		300 V	
Protection against electric shock		Class II (double insulation)	
Pollution degree (operating environment)		3 (EN60947-5-1)	
Impulse withstand voltage (EN60947-5-1)		Between terminals of the same polarity	2.5 kV
		Between terminals of different polarities	4 kV
		Between other terminals and uncharged metallic parts	6 kV
Insulation resistance		100 MΩ min.	
Contact gap		2 x 2 mm min	
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude	
Shock resistance	**Destruction**	1,000 m/s^2 min.	
	Malfunction	300 m/s^2 min.	
Conditional short-circuit current		100 A (EN60947-5-1)	
Rated open thermal current (I_{th})		10 A (EN60947-5-1)	
Ambient temperature		Operating: –30°C to 70°C with no icing	
Ambient humidity		Operating: 95% max.	
Weight		Approx. 96 g (D4NS-1CF)	

Note: 1. The above values are initial values.

2. The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4NS in places where foreign material may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.

4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.

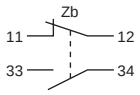
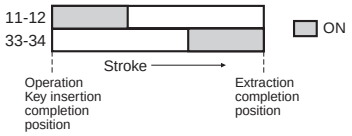
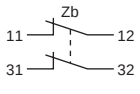
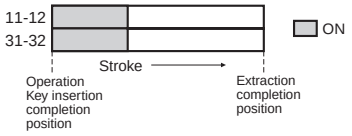
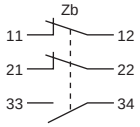
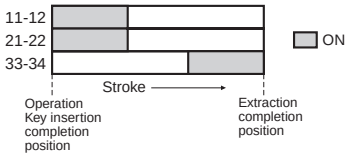
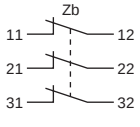
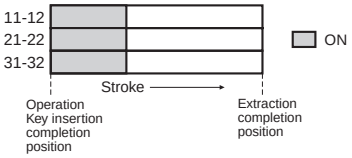
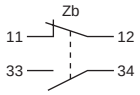
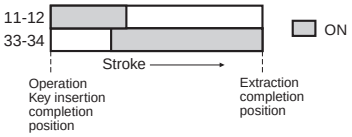
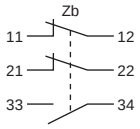
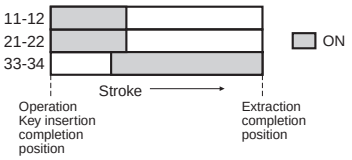
5. Do not pass the 3-A, 250-VAC load through more than 2 circuits.

6. These figures are minimum requirements for safe operation.

7. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

Connections

■ Contact Form (Diagrams Show State with Key Inserted)

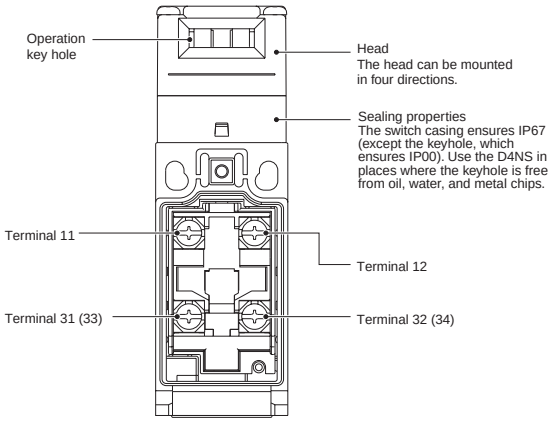
Model	Contact	Contact form	Operating pattern	Remarks
D4NS-□A□	1NC/1NO			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4NS-□B□	2NC			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 31-32 can be used as unlike poles.
D4NS-□C□	2NC/1NO			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 33-34 can be used as unlike poles.
D4NS-□D□	3NC			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 31-32 can be used as unlike poles.
D4NS-□E□	1NC/1NO MBB			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4NS-□F□	2NC/1NO MBB			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22 and 33-34 can be used as unlike poles.

Note: MBB (Make Before Break) contacts have an overlapping structure, so that before the normally closed contact (NC) opens, the normally open contact (NO) closes.

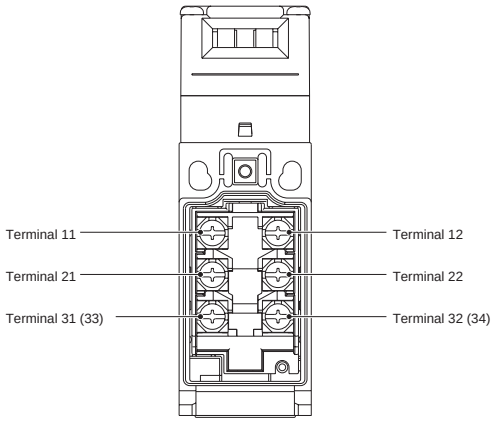
Nomenclature

■ Structure

D4NS-□A□, D4NS-□B□, D4NS-□E□



D4NS-□C□, D4NS-□D□, D4NS-□F□



Note: The 2-conduit models have the same terminal arrangement.

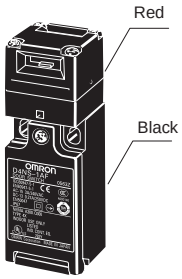
Dimensions

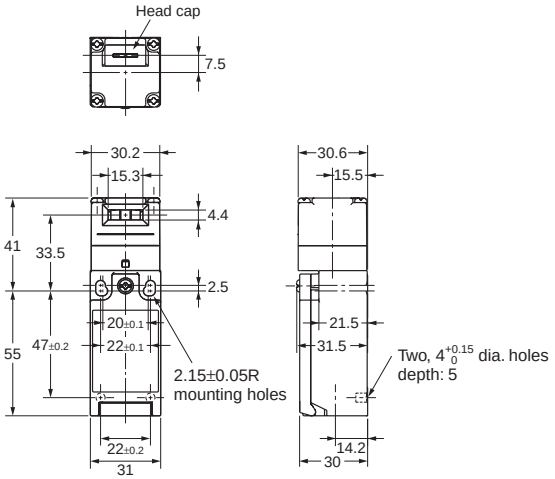
Note: All units are in millimeters unless otherwise indicated.

■ Switches

1-Conduit Models

D4NS-1□F
D4NS-2□F
D4NS-3□F
D4NS-4□F



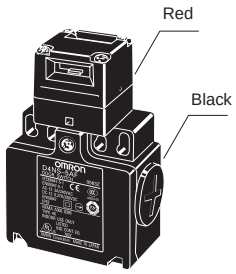


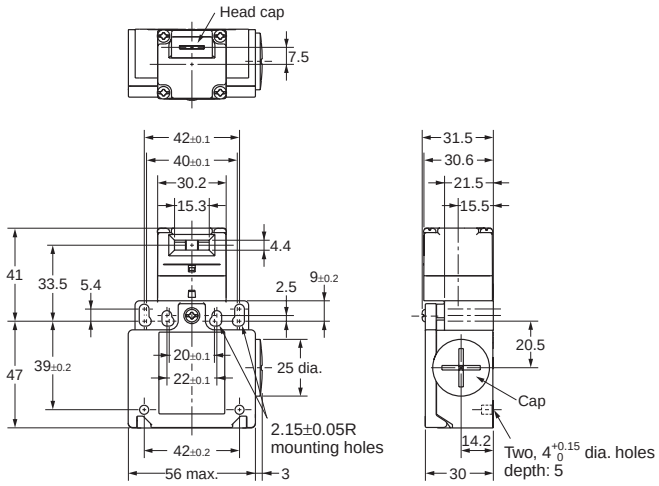
Operating characteristics	D4NS-1□F D4NS-2□F D4NS-3□F D4NS-4□F
Key insertion force Key extraction force	15 N max. 30 N max.
Pretravel (PT)	6±3 mm
Total travel (TT)	(28 mm)
Direct opening force* Direct opening stroke*	60 N min. 10 mm min.

* Always maintain the above operating characteristics for safe use.

2-Conduit Models

D4NS-5□F
D4NS-6□F
D4NS-7□F
D4NS-8□F



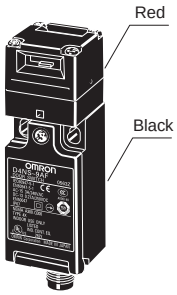


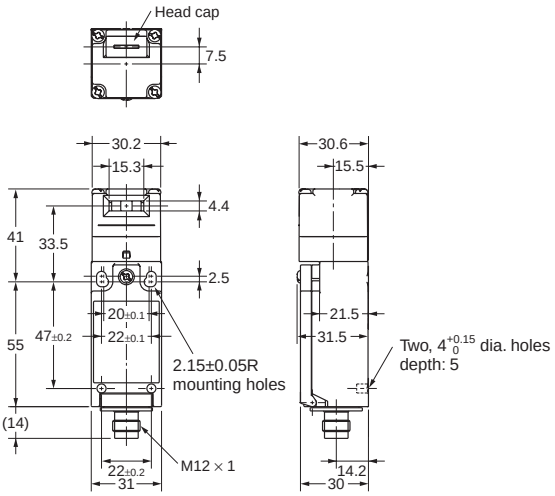
Operating characteristics	D4NS-5□F D4NS-6□F D4NS-7□F D4NS-8□F
Key insertion force Key extraction force	15 N max. 30 N max.
Pretravel (PT)	6±3 mm
Total travel (TT)	(28 mm)
Direct opening force* Direct opening stroke*	60 N min. 10 mm min.

* Always maintain the above operating characteristics for safe use.

1-Conduit Connector Models

D4NS-9□F





Operating characteristics	D4NS-9□F
Key insertion force Key extraction force	15 N max. 30 N max.
Pretravel (PT)	6±3 mm
Total travel (TT)	(28 mm)
Direct opening force* Direct opening stroke*	60 N min. 10 mm min.

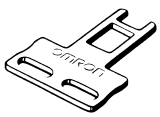
* Always maintain the above operating characteristics for safe use.

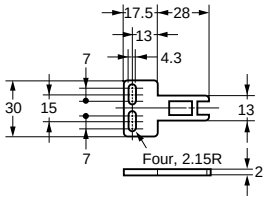
Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. There are fluctuations in the contact ON/OFF timing for Switches with multiple poles (2NC, 2NC/1NO, or 3NC). Confirm performance before application.

■ Operation Keys

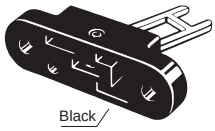
Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

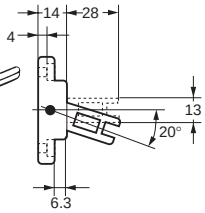
D4DS-K1

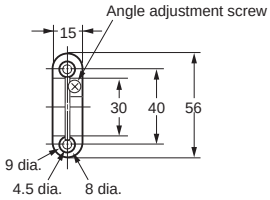




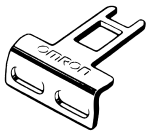
D4DS-K3

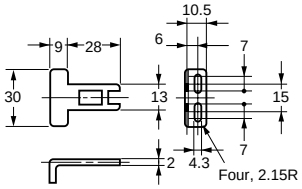




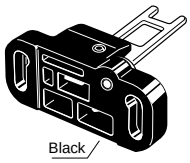


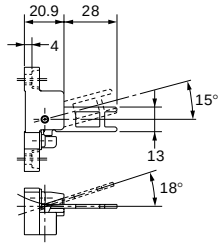
D4DS-K2

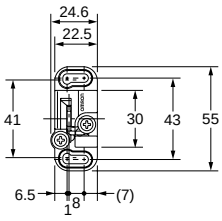




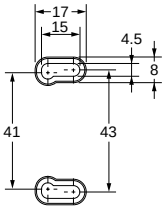
D4DS-K5







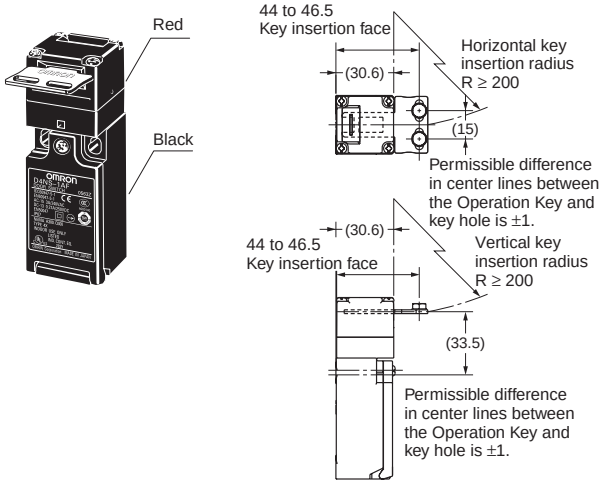
Mounting Holes



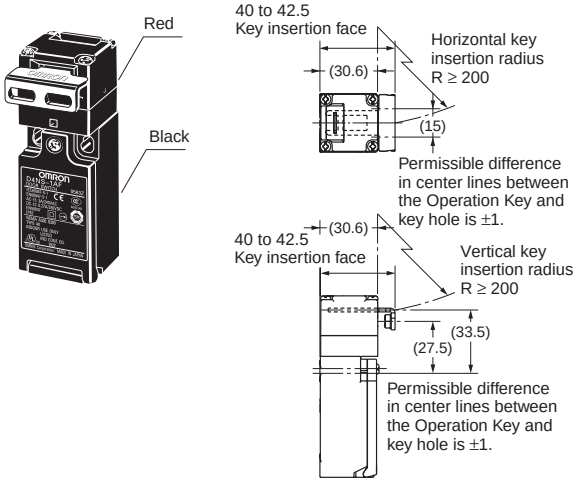
■ With Operation Key Inserted (Relationship between Insertion Radius and Key Hole)

Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

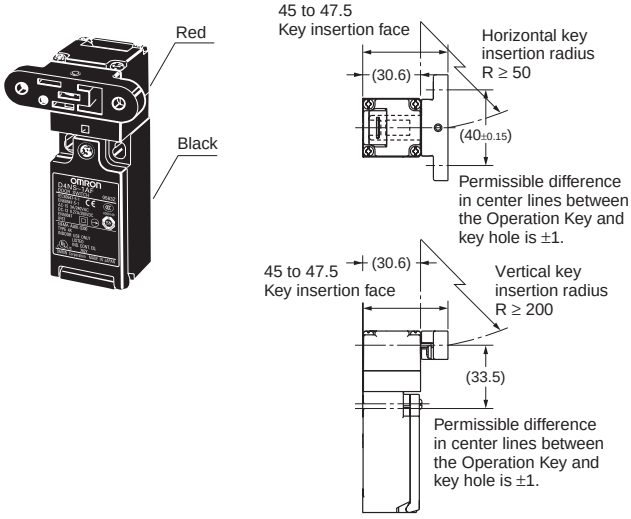
D4NS-1□F + D4DS-K1



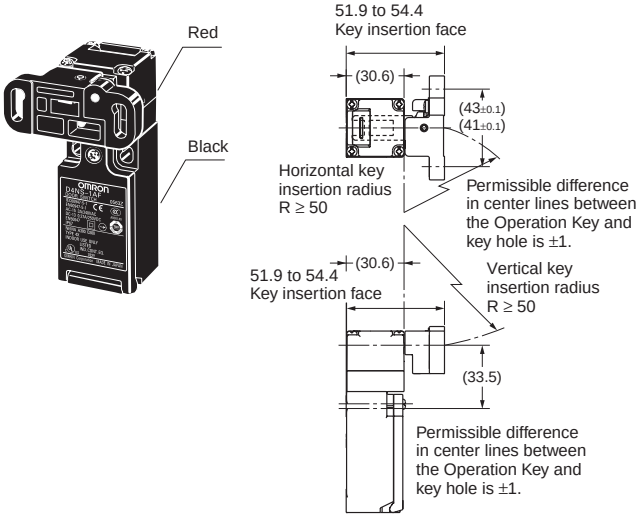
D4NS-1□F + D4DS-K2



D4NS-1□F + D4DS-K3

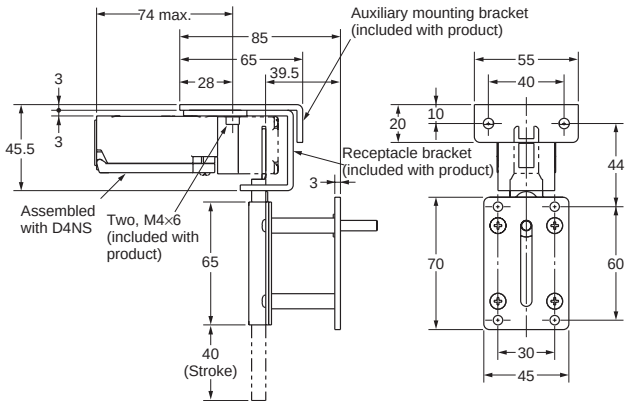


D4NS-1□F + D4DS-K5

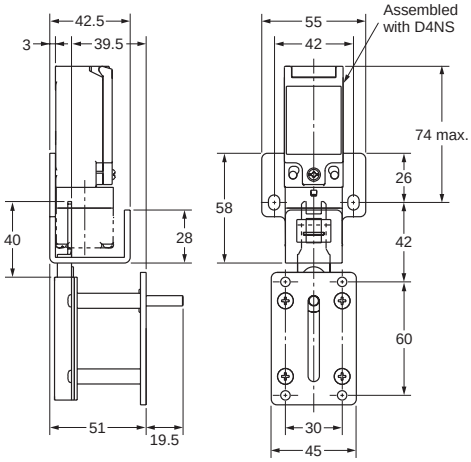


D4NS-1□F + D4NS-SK01

Switch Mounting Pattern 1



Switch Mounting Pattern 2



Safety Precautions

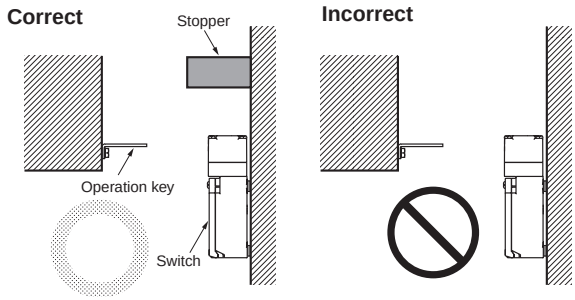
Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

■ Precautions for Safe Use

- Do not use the Switch in locations where explosive or flammable gases may be present.
- Never disassemble or modify your D4NS in any way, or the D4NS will not operate normally.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head.
  Otherwise, accelerated wear or breaking may result.
- Always be sure that the power supply is turned OFF while wiring the Switch.
- Always attach the cover after completing wiring and before using the Switch. Electric shock may occur if the Switch is used without the cover attached.
- Connect a fuse in series with the D4NS to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%. When using the D4NS for an EN rating, use a 10-A fuse of type gI or gG that complies with IEC 60269.
- When switching general loads (250 VAC/3 A), do not operate two circuits or more at the same time. Otherwise, insulation performance may be degraded.

Stopper Installation

Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.



■ Precautions for Correct Use

The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

Operating Environment

- This Switch is designed for use indoors. Using the Switch outdoors may damage it.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch as a result of contact failure or corrosion.
- Do not use the Switch in any of the following locations.
  - Locations subject to extreme temperature changes
  - Locations subject to high humidity or condensation
  - Locations subject to excessive vibration
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door
  - Locations subject to detergents, thinners, or other solvents

Mounting Method

Tightening Torque

Loose screws may result in malfunction. Tighten the screws to the specified torques.

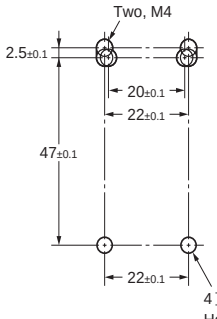
Terminal screw	0.6 to 0.8 N·m
Cover clamping screw	0.5 to 0.7 N·m
Head clamping screw	0.5 to 0.6 N·m
Operation Key clamping screw	2.4 to 2.8 N·m
Body clamping screw	0.5 to 0.7 N·m
Conduit mounting connection and M12 adaptor	1.8 to 2.2 N·m (except 1/2-14NPT)
	1.4 to 1.8 N·m (1/2-14NPT)
Cap screw	1.3 to 1.7 N·m

Mounting Holes

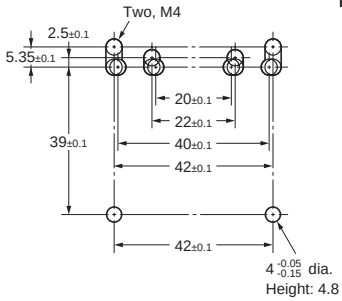
- Use M4 screws and washers to mount the Switch and Operation Key, and tighten the screws to the proper tightening torque. For safety, use screws that cannot be easily removed or a similar means to prevent the Switch and Operation Key from being easily removed.
- As shown below, two studs with a maximum height of 4.8 mm and a diameter of $4^{-0.05}_{-0.15}$ mm can be provided, the studs inserted into the holes on the bottom of the Switch, and the Switch secured at four locations to increase the mounting strength.

Switch Mounting Holes and Studs

- 1-Conduit Modules

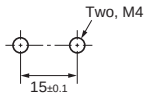


- 2-Conduit Modules

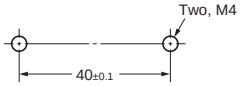


Operation Key Mounting Holes

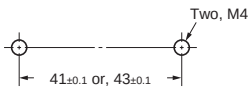
- Horizontal/Vertical Mounting (D4DS-K1/-K2)



- Horizontal Adjustable Mounting (D4DS-K3)



- Horizontal/Vertical Adjustable Mounting (D4DS-K5)



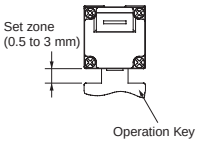
- Use the designated OMRON Operation Key with the Switch. Using another Operation Key may result in Switch damage.
- Set the Operation Key so that it is within 1 mm of the center of the key hole. If the Operation Key is offset or at an angle, accelerated wear or breaking may result.
- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.

Head Direction

- The rotation of the Switch head may be adjusted to any of the four directions by loosening the head clamping screws at the four corners of the head. Make sure that no foreign materials enter through the head.
- When changing the direction of the head, do so while the Operation Key is inserted.

Securing the Door

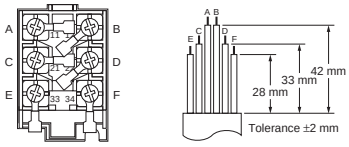
When the door is closed (with the Operation Key inserted), it may be pulled beyond the set zone because of, for example, the door's weight, or the door cushion rubber. Also, if a load is applied to the Operation Key, the door may fail to unlock properly. Use hooks to ensure that the door stays within the set zone.



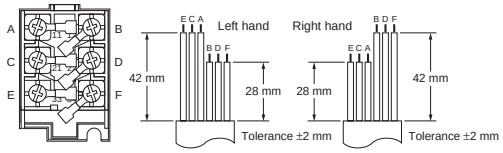
Wiring

- When connecting with insulation tubes and M3.5 crimp terminals, connect the terminals as shown in the following figure and wire without overriding to the case and the cover. Adequate conductor size is AWG 20 to AWG18 (0.5 to 0.75 mm^2).
  Prepare lead wires using the lengths given in the following diagrams. If lead wires are too long, they will press against the cover causing the cover to not close properly.

1-Conduit Models with 3 Poles



2-Conduit Models with 3 Poles

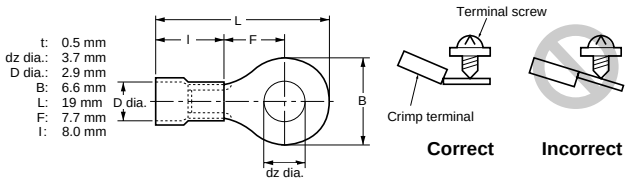


- Do not push the crimp terminal and the likes into the opening between the parts to prevent the case from being broken and deformed.
- Use terminals having the thickness of 0.5 mm or less to avoid the contact between the terminal and the Switch case inside.

  The terminals listed below have thickness of 0.5 mm or less.

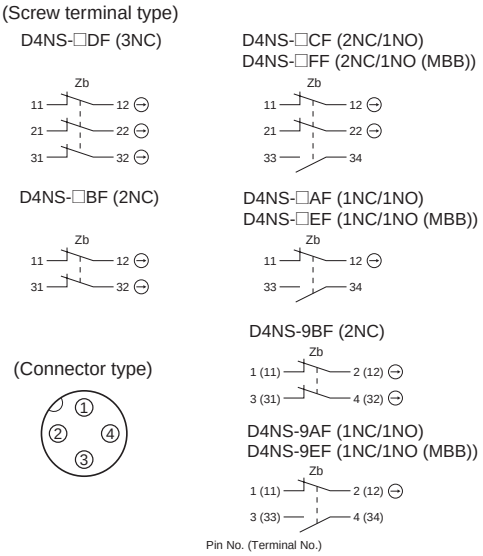
Manufacture	Type
J.S.T. Mfg Co.	FV0.5-3.7 (F type) V0.5-3.7 (straight type)

J.S.T is a Japanese manufacturer.



Contact Arrangement

- The following show a safety contact and an auxiliary contact for 3 contacts and 2 contacts types.



Suitable socket is Type XS2F (OMRON).

- Refer to the Connector Catalog for corresponding Socket pin numbers and lead wire colors.

Socket Tightening (Models with Connectors)

- Turn the tightening screws on the Socket by hand and tighten them until the gap between the Socket and Plug essentially disappears.
- Make sure, however, that the Socket's connector is tightened securely, otherwise the rated degree of protection (IP67) of the D4NS may not be maintained. Furthermore, the Socket connector may be loosened by vibration.

Conduit Opening

- When using 1/2-14NPT conduits, apply sealing tape between the connector and conduit opening to maintain the degree of protection (IP67) of the Switch.
- Use cables with suitable diameters for the connector being used.
- When wiring, place the enclosed cap screw on unused conduit openings (for 2-Conduit Switches) and tighten them to the suitable tightening torque.

Recommended Connectors

Use the connector with thread section of 9 mm long or less. In the case of the connector with longer thread section, protruded part may interfere with the other parts inside the body. Use below listed connector to secure IP67.

Size	Manufacture	Type	Adequate cable diameter
G1/2	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
Pg13.5	LAPP	S-13.5 5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5 5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2 5301-6030	6.0 to 12.0 mm

When use LAPP's products, use together with a Seal Packing which is sold separately (Type names, JPK-16, GP-13.5, GPM20. GPM12 is for M12 connector) and tighten with proper tightening torque.

LAPP is a German manufacturer.

Before using the 2 conduit type 1/2-14NPT connector, attach the appended changing adapter to the Switch, and wind the seal tape about the joint of the adapter and Switch.

When use M12 conduit type, connect the above listed connector, after tightened the M12 changing adaptor to the Switch.

Production Discontinuation

Following the release of the D4NS, production of the D4DS will be discontinued.

Date of Production Discontinuation

Production of the D4DS Series will be discontinued as of the end of March 2006.

Date of Substitute Product Release

Sale of the D4NS Series commenced in July 2003.

Product Replacement

1. Dimensions

   The D4DS and D4NS have basically the same structure, and use the same mounting method, Operation Keys, mounting hole and Operation Key insertion positions. The multi-contact structure and the extra 4 mm in length, however, are different.
2. Terminal Numbers

   For the 2-contact model, the terminals 21, 22, 23, and 24 on the D4DS are 31, 32, 33, and 34 on the D4NS.
3. Recommended Terminals

   If the recommended terminals are not used, the Switch may not be compatible. Make sure that the Switch is compatible with the terminals.

Comparison of the D4DS and Substitute Products

Model	D4NS-□
Switch color	Very similar
Dimensions	Very similar
Wiring/connection	Significantly different
Mounting method	Completely compatible
Ratings/performance	Very similar
Operating characteristics	Very similar
Operating method	Completely compatible

List of Recommended Substitute Products

Switch

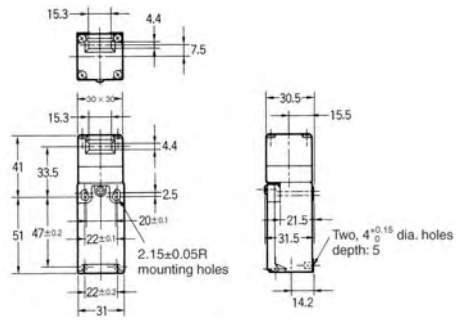
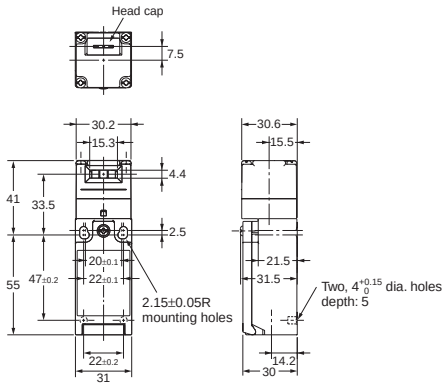
D4DS product	Recommended substitute product
D4DS-15FS	D4NS-1AF
D4DS-25FS	D4NS-2AF
D4DS-35FS	D4NS-3AF
D4DS-55FS	D4NS-5AF
D4DS-65FS	D4NS-6AF
D4DS-1AFS	D4NS-1BF
D4DS-2AFS	D4NS-2BF
D4DS-3AFS	D4NS-3BF
D4DS-5AFS	D4NS-5BF
D4DS-6AFS	D4NS-6BF

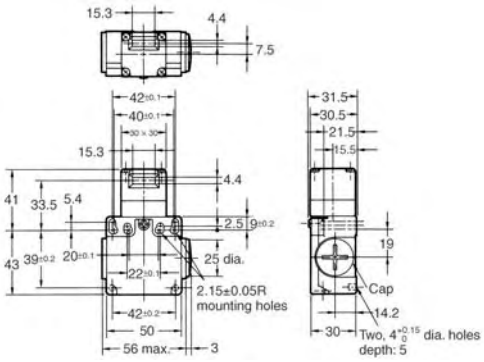
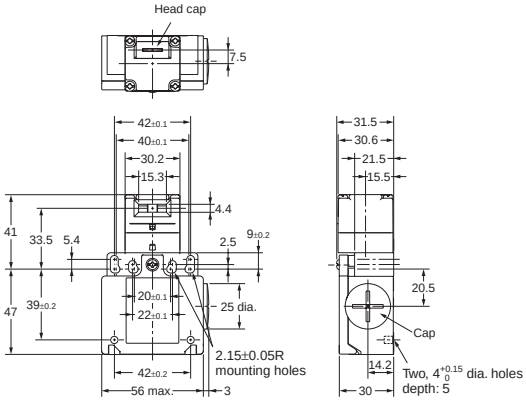
Operation Key

- D4DS-K1
- D4DS-K2
- D4DS-K3
- D4DS-K5

All of the above Operation Keys can be used with the D4NS.

Dimensions (Unit: mm)

Discontinued Models (1-Conduit D4DS)	Replacement Products (1-Conduit D4NS)
	

Discontinued Model (2-Conduit D4DS)	Replacement Products (2-Conduit D4NS)
	

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C128-E1-05 In the interest of product improvement, specifications are subject to change without notice.

Slim Safety Door Switch
D4GS-N

Slim Safety Door Switches with IP67 Rating

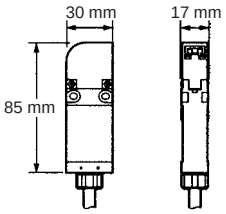
- Slim design with a width of only 17 mm (three-contact models).
- Reversible design allowing either front or rear mounting.
- Built-in Switches with two- or three-terminal contact construction are available.
- Operation Key with rubber mounting hole to absorb vibration and shock.

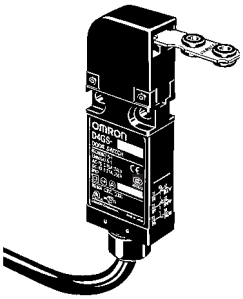
Note: Be sure to read the *"Precautions for All Safety Door Switches"* on page 317.

Features

Slim Safety Door Switches with 3-terminal Contact Construction

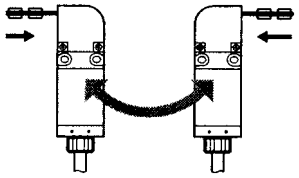
Thin and 1/2 the size as OMRON's previous models.





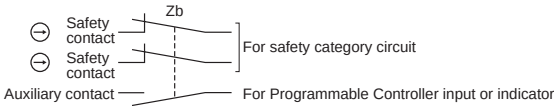
Reversible Design

Front and rear mounting are both possible.



Built-in Switches

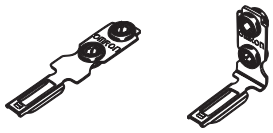
Two- and three-terminal contact models are available.



Note: The safety contacts are direct opening contacts certified by EN and each of them is indicated with the mark ⊖→.

Operation Key

The operation key mounting hole is designed with rubber to absorb vibration and shock.



IP67 Degree of Protection

(Applicable to main body only; Operation Key insertion face meets IP00.)

The D4GS-N uses rust-resistant materials and incorporates a drain opening as effective countermeasures against problems caused by water.

Note: IP67 is based on the test method specified in EN60947-5-1. Be sure to confirm in advance the sealing performance under the actual operating environment and conditions.

Safety Standards

Meeting EN (TÜV) Standards and CE marking requirements along with a variety of international standard requirements, such as UL and CSA requirements. All NC contacts satisfy requirements for the direct opening mechanism.

Model Number Structure

■ Model Number Legend

Switch
D4GS-N□□-□
1 2 3

1. Built-in Switch
1: 1NC/1NO (slow-action)
2: 2NC (slow-action)
3: 2NC/1NO (slow-action)
4: 3NC (slow-action)

2. Direction of Operation Key Insertion
R: Horizontal
T: Vertical

3. Cable Length
Blank: 1 m
3: 3 m
5: 5 m

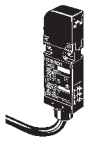
Operation Key
D4GS-NK□
1

1. Operation Key Type
1: Horizontal mounting
2: Vertical mounting
4: Adjustable mounting (Vertical)

Ordering Information

■ List of Models

Switches

Appearance	Direction of Operation Key insertion	Cable length	1NC/1NO (Slow-action)	2NC (Slow-action)	2NC/1NO (Slow-action)	3NC (Slow-action)
	Horizontal	1 m	D4GS-N1R	D4GS-N2R	D4GS-N3R	D4GS-N4R
		3 m	D4GS-N1R-3	D4GS-N2R-3	D4GS-N3R-3	D4GS-N4R-3
		5 m	D4GS-N1R-5	D4GS-N2R-5	D4GS-N3R-5	D4GS-N4R-5
	Vertical	1 m	D4GS-N1T	D4GS-N2T	D4GS-N3T	D4GS-N4T
		3 m	D4GS-N1T-3	D4GS-N2T-3	D4GS-N3T-3	D4GS-N4T-3
		5 m	D4GS-N1T-5	D4GS-N2T-5	D4GS-N3T-5	D4GS-N4T-5

Operation Keys (Order Separately)

Type	Model
Horizontal mounting 	D4GS-NK1
Vertical mounting 	D4GS-NK2
Adjustable mounting (Vertical) 	D4GS-NK4

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN1088
  EN60204-1
  GS-ET-15

■ Certified Standards

Certification body	Standard	File No.
TÜV Rheinland	EN60947-5-1 GS-ET-15	J2051125 (certified direct opening)
UL (see note1.)	UL508 CSA C22.2 No. 14	E76675
CQC (CCC)	GB14048.5	2003010305064262

Note: 1. Certification for CSA C22.2 No. 14 is authorized by the UL mark.

2. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item	AC-15	DC-13
Rated operating current (I_e)	0.75 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC60269 as a short-circuit protection device.

UL/CSA (UL508, CSA C22.2 No. 14)

C300

Rated voltage	Carry current	Current (A)		Voltage (VA)	
		Make	Break	Make	Break
120 VAC	2.5 A	15	1.5	1,800	180
240 VAC		7.5	0.75		

Q300

Rated voltage	Carry current	Current (A)		Voltage (VA)	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55	0.55	69	69
250 VDC		0.27	0.27		

■ Characteristics

Degree of protection (see note 3.)	Body: IP67 (EN60947-5-1) (Operation Key insertion face: IP00)
Durability (see note 4.)	Mechanical: 1,000,000 times min. Electrical: 100,000 times min. (1-A resistive load at 125 VAC) (see note 5.)
Operating speed	0.1 to 0.5 m/s
Contact gap	2 × 2 mm min.
Operating frequency	30 operations/minute
Direct opening force (see note 6.)	60 N min.
Direct opening travel (see note 6.)	10 mm min.
Insulation resistance	100 MΩ min. (at 500 VDC) between terminals of the same polarities, between terminals of different polarities, and between each terminal and non-current carrying metal parts
Minimum applicable load (see note 7.)	4 mA at 24 VDC
Contact resistance	300 mΩ max. (Initial value with 1-m cable)
Dielectric strength	Between terminals of same polarities: Uimp 2.5 kV (EN60947-5-1) Between terminals of different polarities: Uimp 4 kV (EN60947-5-1) Between each terminal and non-current carrying metal parts: Uimp 6 kV (EN60947-5-1)
Conditional short-circuit current	100 A (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Conventional free air thermal current (I_{th})	2.5 A (EN60947-5-1)
Protection against electric shock	Class II (double insulation) (IEC60536)
Vibration resistance	Malfunction: 10 to 55 Hz, 0.35-mm single amplitude
Shock resistance	Malfunction: 300 m/s^2 min.
Ambient temperature	Operating: –30°C to 70°C (with no icing)
Ambient humidity	Operating: 95% max.
Cable	UL2464 No. 22 AWG, finishing O.D.: 7.2 mm
Weight	Approx. 120 g (D4GS-N1R, with 1-m cable)

Note: 1. The above values are initial values.

2. The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

3. The degree of protection shown above is based on the test method specified in EN60947-5-1. Be sure to confirm in advance the sealing performance under the actual operating environment and conditions.
Although the switch box is protected from dust, oil, or water penetration, do not use the D4GS-N in places where dust, oil, water, or chemicals may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.

4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%.

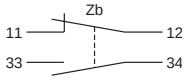
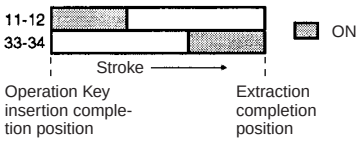
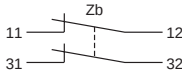
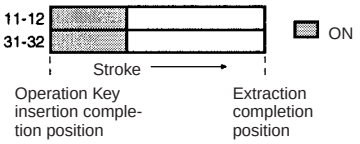
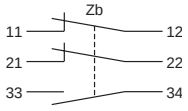
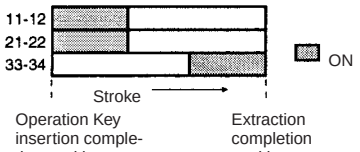
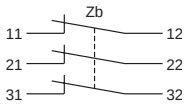
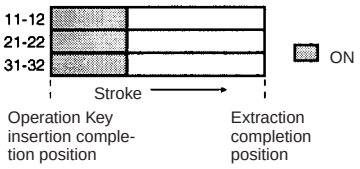
5. When the ambient temperature is 35°C or higher, do not apply 1 A at 125 VAC to more than one circuit.

6. These figures are minimum requirements for safe operation.

7. The value given for minimum applicable load is a reference value for microloads. The value will vary depending on factors such as the switching frequency, the ambient environment, and the reliability level. Be sure to confirm correct operation with the actual load before application.

Connections

■ Contact Form (Diagrams Show State with Key Inserted)

Model	Contact		Operating pattern	Remarks
D4GS-N1□-□	1NC/1NO			Only NC contact 11-12 has a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4GS-N2□-□	2NC			NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 31-32 can be used as unlike poles.
D4GS-N3□-□	2NC/1NO			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22 and 33-34 can be used as unlike poles.
D4GS-N4□-□	3NC			NC contacts 11-12, 21-22 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22 and 31-32 can be used as unlike poles.

Dimensions

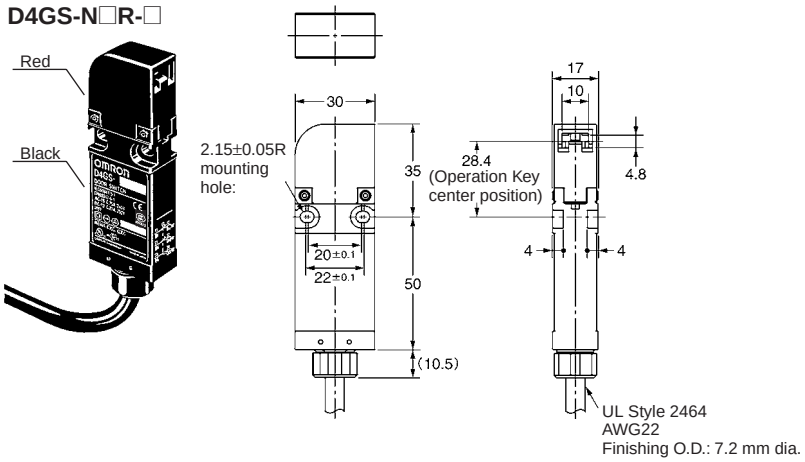
Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions. Dimensions in parentheses are reference values.

3. There are fluctuations in the contact ON/OFF timing for Switches with multiple poles (2NC, 2NC/1NO, or 3NC). Confirm performance before application.

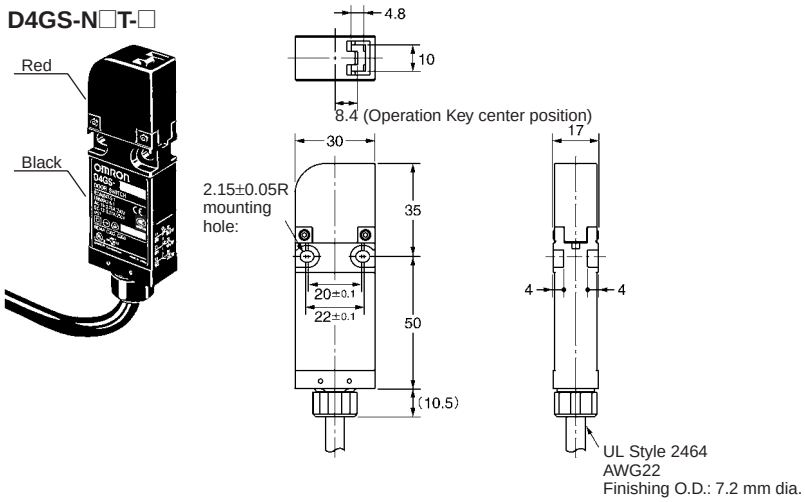
■ Switches

D4GS-N□R-□



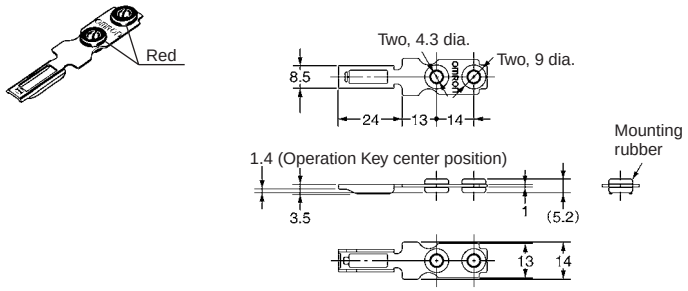
Operating characteristics	Model
Key insertion force	15 N max.
Key extraction force	30 N max.
Pretravel (PT)	0.8±3 mm
Movement before being locked	(22 mm) min.
Direct opening force	60 N min.
Direct opening stroke	10 mm min.

D4GS-N□T-□

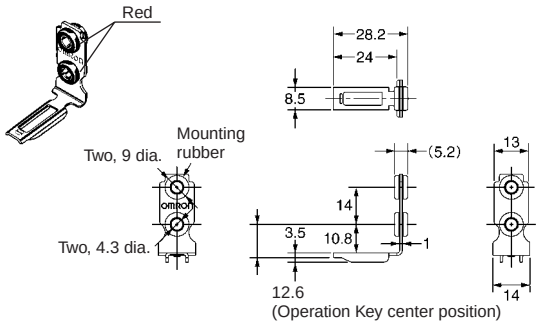


■ Operation Keys

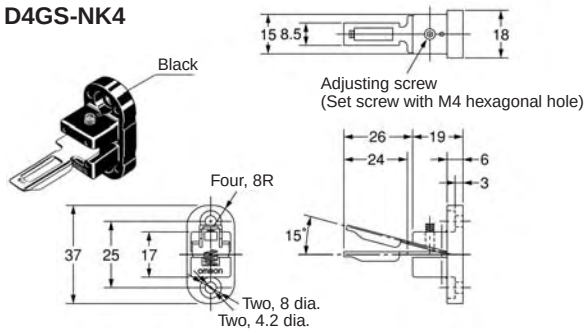
D4GS-NK1



D4GS-NK2

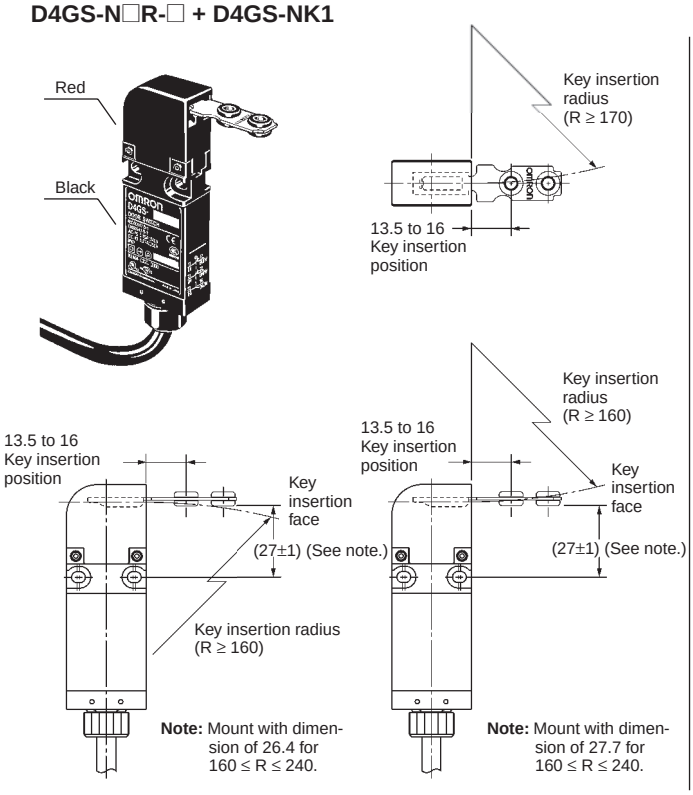


D4GS-NK4

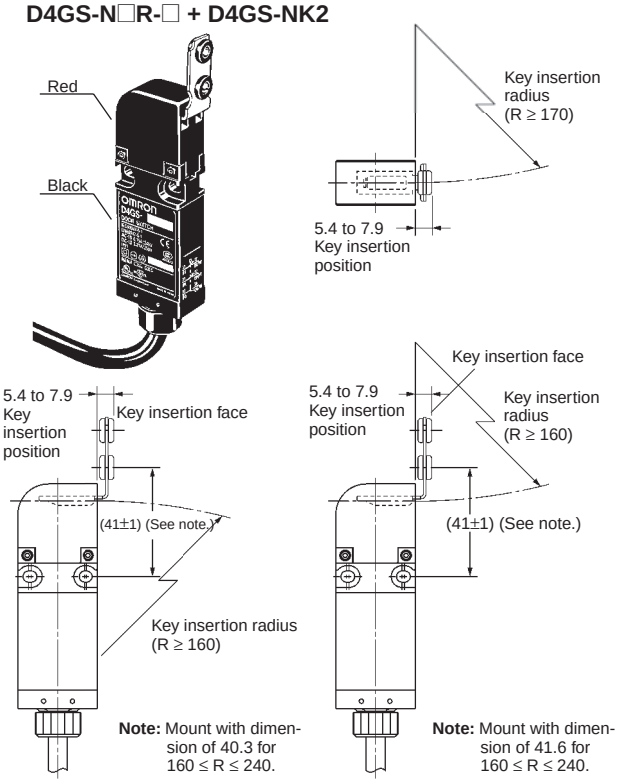


■ With Operation Key Inserted

D4GS-N□R-□ + D4GS-NK1



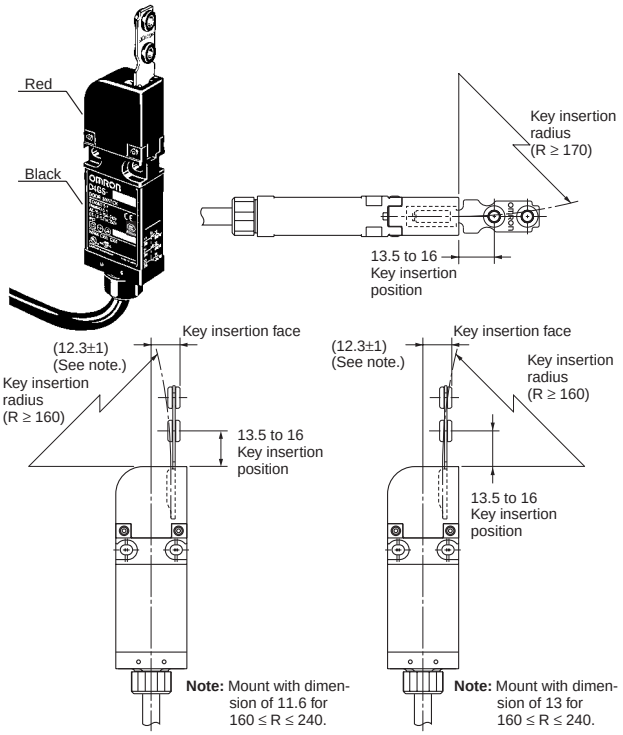
D4GS-N□R-□ + D4GS-NK2



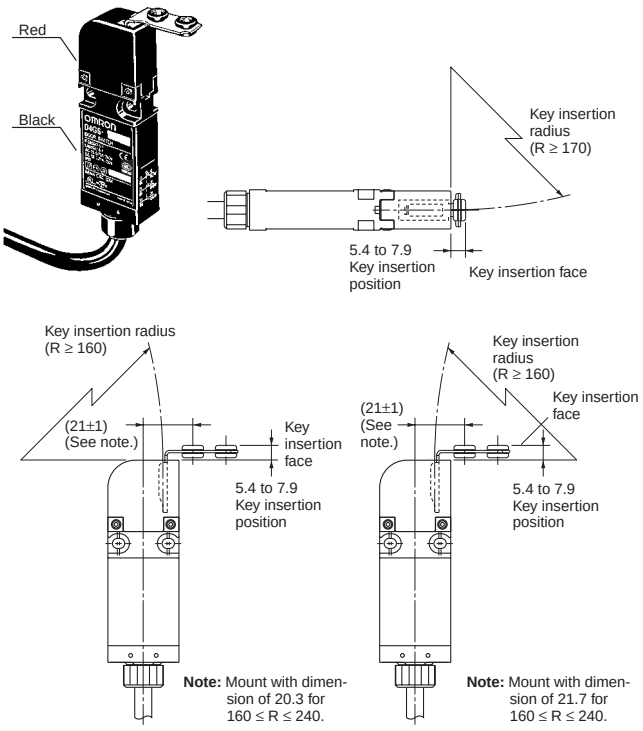
Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions. Dimensions in parentheses are reference values.

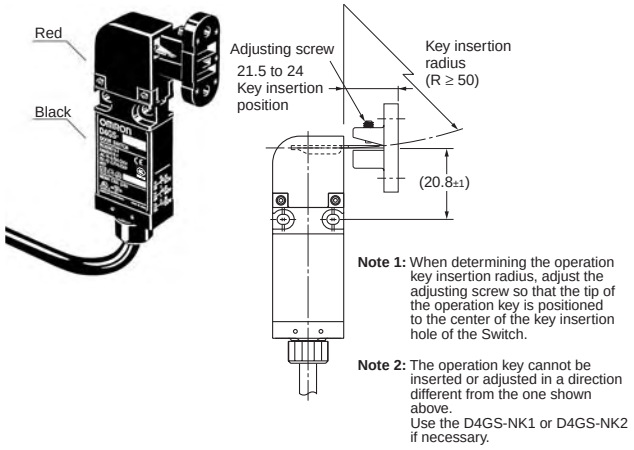
D4GS-N□T-□ + D4GS-NK1



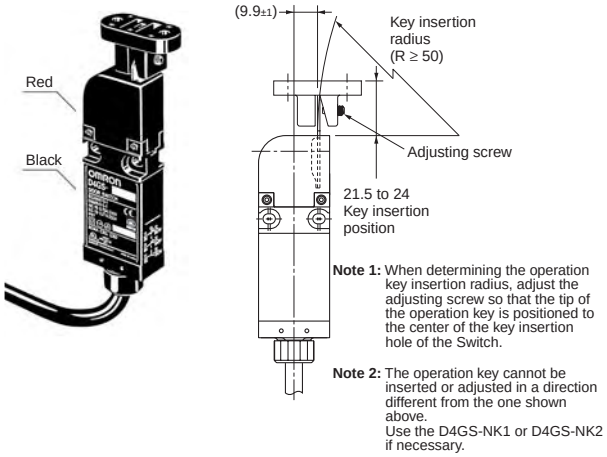
D4GS-N□T-□ + D4GS-NK2



D4GS-N□R-□ + D4GS-NK4



D4GS-N□T-□ + D4GS-NK4



Note: 1. All units are in millimeters unless otherwise indicated.

2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions. Dimensions in parentheses are reference values.

Safety Precautions

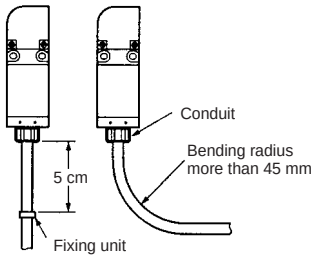
Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

■ Precautions for Safe Use

- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the Switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head.
  Otherwise, accelerated wear or breaking may result.
- When switching general loads (125VAC/1A), do not operate two circuits or more at the same time. Otherwise, insulation performance may be degraded.
- Do not use the D4GS-N□ Switch or D4GS-NK□ Operation Key (rubber color: red) in combination with the D4GS-□ Switch or D4GS-K□ Operation Key (rubber color: black).
- Be sure to evaluate the D4GS-N under actual working conditions after installation.
- Do not drop the D4GS-N. Excessive shock or vibration can cause malfunction or damage to Switch characteristics. Do not disassemble the internal switch, there are no user-serviceable parts inside.

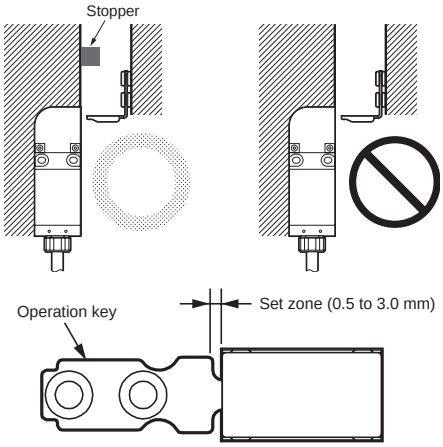
Handling Cables

Cables should not be bent repeatedly.
A cable is fixed with sealing materials on the bottom of the D4GS-N. When excessive force may be imposed on the cable, fix the cable with a fixing unit at the distance of 5 cm from the bottom of the D4GS-N as shown.
When bending the cable, secure the cable with more than 45-mm bending radius so as not to cause damage to the insulator or sheath of the cable.
Do not fasten or loosen the conduit at the bottom of the D4GS-N.
When wiring, be sure not to allow a liquid such as water or oil into the tip of cable.



Stopper Installation

Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.



■ Precautions for Correct Use

The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

Life Expectancy

The life of the D4GS-N will vary with the switching conditions. Before applying the D4GS-N, test the D4GS-N under actual operating conditions and be sure to use the D4GS-N in actual operation within switching times that will not lower the performance of the D4GS-N.

Mounting Methods

Tightening Torque

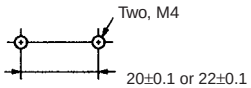
Loose screws may result in malfunction. Tighten the screws to the specified torques.

Type	Torque	Size
Body mounting screw	0.75 to 1.15 N·m	M4 screw
Operation Key mounting screw	0.75 to 1.15 N·m	M4 screw

Note: Use the specified sizes of mounting screws flat or spring washers to mount the Switch and Operation Key, and tighten the screws to the proper tightening torque. For safety, use screws that cannot be easily removed or a similar means to prevent the Switch and Operation Key from being easily removed.

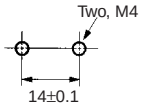
Mounting

Mounting hole dimensions for mounting the main body are as shown below.

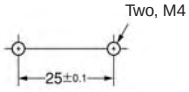


Operation Key Mounting Holes

D4GS-NK1/NK2

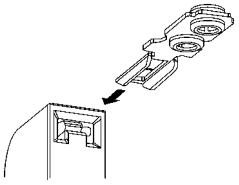


D4GS-NK4



Operation Key

As shown below, mount the Operation Key after matching the concave surface of the Operation Key with the convex surface of the insertion face.



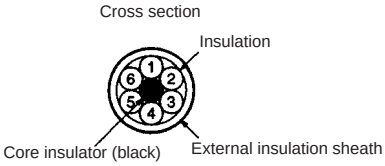
Depending on the conditions in which the Switch is used, the rubber of the Operation Key may deteriorate. If the rubber becomes deformed or cracked, replace it as soon as possible.

Be sure to adjust the position correctly when mounting the Operation Key and the Switch to ensure that the Operation Key does not miss the insertion face and exert an excessive force on the Switch head.

Wiring

Identifying Wires

Identify wires according to the color (with or without white lines) of the insulation on the wire.



Wire Colors

No.	Color of insulation	No.	Color of insulation
1	Blue/white	4	Orange
2	Brown/white	5	Brown
3	Orange/white	6	Blue

Note: "Blue/white, brown/white, or orange/white" means that the cover is blue, brown, or orange with a white line.

Terminal Numbers

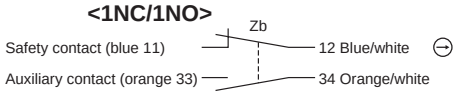
Identify terminal numbers based on the color of the insulation on the wire.

The safety and auxiliary contacts of D4GS-N models of three-terminal contact construction and those of two-terminal contact construction are described below.

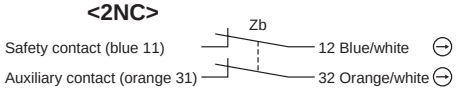
The auxiliary contacts (orange) can be used as safety contacts.

The safety contacts are direct opening contacts certified by EN and each of them is indicated with the mark ⊖.

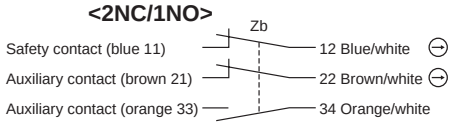
<1NC/1NO>



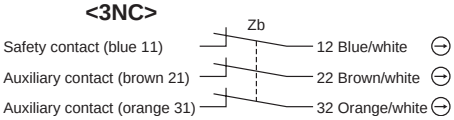
<2NC>



<2NC/1NO>



<3NC>



Cut the black core insulator and all unused wires at the end of the external insulation sheath when wiring the cable.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C120-E1-07 In the interest of product improvement, specifications are subject to change without notice.

Safety-door Switch
D4BS

The Special Operation Key Activates a Direct Opening Mechanism to Open the Contacts and Shut Off Control Circuits when Protective Doors Are Opened on Machine Tools or Other Equipment

- Conforms to EN (TÜV) standards corresponding to the CE marking.
- Certified by UL, CSA, BIA, and SUVA standards.
- The Switch contact is opened by a direct opening mechanism (NC contacts only) when the protective cover is opened. The EN-certified direct opening mechanism is indicated by ⊖ on the Switch.
- Malfunctions and false operation prevented by special Operation Key.
- Wide temperature range specifications: –40 to 80°C.
- Degree of protection of the switch box: IP67 (EN60947-5-1).
- Series includes models with gold-plated contacts for handling the microload range.

Note: Be sure to read the *"Precautions for All Safety Door Switches"* on page 317.

Model Number Structure

■ Model Number Legend

Switch

D4BS - □ □ □ S
1 2 3

1. Conduit
1: PG13.5 (1 conduit)
2: G1/2 (1 conduit)
3: 1/2-14NPT (1 conduit)
5: PG13.5 (3-conduit)
6: G1/2 (3-conduit)
7: 1/2-14NPT (3-conduit)

2. Built-in Switch
5: 1NC/1NO (slow-action)
6: 1NC/NO (slow-action), gold-plated contacts
A: 2NC (slow-action)
B: 2NC (slow-action), gold-plated contacts

3. Head Mounting Direction
F: Four mounting directions possible (front-side mounting at shipping)

Operation Key

D4BS - K □
1

1. Operation Key Type
1: Horizontal mounting
2: Vertical mounting
3: Adjustable mounting (Horizontal)

Note: Do not order the head and Switch separately. (The Operation Key, however, must be ordered separately.)

Ordering Information

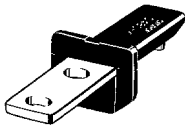
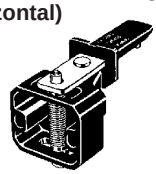
■ List of Models

Switches (Operation Keys are sold separately.)

: Models with certified direct opening contacts.

Type	Mounting direction		Conduit size	1NC/1NO (Slow-action)	2NC (Slow-action)
1-conduit	Front-side mounting		Pg13.5	D4BS-15FS	D4BS-1AFS
			G1/2	D4BS-25FS	D4BS-2AFS
			1/2–14NPT	D4BS-35FS	D4BS-3AFS
3-conduit			Pg13.5	D4BS-55FS	D4BS-5AFS
			G1/2	D4BS-65FS	D4BS-6AFS
			1/2–14NPT	D4BS-75FS	D4BS-7AFS

Operation Keys (Order Separately)

Type	Model
Horizontal mounting 	D4BS-K1
Vertical mounting 	D4BS-K2
Adjustable mounting (Horizontal) 	D4BS-K3

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN50041
  EN1088

■ Certified Standards

Certification body	Standard	File No.
TÜV Rheinland	EN60947-5-1	R9351022 (certified direct opening)
UL	UL508	E76675
CSA	CSA C22.2 No. 14	LR45746
BIA	GS-ET-15	9303323
SUVA	SUVA	E6187.d
CQC (CCC)	GB14048.5	2003010305073833

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Utilization category	AC-15
Rated operating current (I_e)	2 A
Rated operating voltage (U_e)	400 V

Note: Use a 10-A fuse type a gI or gG that conforms to IEC60269 as a short-circuit protection device.

UL/CSA (UL508, CSA C22.2 No. 14)

A600

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		
480 VAC		15 A	1.5 A		
600 VAC		12 A	1.2 A		

■ Characteristics

Degree of protection (see note 2)	IP67 (EN60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)
Durability (see note 3)	Mechanical: 1,000,000 operations min. Electrical: 500,000 operations min. (10 A at 250 VAC, resistive load)
Operating speed	0.1 m/s to 0.5 m/s
Operating frequency	30 operations/min max.
Rated frequency	50/60 Hz
Contact gap	2 x 2 mm min.
Direct opening force (see note 4)	19.61 N min. (EN60947-5-1)
Direct opening travel (see note 4)	20 mm min. (EN60947-5-1)
Full stroke	23 mm min.
Insulation resistance	100 MΩ min. (at 500 VDC) between terminals of same or different polarity, between each terminal and ground, and between each terminal and non-current-carrying metal part
Contact resistance	25 mΩ max. (initial value)
Rated insulation voltage (U_i)	600 V (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	20 A (EN60947-5-1)
Dielectric strength (U_{imp})	Impulse dielectric strength (U_{imp}) 4 kV (EN60947-5-1) between terminals of same or different polarity, between current-carrying metal parts and ground, and between each terminal and non-current-carrying metal part
Switching overvoltage	1,500 V max. (EN60947-5-1)
Conditional short-circuit current	100 A (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Insulation class	Class I (with ground terminal)
Vibration resistance	Malfunction: 10 to 500 Hz, 0.65-mm single amplitude
Shock resistance	Destruction: 1,000 m/s^2 min. (IEC68-2-27) Malfunction: 300 m/s^2 min. (IEC68-2-27)
Ambient temperature	Operating: –40°C to 80°C (with no icing)
Ambient humidity	Operating: 95% max.
Weight	Approx. 285 g (in the case of D4BS-15FS)

Note: 1. The above values are initial values.

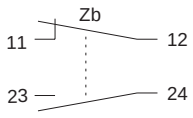
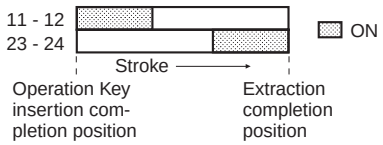
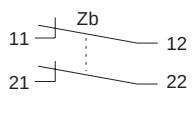
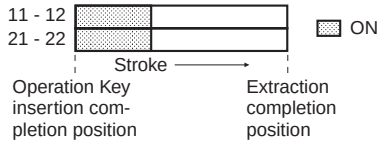
2. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust, oil, or water penetration, do not use the D4BS in places where dust, oil, water, or chemicals may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.

3. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. Contact your OMRON sales representative for more detailed information on other operating environments.

4. These figures are minimum requirements for safe operation.

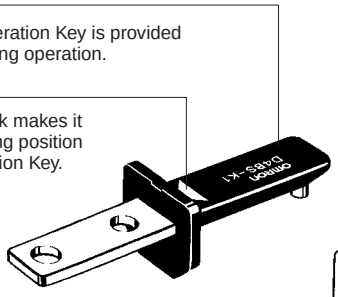
Connections

■ Contact Form (Diagrams Show State with Key Inserted)

Model	Contact form		Operating pattern	Remarks
D4BS-□5□S	**1NC/1NO**			Only NC contact 11-12 has a certified direct opening mechanism. ⊖ Terminals 11-12 and 23-24 can be used as unlike poles.
D4BS-□A□S	**2NC**			NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ Terminals 11-12 and 21-22 can be used as unlike poles.

Note: The terminal numbers are in accordance with EN50013, and the contact symbols are in accordance with IEC60947-5-1.

Nomenclature



Operation Key
D4BS's exclusive-use Operation Key is provided to assure accurate switching operation.

Set Zone Mark
A triangular Set Zone Mark makes it easy to adjust the operating position when inserting the Operation Key.

Head
The switch head is coated with easy-to-see red paint. The mounting direction of the switch head can be varied to any of the four directions.

Seal Ring (NBR)

Oil Seal (NBR)
The operation plunger employs an oil seal, with which the switch box meets the requirements of IP67 (the sealing capability of the Operation Key's insertion mouth is IP00).

Built-in Switch
A shearing force contact separating mechanism (NC contact) is employed, which positively pulls apart the contacts from each other by using shearing force if any abnormality such as contact welding should occur in the contact area.

There is a difference in level between the NC and NO terminal, which assures easy wiring.

Seal Packing (NBR)

Conduit Opening

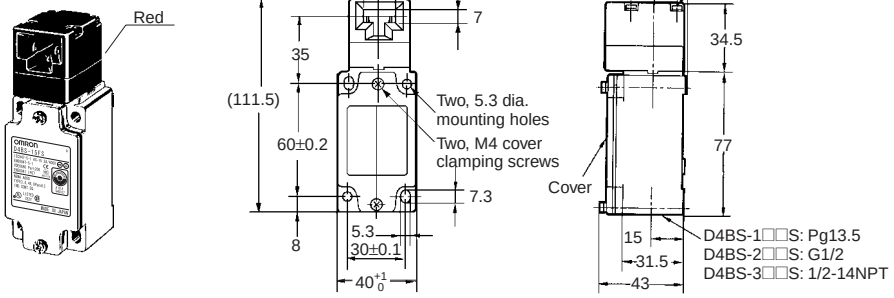
Box Size	1-conduit box	3-conduit box
Pg13.5	Yes	Yes
G1/2	Yes	Yes
1/2-14NPT	Yes	Yes

Ground Terminal Screw
A ground terminal is provided to improve safety. (Built into the Unit.)

Dimensions

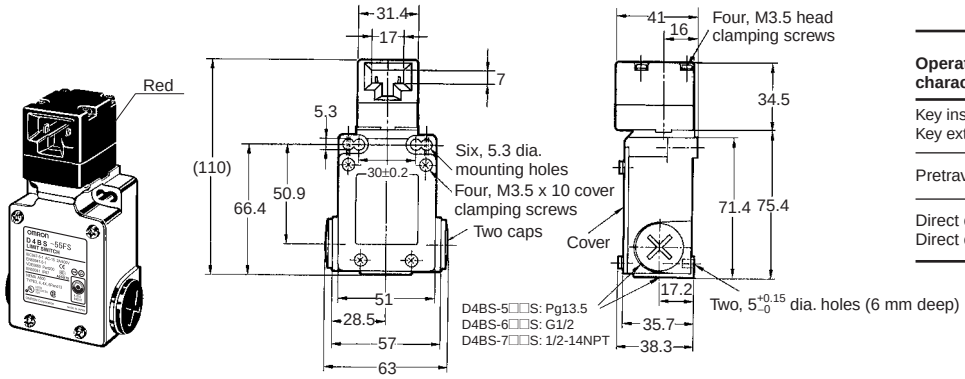
Switches

1-conduit
D4BS-1□□S
D4BS-2□□S
D4BS-3□□S



Operating characteristics	D4BS-1□□S D4BS-2□□S D4BS-3□□S
Key insertion force Key extraction force	19.61 N max. 19.61 N max.
Pretravel (PT)	10±5 mm
Direct opening force Direct opening stroke	19.61 N min. 20 mm min.

3-conduit
D4BS-5□□S
D4BS-6□□S
D4BS-7□□S



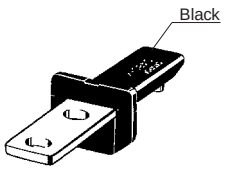
Operating characteristics	D4BS-5□□S D4BS-6□□S D4BS-7□□S
Key insertion force Key extraction force	19.61 N max. 19.61 N max.
Pretravel (PT)	10±5 mm
Direct opening force Direct opening stroke	19.61 N min. 20 mm min.

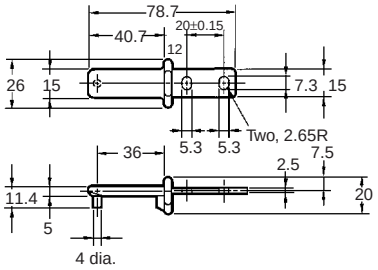
Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
3. There are fluctuations in the contact ON/OFF timing for 2NC contacts. Confirm performance before application.
4. The conduit thread varies with the model as follows:

Conduit thread	Model
Pg 13.5	D4BS-1□□S, D4BS-5□□S
G1/2	D4BS-2□□S, D4BS-6□□S
1/2-14NPT	D4BS-3□□S, D4BS-7□□S

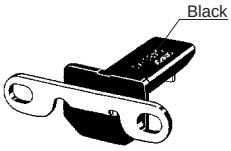
Operation Keys

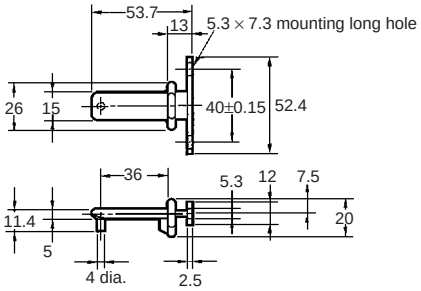
D4BS-K1



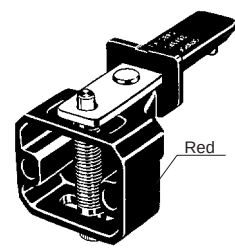


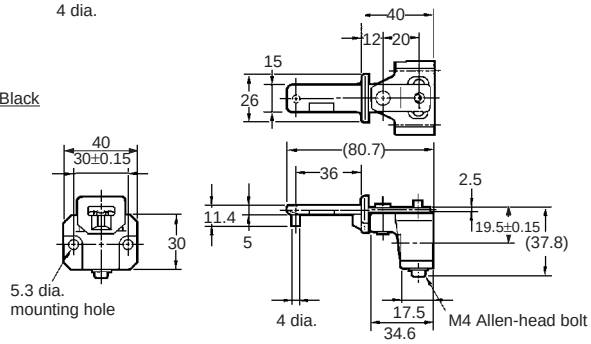
D4BS-K2





D4BS-K3

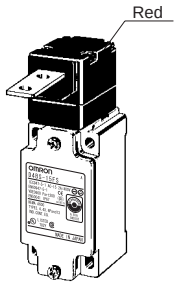


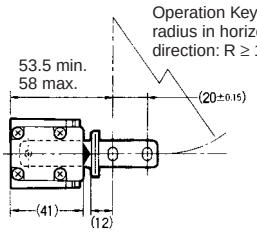


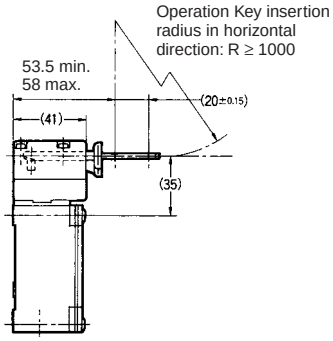
With Operation Key Inserted

Horizontal Mounting

D4BS-1□□S +D4BS-K1
D4BS-2□□S +D4BS-K1
D4BS-3□□S +D4BS-K1

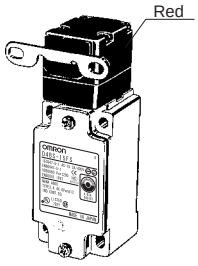


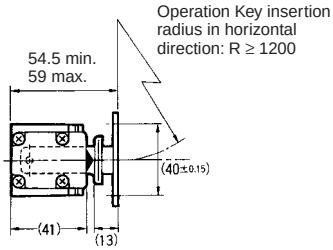


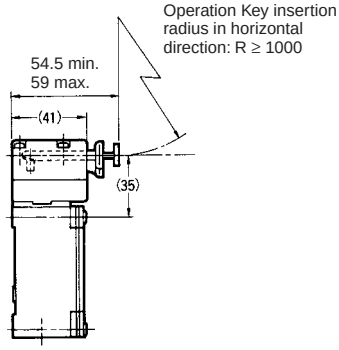


Vertical Mounting

D4BS-1□□S +D4BS-K2
D4BS-2□□S +D4BS-K2
D4BS-3□□S +D4BS-K2

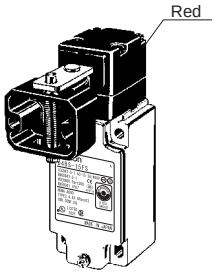


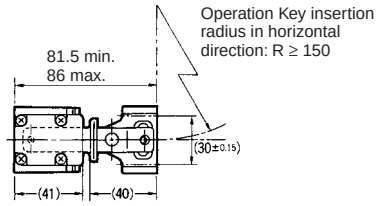


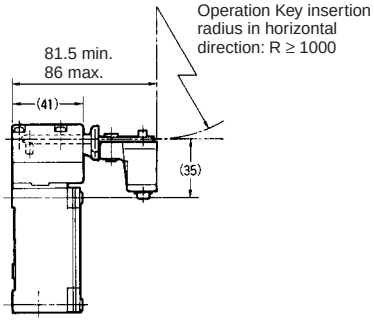


Adjustable Mounting (Horizontal)

D4BS-1□□S +D4BS-K3
D4BS-2□□S +D4BS-K3
D4BS-3□□S +D4BS-K3







Note: "R" is the Operation Key insertion radius.

Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

■ Precautions for Safe Use

- Do not use the Switch in locations where explosive or flammable gases may be present.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the Switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head.
  Otherwise, accelerated wear or breaking may result.
- Always attach the cover after completing wiring and before using the Switch. Electric shock may occur if the Switch is used without the cover attached.

■ Precautions for Correct Use

Operating Environment

- This Switch is designed for use indoors. Using the Switch outdoors may damage it.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch as a result of contact failure or corrosion.
- Do not use the Switch in any of the following locations.
  - Locations subject to extreme temperature changes
  - Locations subject to high humidity or condensation
  - Locations subject to excessive vibration
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door
  - Locations subject to detergents, thinners, or other solvents

Tightening Torque

Loose screws may result in malfunction. Tighten the screws to the specified torques.

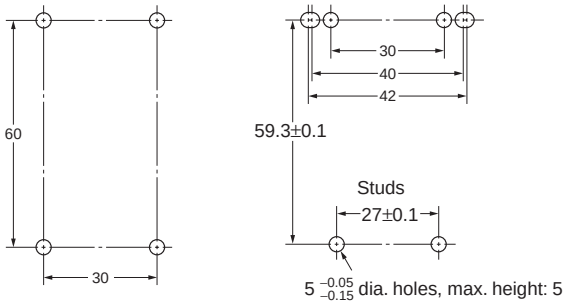
Type	Torque
M3.5 terminal screw (including ground terminal screw)	0.59 to 0.78 N·m
Cover mounting screw (See note 1.)	1.18 to 1.37 N·m
Head mounting screw	0.78 to 0.98 N·m
M5 body mounting screw (See note 2.)	4.90 to 5.88 N·m
Operation Key mounting screw	2.35 to 2.75 N·m
Connector	1.77 to 2.16 N·m
Cap screw	1.27 to 1.67 N·m

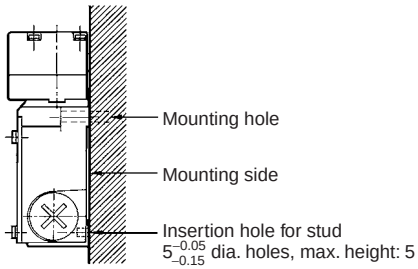
Note: 1. Apply a torque of 0.78 to 0.88 N·m if the D4BS is a three-conduit model.

2. Apply a torque of 4.90 to 5.88 N·m for an Allen-head bolt. For a pan head screw, apply a torque of 2.35 to 2.75 N·m.

Mounting Dimensions (M5)

Standard Model **Three-conduit Model**

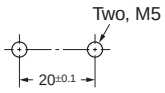




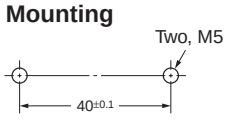
The D4BS can be mounted more securely by adding two studs, each of which is 5 mm maximum in height and $5^{-0.05}_{-0.15}$ mm in diameter as shown below.

Operation Key Mounting Dimensions

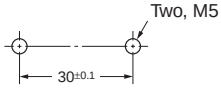
Horizontal Mounting



Vertical Mounting



Adjustable Mounting (Horizontal)

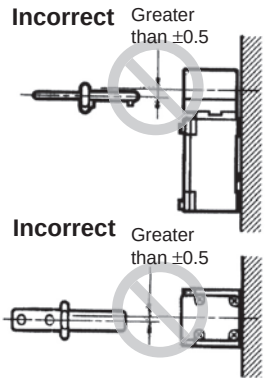


For safety, use screws that cannot be easily removed or a similar means to prevent the Switch and Operation Key from being easily removed.

Operation Key

Make sure that the Operation Key can be inserted properly with a tolerance of ±0.5 mm in the upward, downward, left, or right direction, otherwise the D4BS may soon become damaged.

Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.

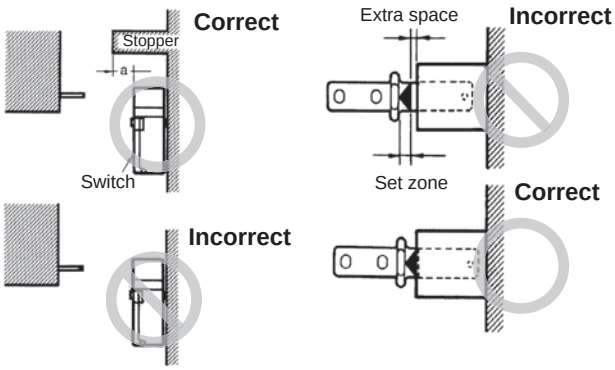


Changes in Head Mounting Direction

By removing the screws on the four corners of the head, the head can be reset in any of four directions. The head direction can be changed with or without the Operation Key inserted in the head. Make sure that no foreign materials enter through the head and that the head is tightened securely within the proper torque range.

Stopper Installation

Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.

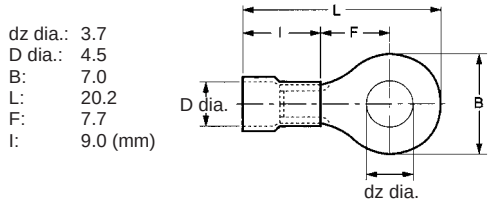


Refer to *Dimensions* for the mounting dimensions of the Operation Key and mount the Operation Key correctly. The Operation Key will soon become damaged or worn out if it is not mounted correctly.

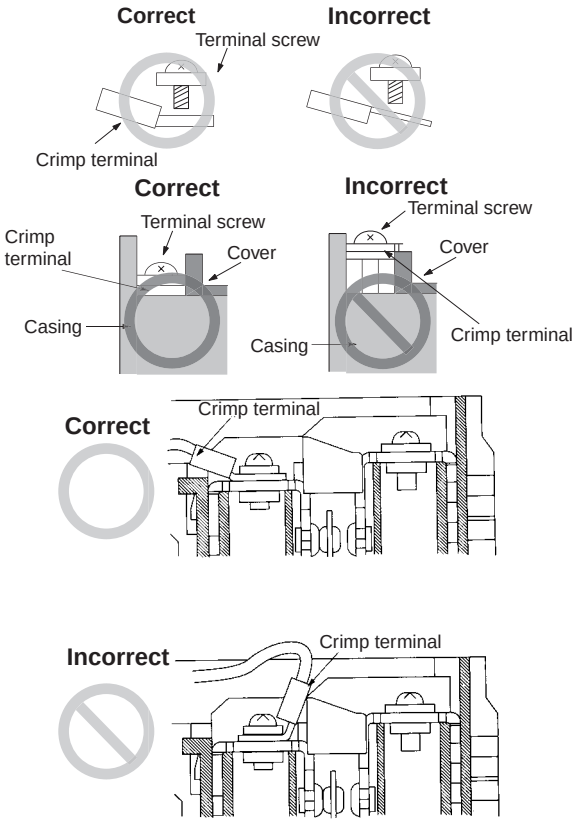
Wiring

Do not connect the lead wires directly to the terminals. Connect the lead wires through insulation tubes and M3.5 crimp terminals. Tighten each terminal screw within the proper torque range.

The proper lead wire is AWG20 to AWG14 (0.5 to 2.5 mm^2) in size.



Wire using the methods shown below so that the crimp terminals are not caught on the case or cover. Otherwise it may not be possible to mount the cover completely and malfunctions may occur.



Conduit Opening

Tighten the connector to a suitable torque. Excessive tightening torque may damage the casing.

When using 1/2-14NPT conduits, apply sealing tape between the connector and conduit opening to maintain the degree of protection (IP67) of the Switch. If using a Pg13.5 conduit, use an ABS-08 Pg13.5 connector or an ABS-12 Pg13.5 connector (manufactured by Nippon Flex).

Use a connector (SC Series, sold separately) suitable for the outer diameter of the cable.

When wiring a 3-conduit model, securely tighten the cap screw provided for unused conduit openings.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C094-E1-08

In the interest of product improvement, specifications are subject to change without notice.

Guard Lock Safety-door Switch
D4GL

Vertically Mounting Guard Lock Safety-door Switch Ideal for Limited Installation Space

- Selectable Operation Key insertion direction.
- Slim safety-door switch with an electromagnetic lock or unlock mechanism.
- Built-in switches with multiple-contact construction are available.
- A key holding force of 1,000 N minimum.
- Can be used for either standard loads or microloads.
- Lineup includes models with a conduit size of M20.

Note: Be sure to read the *"Safety Precautions"* on page 361 and the *"Precautions for All Safety Door Switches"* on page 317.

Model Number Structure

■ Model Number Legend

Switch

D4GL-□□□□-□□
1 2 3 4 5 6

1. **Conduit Size**
   - 1: Pg13.5
   - 2: G1/2
   - 4: M20
2. **Built-in Switch (with Door Open/Closed Detection Switch and Lock Monitor Switch Contacts)**
   - A: 1NC/1NO slow-action contacts plus 1NC/1NO slow-action contacts
   - B: 1NC/1NO slow-action contacts plus 2NC slow-action contacts
   - C: 2NC slow-action contacts plus 1NC/1NO slow-action contacts
   - D: 2NC slow-action contacts plus 2NC slow-action contacts
   - E: 2NC/1NO slow-action contacts plus 1NC/1NO slow-action contacts
   - F: 2NC/1NO slow-action contacts plus 2NC slow-action contacts
   - G: 3NC slow-action contacts plus 1NC/1NO slow-action contacts
   - H: 3NC slow-action contacts plus 2NC slow-action contacts
3. **Head Mounting Direction and Material**
   - F: Four mounting directions possible (Front-side mounting at time of delivery)/plastic
4. **Door Lock and Release**
   - A: Mechanical lock/24-VDC solenoid release
   - G: 24-VDC solenoid lock/mechanical release
5. **Indicator**
   - B: 24 VDC (orange/green LED indicator)
6. **Release Key Type**
   - Blank: Standard release key
   - 4: Special release key

Operation Key

D4DS-K□
1

1. **Operation Key Type**
   - 1: Horizontal mounting
   - 2: Vertical mounting
   - 3: Adjustable mounting (horizontal)
   - 5: Adjustable mounting (horizontal/vertical)

Ordering Information

■ List of Models

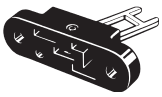
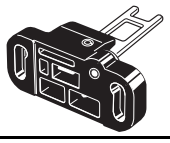
Switches (Operation Keys are sold separately.)

: Models with certified direct opening contacts.

Head material	Release key type	Solenoid voltage/ indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts) (slow-action) Certified direct opening NC contact	Conduit size	Model
Plastic	Standard	Solenoid: 24 VDC Orange/green LED: 24 VDC	Mechanical lock Solenoid release	1NC/1NO+1NC/1NO	Pg13.5	D4GL-1AFA-A
					G1/2	D4GL-2AFA-A
					M20	D4GL-4AFA-A
				1NC/1NO+2NC	Pg13.5	D4GL-1BFA-A
					G1/2	D4GL-2BFA-A
					M20	D4GL-4BFA-A
				2NC+1NC/1NO	Pg13.5	D4GL-1CFA-A
					G1/2	D4GL-2CFA-A
					M20	D4GL-4CFA-A
				2NC+2NC	Pg13.5	D4GL-1DFA-A
					G1/2	D4GL-2DFA-A
					M20	D4GL-4DFA-A
				2NC/1NO+1NC/1NO	Pg13.5	D4GL-1EFA-A
					G1/2	D4GL-2EFA-A
					M20	D4GL-4EFA-A
				2NC/1NO+2NC	Pg13.5	D4GL-1FFA-A
					G1/2	D4GL-2FFA-A
					M20	D4GL-4FFA-A
				3NC+1NC/1NO	Pg13.5	D4GL-1GFA-A
					G1/2	D4GL-2GFA-A
					M20	D4GL-4GFA-A
				3NC+2NC	Pg13.5	D4GL-1HFA-A
					G1/2	D4GL-2HFA-A
					M20	D4GL-4HFA-A
			Solenoid lock Mechanical release	1NC/1NO+1NC/1NO	Pg13.5	D4GL-1AFG-A
					G1/2	D4GL-2AFG-A
					M20	D4GL-4AFG-A
				1NC/1NO+2NC	Pg13.5	D4GL-1BFG-A
					G1/2	D4GL-2BFG-A
					M20	D4GL-4BFG-A
				2NC+1NC/1NO	Pg13.5	D4GL-1CFG-A
					G1/2	D4GL-2CFG-A
					M20	D4GL-4CFG-A
				2NC+2NC	Pg13.5	D4GL-1DFG-A
					G1/2	D4GL-2DFG-A
					M20	D4GL-4DFG-A
				2NC/1NO+1NC/1NO	Pg13.5	D4GL-1EFG-A
					G1/2	D4GL-2EFG-A
					M20	D4GL-4EFG-A
				2NC/1NO+2NC	Pg13.5	D4GL-1FFG-A
					G1/2	D4GL-2FFG-A
					M20	D4GL-4FFG-A
				3NC+1NC/1NO	Pg13.5	D4GL-1GFG-A
					G1/2	D4GL-2GFG-A
					M20	D4GL-4GFG-A
				3NC+2NC	Pg13.5	D4GL-1HFG-A
					G1/2	D4GL-2HFG-A
					M20	D4GL-4HFG-A

Head material	Release key type	Solenoid voltage/ indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts) (slow-action) Certified direct opening NC contact	Conduit size	Model
Plastic	Special release key	Solenoid: 24 VDC Orange/green LED: 24 VDC	Mechanical lock Solenoid release	1NC/1NO+1NC/1NO	Pg13.5	D4GL-1AFA-A4
					G1/2	D4GL-2AFA-A4
					M20	D4GL-4AFA-A4
				1NC/1NO+2NC	Pg13.5	D4GL-1BFA-A4
					G1/2	D4GL-2BFA-A4
					M20	D4GL-4BFA-A4
				2NC+1NC/1NO	Pg13.5	D4GL-1CFA-A4
					G1/2	D4GL-2CFA-A4
					M20	D4GL-4CFA-A4
				2NC+2NC	Pg13.5	D4GL-1DFA-A4
					G1/2	D4GL-2DFA-A4
					M20	D4GL-4DFA-A4
				2NC/1NO+1NC/1NO	Pg13.5	D4GL-1EFA-A4
					G1/2	D4GL-2EFA-A4
					M20	D4GL-4EFA-A4
				2NC/1NO+2NC	Pg13.5	D4GL-1FFA-A4
					G1/2	D4GL-2FFA-A4
					M20	D4GL-4FFA-A4
				3NC+1NC/1NO	Pg13.5	D4GL-1GFA-A4
					G1/2	D4GL-2GFA-A4
					M20	D4GL-4GFA-A4
				3NC+2NC	Pg13.5	D4GL-1HFA-A4
					G1/2	D4GL-2HFA-A4
					M20	D4GL-4HFA-A4
			Solenoid lock Mechanical release	1NC/1NO+1NC/1NO	Pg13.5	D4GL-1AFG-A4
					G1/2	D4GL-2AFG-A4
					M20	D4GL-4AFG-A4
				1NC/1NO+2NC	Pg13.5	D4GL-1BFG-A4
					G1/2	D4GL-2BFG-A4
					M20	D4GL-4BFG-A4
				2NC+1NC/1NO	Pg13.5	D4GL-1CFG-A4
					G1/2	D4GL-2CFG-A4
					M20	D4GL-4CFG-A4
				2NC+2NC	Pg13.5	D4GL-1DFG-A4
					G1/2	D4GL-2DFG-A4
					M20	D4GL-4DFG-A4
				2NC/1NO+1NC/1NO	Pg13.5	D4GL-1EFG-A4
					G1/2	D4GL-2EFG-A4
					M20	D4GL-4EFG-A4
				2NC/1NO+2NC	Pg13.5	D4GL-1FFG-A4
					G1/2	D4GL-2FFG-A4
					M20	D4GL-4FFG-A4
				3NC+1NC/1NO	Pg13.5	D4GL-1GFG-A4
					G1/2	D4GL-2GFG-A4
					M20	D4GL-4GFG-A4
				3NC+2NC	Pg13.5	D4GL-1HFG-A4
					G1/2	D4GL-2HFG-A4
					M20	D4GL-4HFG-A4

Operation Keys (Order Separately)

Type	Model
Horizontal mounting 	D4DS-K1
Vertical mounting 	D4DS-K2
Adjustable mounting (Horizontal) 	D4DS-K3
Adjustable mounting (Horizontal/Vertical) 	D4DS-K5

Specifications

■ Standards and EC Directives

- Machinery Directive
- Low Voltage Directive
- EN1088
- EN60204-1
- GS-ET-19

■ Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN60947-5-1 (certified direct opening)	(See note 1.)
UL (See note 2.)	UL508, CSA C22.2 No.14	E76675
CQC (CCC)	GB14048.5	2003010305064264

Note: 1. Consult your OMRON representative for details.
2. Certification for CSA C22.2 No. 14 is authorized by the UL mark.
3. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item / Utilization category	AC-15	DC-13
Rated operating current (I_e)	0.75 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC60269 as a short-circuit protection device.

UL/CSA (UL508, CSA C22.2 No. 14)

C300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	2.5 A	15 A	1.5 A	1,800 VA	180 VA
240 VAC		7.5 A	0.75 A		

Q300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VAC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VAC		0.27 A	0.27 A		

Solenoid Coil Characteristics

Item	24 VDC
Rated operating voltage (100% ED)	24 VDC ±10%
Current consumption	Approx. 200 mA
Insulation	Class F (130°C max.)

Indicator Characteristics

Item	LED
Rated voltage	24 VDC
Current leakage	Approx. 3 mA
Color (LED)	Orange/Green

■ Characteristics

Degree of protection (See note 3.)		IP67 (EN60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)	
Durability (See note 4.)	**Mechanical**	1,000,000 operations min.	
	Electrical	500,000 operations min. for a resistive load of 4 mA at 24 VDC; 150,000 operations min. for a resistive load of 1 A at 125 VAC in 2 circuits and 4 mA at 24 VDC in 2 circuits (See note 5.)	
Operating speed		0.05 to 0.5 m/s	
Operating frequency		30 operations/minute max.	
Rated frequency		50/60 Hz	
Contact gap		2 x 2 mm min.	
Direct opening force (See note 6.)		60 N min. (EN60947-5-1)	
Direct opening travel (See note 6.)		10 mm min. (EN60947-5-1)	
Holding force (See note 7.)		1,000 N min.	
Insulation resistance		100 MΩ min. (at 500 VDC)	
Minimum applicable load (See note 8.)		Resistive load of 4 mA at 24 VDC (N-level reference value)	
Rated insulation voltage (U_i)		300 V (EN60947-5-1)	
Conventional enclosed thermal current (I_{the})		2.5 A (EN60947-5-1)	
Impulse withstand voltage (EN60947-5-1)		Between terminals of the same polarity	2.5 kV
		Between terminals of different polarities	4 kV
		Between solenoid and uncharged metallic parts	0.8 kV
		Between other terminals and uncharged metallic parts and between other terminals and ground	4 kV
Conditional short-circuit current		100 A (EN60947-5-1)	
Pollution degree (operating environment)		3 (EN60947-5-1)	
Protection against electric shock		Class II (double insulation)	
Closed-circuit counterelectromotive force		1,500 V max. (EN60947-5-1)	
Contact resistance		100 mΩ max. (initial value)	
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude	
Shock resistance	**Destruction**	1,000 m/s^2 min.	
	Malfunction	300 m/s^2 min.	
Ambient temperature		Operating: –10°C to 55°C with no icing	
Ambient humidity		Operating: 95% max.	
Weight		Approx. 400 g (D4GL-1AFA-A)	

Note: 1. The above values are initial values.

2. The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4GL in places where foreign material may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.

4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.

5. If the ambient temperature is greater than 35°C, do not pass the 1-A, 125-VAC load through more than 2 circuits.

6. These figures are minimum requirements for safe operation.

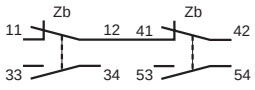
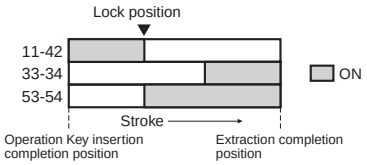
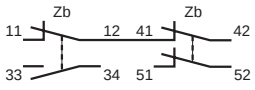
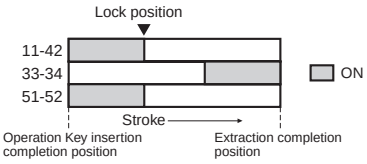
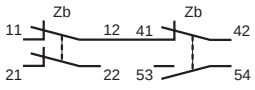
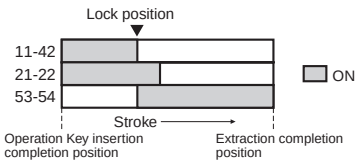
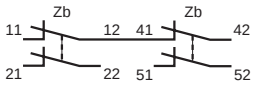
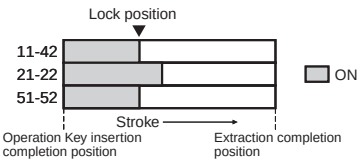
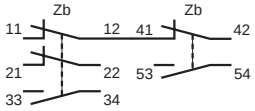
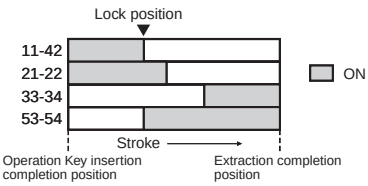
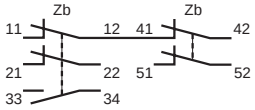
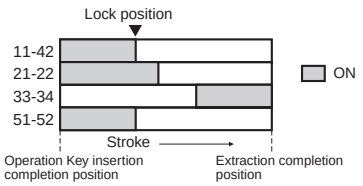
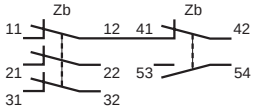
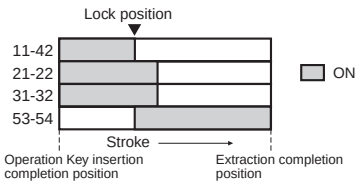
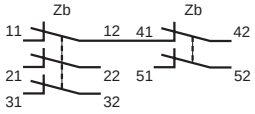
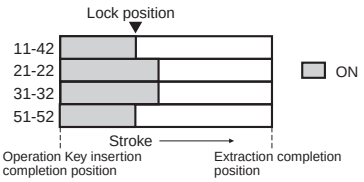
7. This figure is based on the GS-ET-19 evaluation method.

8. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

Connections

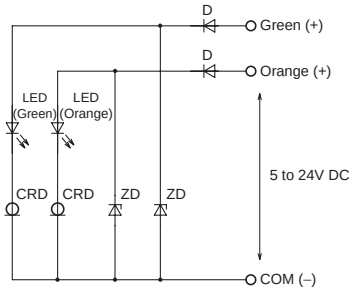
■ Contact Form

Indicates conditions where the Key is inserted and the lock is applied. Terminals 12 and 41 are connected internally (as per BIA GS-ET-19).

Model	Contact	Contact form (door open/closed detection switch and lock monitor switch contacts)	Operating pattern	Remarks
D4GL-□AF□-□	1NC/1NO + 1NC/1NO			Only NC contact 11-12 has a certified direct opening mechanism. ⊖ The terminals 11-42, 33-34, and 53-54 can be used as unlike poles.
D4GL-□BF□-□	1NC/1NO + 2NC			Only NC contact 11-12, has a certified direct opening mechanism. ⊖ The terminals 11-42, 33-34, and 51-52 can be used as unlike poles.
D4GL-□CF□-□	2NC + 1NC/1NO			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, and 53-54 can be used as unlike poles.
D4GL-□DF□-□	2NC + 2NC			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, and 51-52 can be used as unlike poles.
D4GL-□EF□-□	2NC/1NO + 1NC/1NO			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 33-34, and 53-54 can be used as unlike poles.
D4GL-□FF□-□	2NC/1NO + 2NC			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 33-34, and 51-52 can be used as unlike poles.
D4GL-□GF□-□	3NC + 1NC/1NO			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 31-32, and 53-54 can be used as unlike poles.
D4GL-□HF□-□	3NC + 2NC			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 31-32, and 51-52 can be used as unlike poles.

■ Indicator

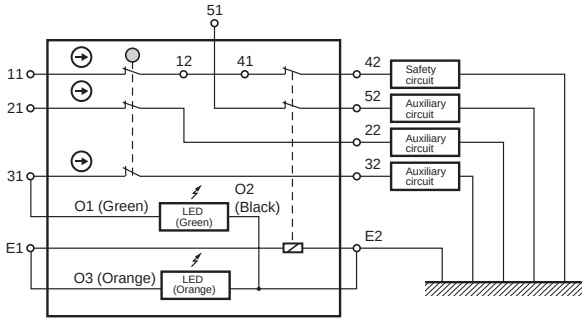
Internal Circuit Diagram



■ Circuit Connection Example

- Terminals 12 and 41 are connected internally and so connect terminals 11 and 42 for safety-circuit input. (BIA GS-ET-19)
- Connect terminals 21 and 22 and terminals 51 and 52 in series when using as safety-circuit input (redundancy circuit for terminals 11 and 12 and terminals 41 and 42 above). Connect the terminals individually when using as auxiliary-circuit input (e.g., terminals 21 and 22 for safety-door open/closed monitoring and terminals 51 and 52 for monitoring the lock status).
- In the following connection example, terminals 21 and 22 and terminals 51 and 52 are used as auxiliary-circuit input.

Connection Example for D4GL-1HFA-A



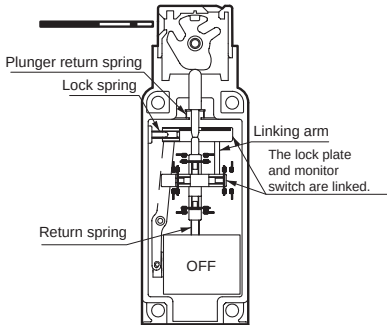
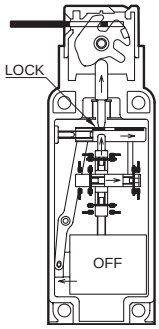
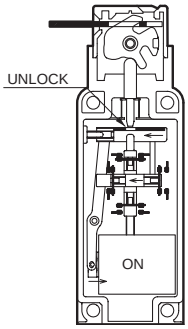
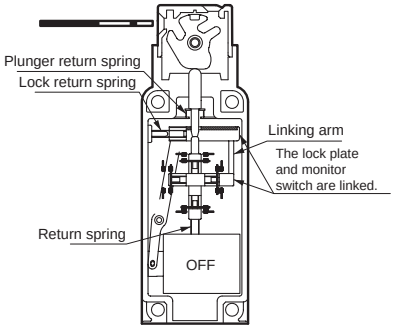
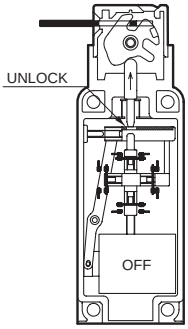
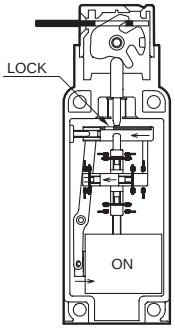
- Direct opening contacts used as safety-circuit input are indicated with the ⊖ mark. Terminals 11 and 12 and terminals 21 and 22 are direct opening contacts.
- Connect the indicators in parallel to the auxiliary circuits or terminals E1 and E2.
- Although the 3 lines are connected at the time of delivery, rewire them as necessary for the application.
- The following table shows the connection configuration required to make the green indicator light when the door is closed and the orange indicator light when the solenoid turns ON.

Indicator	Terminal number	Lead wire color	Connected terminal number
Green indicator	O1	Green	31
Orange indicator	O2	Orange	E1
Common	O3	Black	E2

- If an indicator is connected in parallel to a direct opening contact, when the indicator breaks, a short-circuit current will be generated, possibly resulting in an installation malfunction.
- Do not switch standard loads for more than 2 circuits at the same time. Otherwise, the level of insulation may decrease.
- The solenoid has polarity. Be sure to connect terminals with the correct polarity.

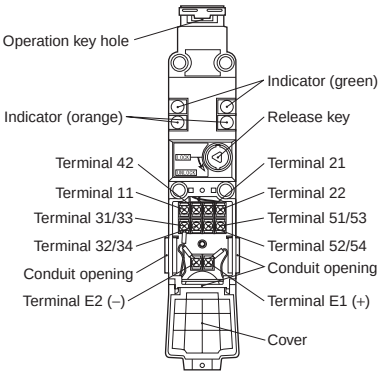
Operation Method

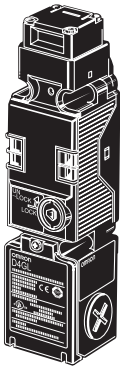
■ Operation Principles

Mechanical lock models		 When the door is closed, it is locked by the lock spring. The door will stay locked even if there is a power interruption.	 The solenoid is released only when the lock is turned ON.
Solenoid lock models		 If the solenoid is OFF, the door will not be locked when it is closed. This means that the door can be opened and closed easily when replacing workpieces or parts.	 The door is locked only when the solenoid is turned ON. This means that the door will be unlocked if there is a power interruption and so this model cannot be used in systems that would maintain a hazardous state (e.g., systems requiring toxic gases, high temperatures, or gears that would continue to turn due to inertia).

Nomenclature

■ Structure





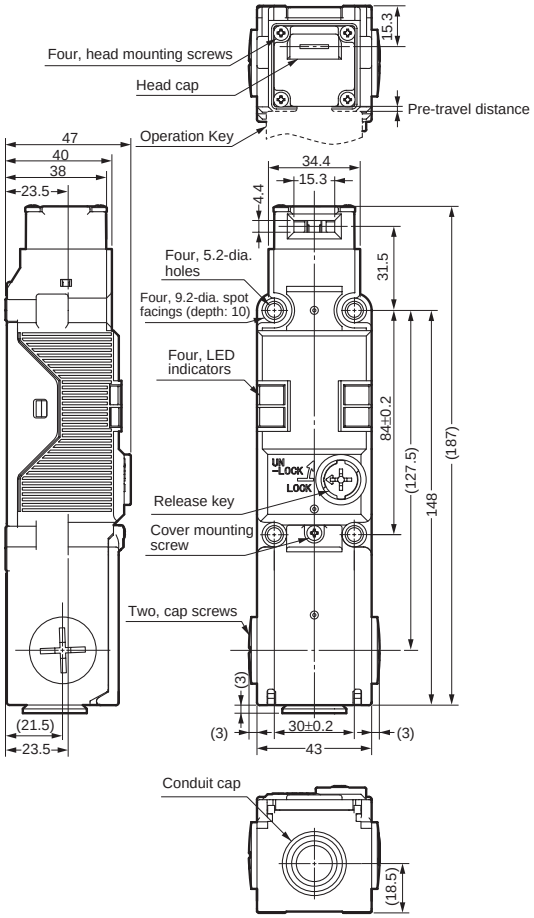
Note: Terminal numbers vary with the model. Confirm terminal numbers by referring to the cover on the back of the Switch.

Dimensions

Note: All units are in millimeters unless otherwise indicated.

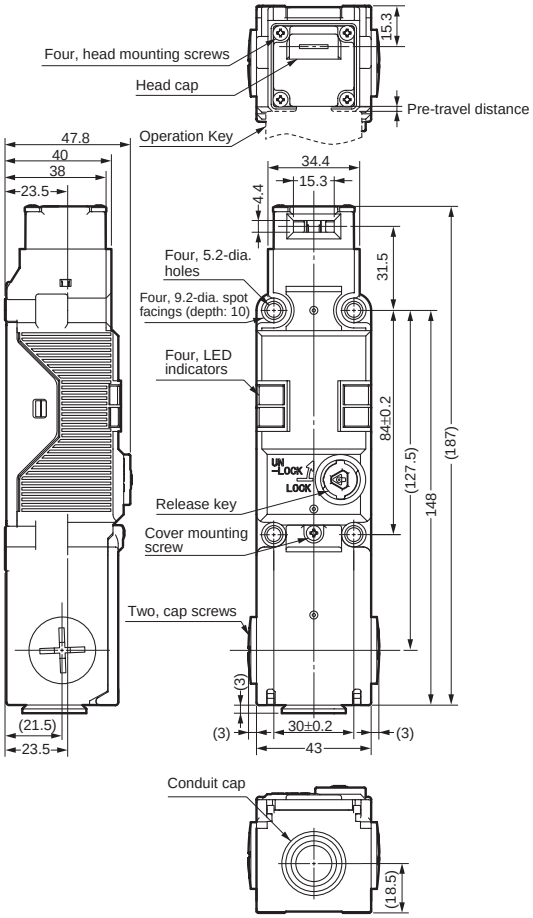
Switches

D4GL-□□□□-A



Operating characteristics	D4GL-□□□□-A
Key insertion force Key extraction force	15 N max. 40 N max.
Pre-travel distance	10 mm max.
Movement before being locked	4 mm min.

D4GL-□□□□-A4

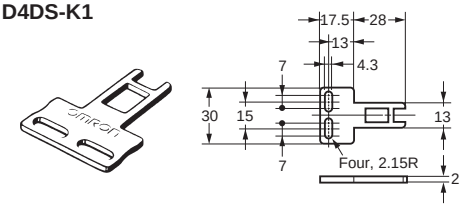


Operating characteristics	D4GL-□□□□-A4
Key insertion force Key extraction force	15 N max. 40 N max.
Pre-travel distance	10 mm max.
Movement before being locked	4 mm min.

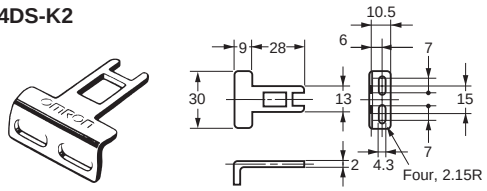
Operation Keys

Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

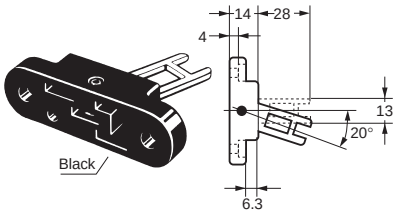
D4DS-K1

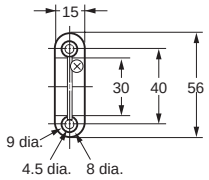


D4DS-K2

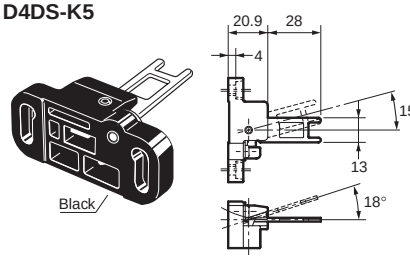


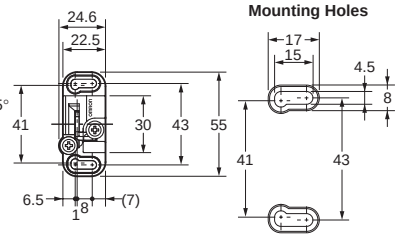
D4DS-K3





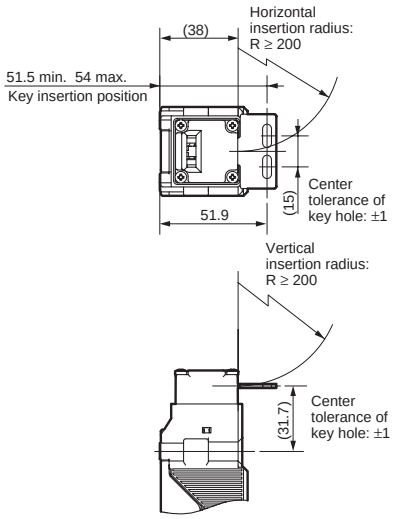
D4DS-K5



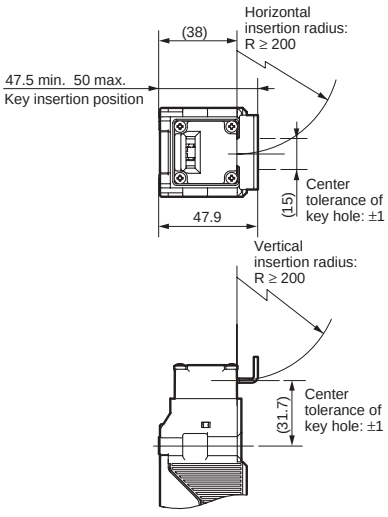


With Operation Key Inserted

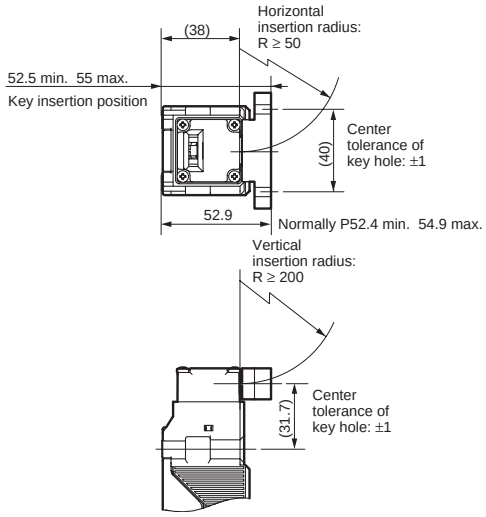
D4GL + D4DS-K1



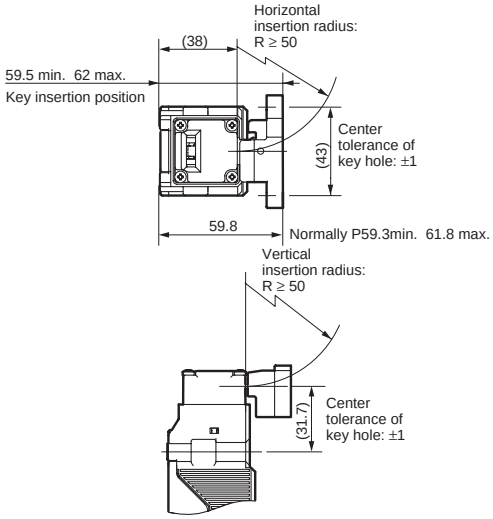
D4GL + D4DS-K2



D4GL + D4DS-K3

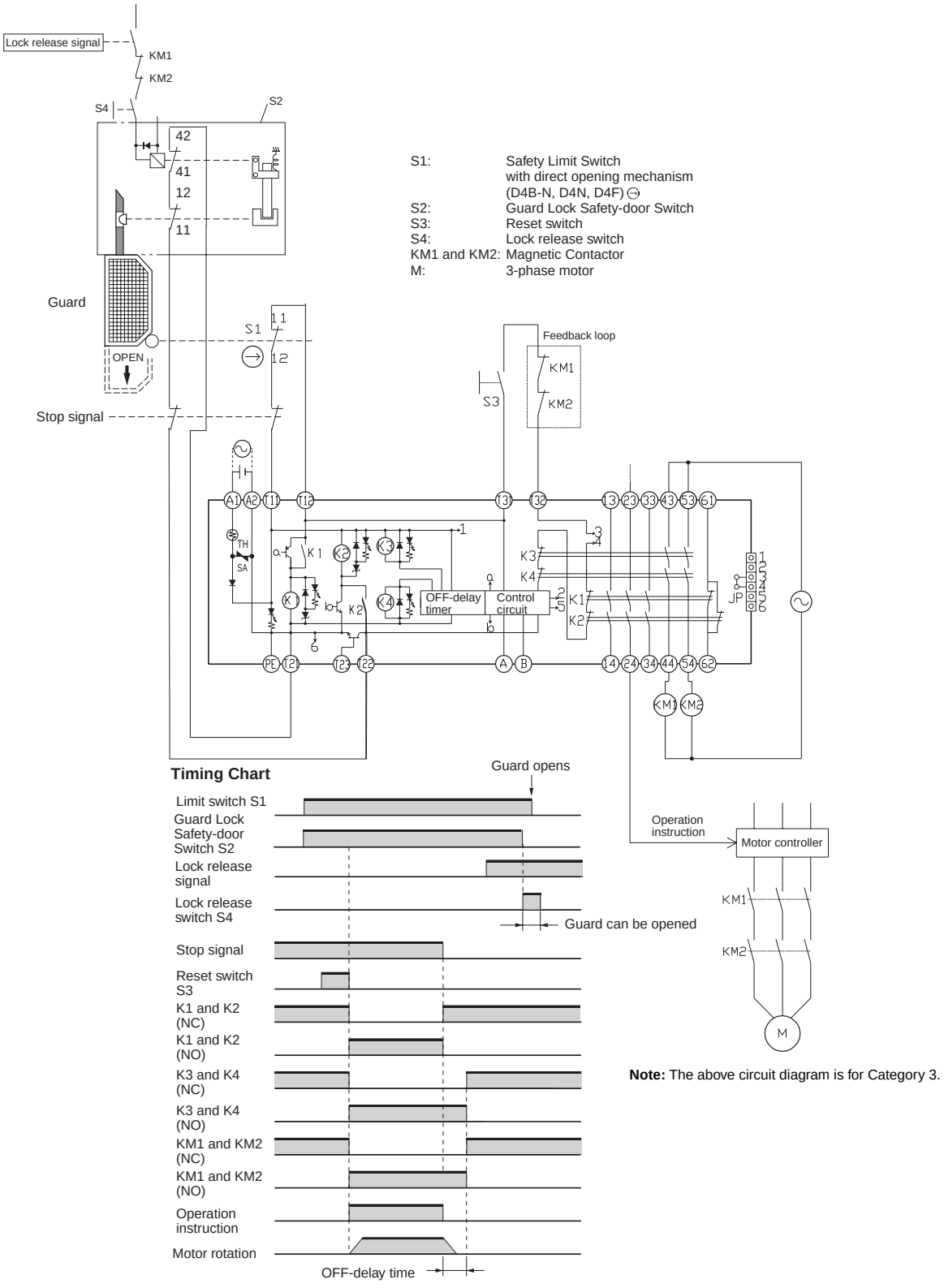


D4GL + D4DS-K5



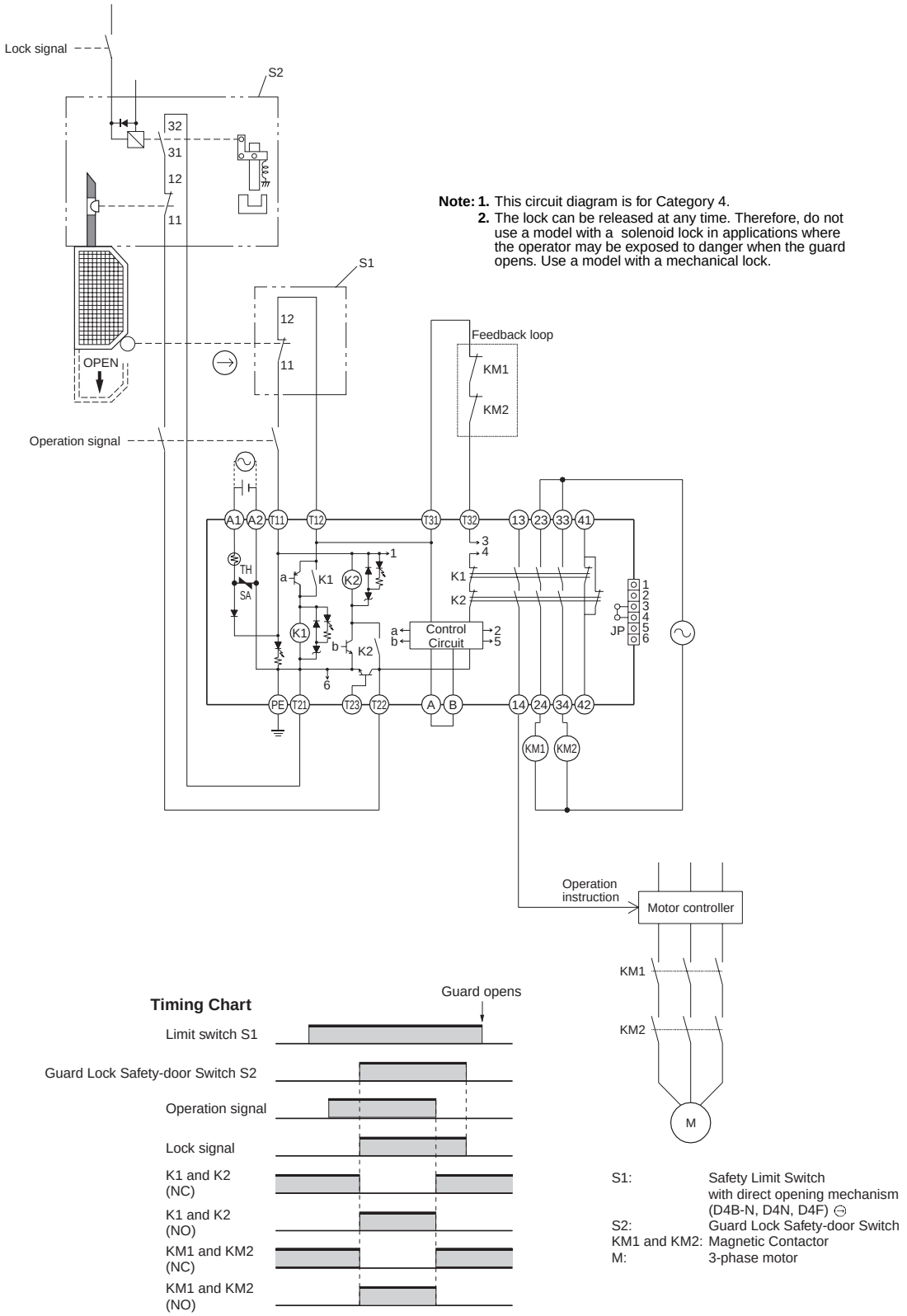
Application Examples

■ G9SA-321-T + D4GL-□□□A-□ (Mechanical Lock Type) Circuit Diagram (Manual Reset)



Note: The above circuit diagram is for Category 3.

■ G9SA-301 (24 VAC/VDC) + D4GL-□□□G-□ (Solenoid Lock Type) Circuit Diagram (Auto-reset)



Note: 1. This circuit diagram is for Category 4.
2. The lock can be released at any time. Therefore, do not use a model with a solenoid lock in applications where the operator may be exposed to danger when the guard opens. Use a model with a mechanical lock.

Timing Chart

S1:	Safety Limit Switch with direct opening mechanism (D4B-N, D4N, D4F) ⊖
S2:	Guard Lock Safety-door Switch
KM1 and KM2:	Magnetic Contactor
M:	3-phase motor

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

@ DANGER

Always verify the operation of the safety functions before starting the system. Not doing so may result in the safety functions not performing as expected if the wiring or settings are incorrect or the Switches have failed. The system being controlled may continue to operate and possibly cause injury or death.

Always ensure that the release key is set to the "LOCK" position before starting the system. If the release key remains set to "UNLOCK", the electromagnetic lock function will not operate and the system may continue to operate, possibly causing injury or death. Always monitor the solenoid NC contact (Terminal 11-42) in your safety circuit.
Do not connect indicator devices (like LED) to safety circuit connected to terminal 11-42.

Before changing the head direction always ensure that the release key is set to "UNLOCK", or that the Operation Key is inserted. Not doing so may damage the Switch and the system may continue to operate, possibly causing injury or death. Refer to *"Release Key"* on page 362.

Do not apply force exceeding the specified maximum holding force. Doing so may damage the Switch lock mechanism and the system may continue to operate, possibly causing injury or death. Either install another locking component (e.g., a stopper) in addition to the Switch, or use a warning method or indicator to show that the controlled system is locked to avoid overloading the holding force in lock mode.

⚠ CAUTION

Do not insert the Operation Key when the door is open. The machine may operate, possibly causing injury.

Do not use metal conduits or wiring ducts. Electric shock may occasionally occur.

■ Precautions for Safe Use

Installation Environment

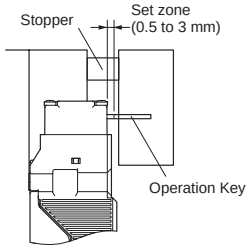
- Do not use the Switch in locations where explosive or flammable gases may be present.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the Switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head.
  Otherwise, accelerated wear or breaking may result.

Wiring

- Connect a fuse in series with the D4GL to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%. When using the D4GL for an EN rating, use a 10-A fuse of type gI or gG that complies with IEC 60269.
- When switching general loads (125 VAC/1 A), do not operate two circuits or more at the same time. Otherwise, insulation performance may be degraded.
- Do not allow the load current to exceed the rated value.
- Always attach the cover after completing wiring and before using the Switch. Do not supply power when the cover is not attached. Electric shock may occur if the Switch is used without the cover attached.

Installation

- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capability.
- Make sure the Switch is mounted securely to prevent it from falling off. Otherwise injury may result.
- Mount the Operation Key so that it will not come into contact with persons in the area when the door is opened and closed. Injury may result.
- Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.



Other Precautions

- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- The durability of the Switch is greatly influenced by the switching conditions. Always test the switch under actual working conditions before application and use it in a switching circuit for which there are no problems with performance.
- The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.

■ Precautions for Correct Use

The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

Operating Environment

- This Switch is designed for use indoors. Using the Switch outdoors may damage it.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or Cl_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch as a result of contact failure or corrosion.
- Do not use the Switch in any of the following locations.
  - Locations subject to extreme temperature changes
  - Locations subject to high humidity or condensation
  - Locations subject to excessive vibration
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door
  - Locations subject to detergents, thinners, or other solvents

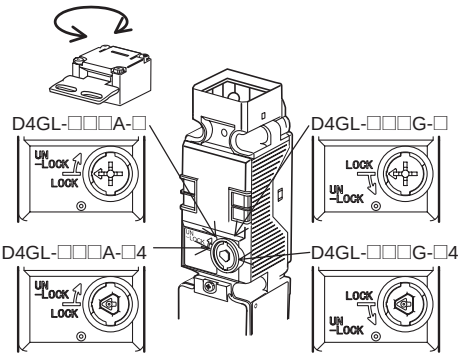
Storage

Do not store the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or Cl_2) or dust is present, or in locations subject to high temperature or high humidity.

Release Key

- The release key is used to unlock the Switch in case of emergency or if the power supply to the Switch stops.
- If the release key setting is changed from LOCK to UNLOCK, the lock will be released and the safety door can be opened (mechanical lock models only).
- After setting the release key to UNLOCK to, for example, perform maintenance, be sure to return it to LOCK setting before resuming operation.
- Do not use the release key to start or stop machines.
- The auxiliary lock must be released only by authorized personnel.
- Do not impose a force exceeding 0.5 N·m on the release key screws. The release key may be damaged and may not operate properly.
- The release key is set in the unlock position at the factory for the D4GL-□□□A and to the lock position for the D4GL-□□□G.
- To prevent easy release of the auxiliary lock by unauthorized personnel, set it to LOCK and seal it with sealing wax.

Figure 1



Hinged Door

If the Switch is mounted too close to the hinge, the force imposed on the lock will be much larger than for locations far from the hinge and the lock may be damaged. Mount the Switch close to the handle.

Solenoid Lock Models

The solenoid lock locks the door only when power is supplied to the solenoid. Therefore, the door will be unlocked if the power supply to the solenoid stops. Therefore, do not use solenoid lock models for machines that may be operating and dangerous even after the machine stops operating.

Mounting

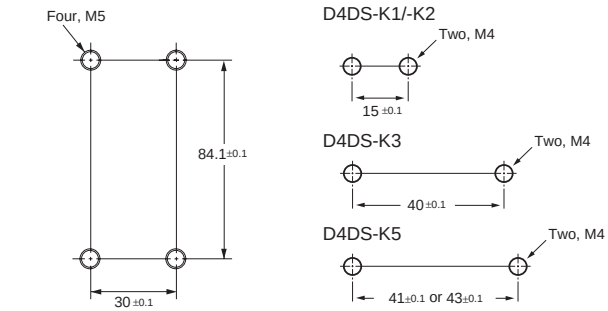
Tightening Torque

Be sure to tighten each screw of the Switch properly. Loose screws may result in malfunction.

Type	Tightening torque
Terminal screw	0.4 to 0.5 N·m
Cover mounting screw	0.5 to 0.7 N·m
Head mounting screw	0.5 to 0.6 N·m
Operation Key mounting screw	2.4 to 2.8 N·m
Switch mounting screw	1.3 to 1.5 N·m
Connector	1.8 to 2.1 N·m for other than 1/2-14NPT
	1.4 to 1.8 N·m for 1/2-14NPT
Cap screw	1.3 to 1.7 N·m

Switch and Operation Key Mounting

- Mount the Switch and Operation Key securely to the applicable tightening torque with M5 screws for the Switch and M4 screws for the Operation Key. Always use washers.
- Do not operate the Switch with anything other than the special OMRON Operation Key. Otherwise, the Switch may be damaged and the safety of the system may not be maintained.

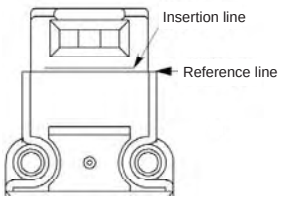


- Ensure that the alignment offset between the Operation Key and the key hole does not exceed ±1 mm. If the Operation Key is offset or at an angle, premature wear or damage to the Switch may result.
- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.
- Do not impose excessive force on the Key top while the Operation Key is inserted into the Switch body or drop the Switch with the Operation Key inserted. Doing either of these may deform the Key or break the Switch body.

Head Direction

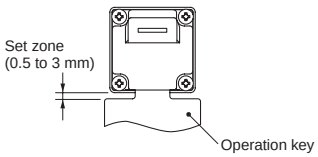
Remove the four screws of the head to enable changing the mounting direction of the head. The head can be mounted in four directions.

Ensure that no foreign material enters the interior of the Switch. Also, insert the head until the insertion line engraved on the head is hidden by the reference line on the Switch, as shown in the following diagram.



Securing the Door

- When the door is closed (with the Operation Key inserted), it may be pulled beyond the set zone because of, for example, the door's weight, or the door cushion rubber. If it is forced open from this condition, the Switch's life may be reduced.
- If a load is applied to the Operation Key, the door may fail to unlock properly. Use hooks to ensure that the door stays within the set zone.



Solenoid

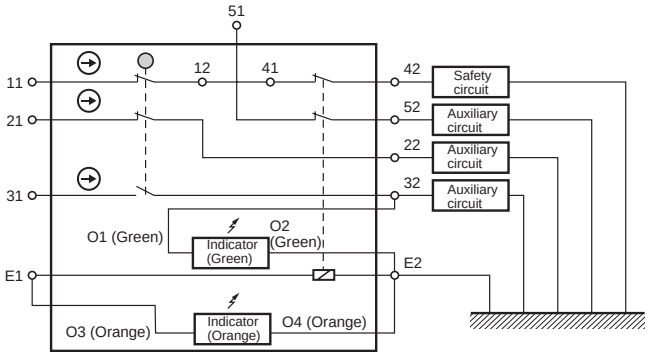
- The solenoid will heat when it carries current. Do not touch it.
- The solenoid has polarity. Confirm terminal polarity before wiring it.

Wiring

Circuit Connection Example for the D4GL-□H-□□-A

- As shown in the following diagram, models are available both with and without an internal connection between terminals 12 and 41.
- Direct opening contacts used as safety-circuit inputs are indicated with the ⊖ mark. Terminals 11 and 42, and terminals 21 and 22 have direct opening contacts.
- Connect terminals 21 and 22 and terminals 51 and 52 in series when using as safety-circuit inputs (redundancy circuit for terminals 11 and 12 and terminals 41 and 42 below). Connect the terminals individually when using as auxiliary-circuit inputs (e.g., terminals 21 and 22 for safety-door open/closed monitoring and terminals 51 and 52 for monitoring the lock status).
- In the following connection example, terminals 21 and 22 and terminals 51 and 52 are used as auxiliary-circuit inputs.
- Connect the indicators in parallel to the auxiliary circuits or terminals E1 and E2.
- Although the 3 lines are connected at the time of delivery, rewire them as necessary for the application.
- The following table shows the connection configuration required to make the green indicator light when the door is closed and the orange indicator light when the solenoid turns ON.

Indicator	Terminal number	Lead wire color	Connected terminal number
Green indicator	O1	Green	31
Orange indicator	O2	Orange	E1
Common	O3	Black	E2

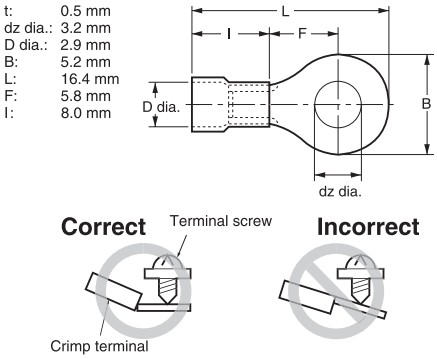


Wiring Precautions

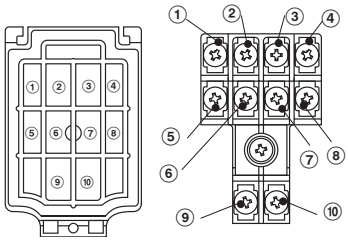
- Do not wire the Switch while power is being supplied. Doing so may result in electric shock.
- Do not let particles, such as small pieces of lead wire, enter the switch body when wiring.
- Applicable lead wire size: AWG24 to AWG22 (0.2 to 0.3 mm^2). Use lead wires of an appropriate length. Not doing so may result in excess length causing the cover to rise and not fit properly.
- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.
- Use crimp terminals that will not interfere with other components inside the case.

Recommended Crimp Terminals

Manufacturer	Model
J.S.T. Mfg Co.	FN0.5-3 (type F) No. 5-3 (straight)



- The terminal block screws and contact numbers correspond as shown in the following diagram. The numbers are provided on the terminal cover. Confirm terminal numbers against the terminal block terminal symbols when wiring.



Processing the Conduit Opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the proper torque. The case may be damaged if excessive tightening torque is applied.
- When using a 1/2-14NPT conduit, wind sealing tape around the conduit end of the connector so that the enclosure will conform to IP67.
- Make sure that the outer diameter of the cable connected to the connector is correct.
- Attach a conduit cap to the unused conduit opening when wiring and tighten it to a suitable torque. The conduit cap is provided with the Switch.

Recommended Connectors

Use a connector with a screw section not exceeding 10 mm. Otherwise the screws will protrude into the case interior. The connectors given in the following table have connectors with screw sections not exceeding 10 mm. Use the following connectors to ensure conformance to IP67.

Size	Manufacturer	Model	Applicable cable diameter
G$^{1}/_{2}$	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
	OHM ELECTRIC CO.	OA-W1609	7.0 to 9.0 mm
		OA-W1611	9.0 to 11.0 mm
Pg13.5	LAPP	S-13.5 5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5 5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2 5301-6030	6.0 to 12.0 mm

Use LAPP connectors together with Seal Packing (JPK-16, GP-13.5, or GPM20), and tighten to the applicable torque. Seal Packing is sold separately.

- For a 1/2-14NPT conduit, use the above connector after attaching the provided Adaptor to the Switch and wrapping it with sealing tape.

Other Precautions

- Perform maintenance inspections periodically.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C125-E1-05

Guard Lock Safety-door Switch
D4JL

World's Top* Holding Force of 3,000 N
***For plastic models, as of May 2005**

- Two safety circuits and two monitor contacts provide an array of monitoring patterns.
- Standard gold-clad contacts enable use with ordinary loads and microloads.
- Models with trapped keys prevent workers from being locked in hazardous work areas.
- Models with rear release buttons allow people to unlock the Switch and escape if they are locked into hazardous areas.
- IP67 degree of protection

Note: Be sure to read the *"Safety Precautions"* on page 382 and the *"Precautions for All Safety Door Switches"* on page 317.

NEW

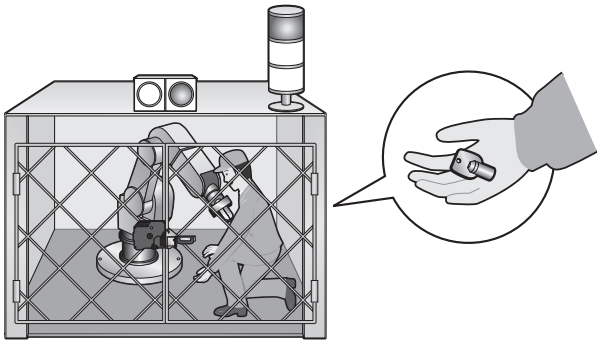
Features

Plastic Guard Lock Safety-door Switches Rank Among the Strongest in the World

A holding force of 3,000 N makes these Switches suitable for large, heavy doors.

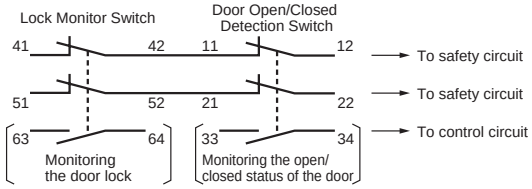
Models with Trapped Keys
(See page 369 for a list of models.)

OMRON also offers Trapped Key Switches (on mechanical lock models only). The door can be opened only by supplying power to the solenoid and then turning the trapped key to unlock the D4JL. As long as a person has the trapped key when he enters a hazardous area, he cannot be accidentally locked inside by someone else. There are thirty different types of trapped keys available for use in applications with adjacent hazardous areas.



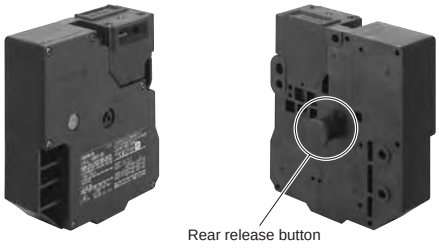
Two Safety Circuits and Two Monitor Contacts

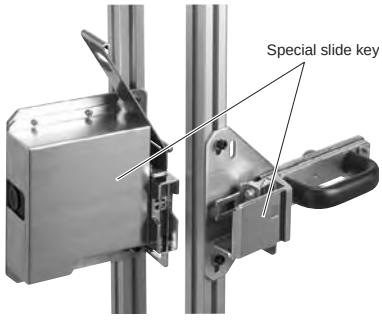
The D4JL has two safety circuits. It also has two contacts to separately monitor the open/closed status of the door and the status of the lock.



Models with Rear Release Buttons
(See page 368 for a list of models.)

A Switch with a rear release button allows the door to be unlocked from inside a hazardous area in an emergency. OMRON also offers Switches with Special Slide Keys. Refer to the *"D4NS-SK/D4JL-SK"* on page 432 for details.





Model Number Structure

■ Model Number Legend

Switches

D4JL-□□□□-□□-□□
1 2 3 4 5 6 7

1. Conduit Size
- 1: Pg13.5
- 2: G1/2
- 3: 1/2-14NPT (See note 2.)
- 4: M20

2. Built-in Switch
- N: 2NC/1NO slow-action contacts plus 2NC/1NO slow-action contacts
- P: 2NC/1NO slow-action contacts plus 3NC slow-action contacts
- Q: 3NC slow-action contacts plus 2NC/1NO slow-action contacts
- R: 3NC slow-action contacts plus 3NC slow-action contacts

3. Head Material
- F: Plastic

4. Door Lock and Release
- A: Mechanical lock/24-VDC solenoid release
- G: 24-VDC Solenoid lock/Mechanical release

5. Indicator
- C: 24 VDC (green LED indicator)
- D: 24 VDC (orange LED indicator)

6. Release Key Type
- 5: Special release key (See note 3).
- 6: Special release key plus rear release button (See note 3).
- 7: Trapped key

7. Trapped Key Type
- 01 to 30: 30 types (See note 4.)

Note: 1. A 24-VDC solenoid lock cannot be combined with a trapped key.
A 24-VDC solenoid lock cannot be combined with a special release key and rear release button.
2. Models with M20 conduits come with an M20 to 1/2-14NPT Adaptor.
3. Release keys are provided.
4. Thirty types of trapped keys can be manufactured. Specify the trapped key type in numerical order starting from 01 when ordering.

Operation Keys

D4JL-K□
1

1. Operation Key Type
- 1: Horizontal mounting
- 2: Vertical mounting

Ordering Information

■ Switches (Operation Keys are sold separately.)

Standard Models

Release key type	Indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts)	Conduit opening	Model
Special release key	Green	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-C5
				G1/2	D4JL-2NFA-C5
				1/2-14NPT	D4JL-3NFA-C5
				M20	D4JL-4NFA-C5
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-C5
				G1/2	D4JL-2PFA-C5
				1/2-14NPT	D4JL-3PFA-C5
				M20	D4JL-4PFA-C5
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-C5
				G1/2	D4JL-2QFA-C5
				1/2-14NPT	D4JL-3QFA-C5
				M20	D4JL-4QFA-C5
			3NC+3NC	PG13.5	D4JL-1RFA-C5
				G1/2	D4JL-2RFA-C5
				1/2-14NPT	D4JL-3RFA-C5
				M20	D4JL-4RFA-C5
		Solenoid lock Mechanical release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFG-C5
				G1/2	D4JL-2NFG-C5
				1/2-14NPT	D4JL-3NFG-C5
				M20	D4JL-4NFG-C5
			2NC/1NO+3NC	PG13.5	D4JL-1PFG-C5
				G1/2	D4JL-2PFG-C5
				1/2-14NPT	D4JL-3PFG-C5
				M20	D4JL-4PFG-C5
			3NC+2NC/1NO	PG13.5	D4JL-1QFG-C5
				G1/2	D4JL-2QFG-C5
				1/2-14NPT	D4JL-3QFG-C5
				M20	D4JL-4QFG-C5
			3NC+3NC	PG13.5	D4JL-1RFG-C5
				G1/2	D4JL-2RFG-C5
				1/2-14NPT	D4JL-3RFG-C5
				M20	D4JL-4RFG-C5
	Orange	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-D5
				G1/2	D4JL-2NFA-D5
				1/2-14NPT	D4JL-3NFA-D5
				M20	D4JL-4NFA-D5
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-D5
				G1/2	D4JL-2PFA-D5
				1/2-14NPT	D4JL-3PFA-D5
				M20	D4JL-4PFA-D5
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-D5
				G1/2	D4JL-2QFA-D5
				1/2-14NPT	D4JL-3QFA-D5
				M20	D4JL-4QFA-D5
			3NC+3NC	PG13.5	D4JL-1RFA-D5
				G1/2	D4JL-2RFA-D5
				1/2-14NPT	D4JL-3RFA-D5
				M20	D4JL-4RFA-D5
		Solenoid lock Mechanical release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFG-D5
				G1/2	D4JL-2NFG-D5
				1/2-14NPT	D4JL-3NFG-D5
				M20	D4JL-4NFG-D5
			2NC/1NO+3NC	PG13.5	D4JL-1PFG-D5
				G1/2	D4JL-2PFG-D5
				1/2-14NPT	D4JL-3PFG-D5
				M20	D4JL-4PFG-D5
			3NC+2NC/1NO	PG13.5	D4JL-1QFG-D5
				G1/2	D4JL-2QFG-D5
				1/2-14NPT	D4JL-3QFG-D5
				M20	D4JL-4QFG-D5
			3NC+3NC	PG13.5	D4JL-1RFG-D5
				G1/2	D4JL-2RFG-D5
				1/2-14NPT	D4JL-3RFG-D5
				M20	D4JL-4RFG-D5

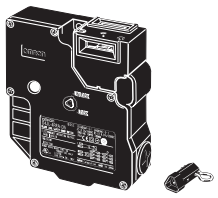
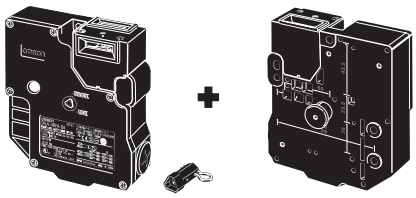
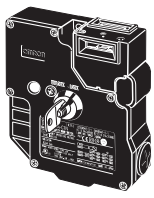
Models with Rear Release Buttons

Release key type	Indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts)	Conduit opening	Model
Special release key	Green	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-C6
				G1/2	D4JL-2NFA-C6
				1/2-14NPT	D4JL-3NFA-C6
				M20	D4JL-4NFA-C6
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-C6
				G1/2	D4JL-2PFA-C6
				1/2-14NPT	D4JL-3PFA-C6
				M20	D4JL-4PFA-C6
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-C6
				G1/2	D4JL-2QFA-C6
				1/2-14NPT	D4JL-3QFA-C6
				M20	D4JL-4QFA-C6
			3NC+3NC	PG13.5	D4JL-1RFA-C6
				G1/2	D4JL-2RFA-C6
				1/2-14NPT	D4JL-3RFA-C6
				M20	D4JL-4RFA-C6
	Orange		2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-D6
				G1/2	D4JL-2NFA-D6
				1/2-14NPT	D4JL-3NFA-D6
				M20	D4JL-4NFA-D6
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-D6
				G1/2	D4JL-2PFA-D6
				1/2-14NPT	D4JL-3PFA-D6
				M20	D4JL-4PFA-D6
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-D6
				G1/2	D4JL-2QFA-D6
				1/2-14NPT	D4JL-3QFA-D6
				M20	D4JL-4QFA-D6
			3NC+3NC	PG13.5	D4JL-1RFA-D6
				G1/2	D4JL-2RFA-D6
				1/2-14NPT	D4JL-3RFA-D6
				M20	D4JL-4RFA-D6

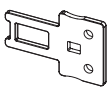
Models with Trapped Keys

Release key type	Indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts)	Conduit opening	Model
Trapped key (See note.)	Green	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-C7-01
				G1/2	D4JL-2NFA-C7-01
				1/2-14NPT	D4JL-3NFA-C7-01
				M20	D4JL-4NFA-C7-01
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-C7-01
				G1/2	D4JL-2PFA-C7-01
				1/2-14NPT	D4JL-3PFA-C7-01
				M20	D4JL-4PFA-C7-01
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-C7-01
				G1/2	D4JL-2QFA-C7-01
				1/2-14NPT	D4JL-3QFA-C7-01
				M20	D4JL-4QFA-C7-01
			3NC+3NC	PG13.5	D4JL-1RFA-C7-01
				G1/2	D4JL-2RFA-C7-01
				1/2-14NPT	D4JL-3RFA-C7-01
				M20	D4JL-4RFA-C7-01
	Orange		2NC/1NO+2NC/1NO	PG13.5	D4JL-1NFA-D7-01
				G1/2	D4JL-2NFA-D7-01
				1/2-14NPT	D4JL-3NFA-D7-01
				M20	D4JL-4NFA-D7-01
			2NC/1NO+3NC	PG13.5	D4JL-1PFA-D7-01
				G1/2	D4JL-2PFA-D7-01
				1/2-14NPT	D4JL-3PFA-D7-01
				M20	D4JL-4PFA-D7-01
			3NC+2NC/1NO	PG13.5	D4JL-1QFA-D7-01
				G1/2	D4JL-2QFA-D7-01
				1/2-14NPT	D4JL-3QFA-D7-01
				M20	D4JL-4QFA-D7-01
			3NC+3NC	PG13.5	D4JL-1RFA-D7-01
				G1/2	D4JL-2RFA-D7-01
				1/2-14NPT	D4JL-3RFA-D7-01
				M20	D4JL-4RFA-D7-01

Note: Thirty types of trapped keys can be manufactured. Specify the trapped key type in numerical order starting from 01 when ordering.

Release key position	Front	Front and rear release button	Front
Release key type	Special release key	Special release key	Trapped key
Switch appearance			

■ Operation Keys

Type	Model
Horizontal mounting 	D4JL-K1
Vertical mounting 	D4JL-K2

Specifications

■ Standards and EC Directives

Conforms to the following EC Directives

- Machinery Directive
- Low Voltage Directive
- EN 1088
- EN 60204-1
- GS-ET-19

Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN 60947-5-1 (certified direct opening)	Consult your OMRON representative for details.
UL (See note.)	UL 508, CSA C22.2 No.14	
CQC (CCC)	GB14048.5	2005010305167533

Note: CSA C22.2 No. 14 was certified by UL.

■ Certified Standard Ratings

TÜV (EN 60947-5-1), CCC (GB14048.5)

Item / Utilization category	AC-15	DC-13
Rated operating current (Ie)	3 A	0.27 A
Rated operating voltage (Ue)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC 60269 as a short-circuit protection device. This fuse is not built into the Switch.

UL/CSA (UL 508, CSA C22.2 No. 14)

A300

Rated voltage	Carry current	Current (A)		Volt-amperes (VA)	
		Make	Break	Make	Break
120 VAC	10 A	60	6	7,200	720
240 VAC		30	3		

Solenoid Coil Characteristics

Item / Type	24 VDC
Rated operating voltage (100% ED)	24 VDC $^{+10\%}_{-15\%}$
Current consumption	Approx. 200 mA
Insulation	Class F (130°C max.)

Indicator Characteristics

Item / Type	LED	
Rated voltage	24 VDC	24 VDC
Current consumption	Approx. 1 mA	Approx. 8 mA
Color (LED)	Orange	Green

■ Characteristics

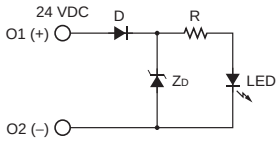
Degree of protection (See note 2.)		IP67 (EN 60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)	
Durability (See note 3.)	**Mechanical**	1,000,000 operations min. (trapped key: 10,000 operations min., rear release button: 3,000 operations min.)	
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC (See note 4.)	
Operating speed		0.05 to 0.5 m/s	
Operating frequency		30 operations/minute max.	
Rated frequency		50/60 Hz	
Direct opening force (See note 5.)		60 N min. (EN 60947-5-1)	
Direct opening travel (See note 5.)		15 mm min. (EN 60947-5-1)	
Holding force (See note 6.)		3,000 N min.	
Insulation resistance		100 MΩ min. (at 500 VDC)	
Minimum applicable load (See note 7.)		Resistive load of 1 mA at 5 VDC (N-level reference value)	
Rated insulation voltage (U_i)		300 V (EN 60947-5-1)	
Rated open thermal current (I_{th})		10 A between terminals 12 and 41, 3 A between all other terminals (EN 60947-5-1)	
Impulse withstand voltage (EN 60947-5-1)		Between terminals of same polarity	2.5 kV
		Between terminals of different polarity	4 kV
		Between other terminals and uncharged metallic parts	6 kV
Conditional short-circuit current		100 A (EN 60947-5-1) (See note 8.)	
Pollution degree (operating environment)		3 (EN 60947-5-1)	
Protection against electric shock		Class II (double insulation)	
Contact resistance (initial value)		25 mΩ max. per contact	
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude	
Shock resistance	**Destruction**	1,000 m/s^2 min.	
	Malfunction	80 m/s^2 min.	
Ambient operating temperature		−10 to +55°C (with no icing)	
Ambient operating humidity		95% max.	
Weight		Approx. 650g	

Note:
1. The above values are initial values.
2. The degree of protection is tested using the method specified by the standard (EN 60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4JL in places where foreign material may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.
3. The durability is for an ambient temperature of 5 to 35°C and an ambient humidity of 40% to 70%. For further conditions, consult your OMRON sales representative.
4. Do not pass a 3-A, 250-VAC load through more than two circuits.
5. These figures are minimum requirements for safe operation.
6. This figure is based on the GS-ET-19 evaluation method.
7. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.
8. Use a 10-A fuse type gI or gG that conforms to IEC 60269 as a short-circuit protection device.

Connections

■ Indicators

Internal Circuit Diagram

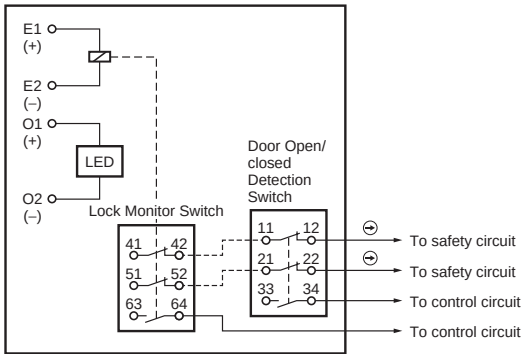


- Direct opening contacts used as safety-circuit input are indicated with the ⊖ mark. Terminals 11-12 and terminals 21-22 are direct opening contacts.
- Do not connect the indicator directly to direct opening contacts. If indicator is connected in parallel with direct opening contacts, a short-circuit current may flow in the event that the indicator is damaged, causing equipment to malfunction.
- Do not switch standard loads for more than 2 circuits at the same time. Otherwise, the level of insulation may decrease.
- The solenoid terminals have polarity (E1: + and E2: –). Confirm the polarity before wiring.

■ Circuit Connection Example

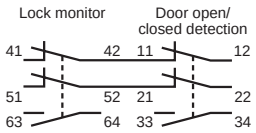
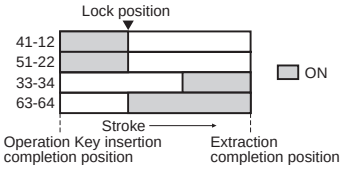
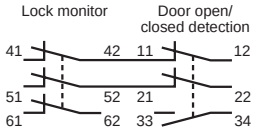
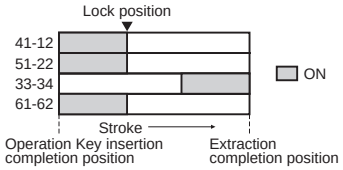
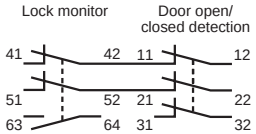
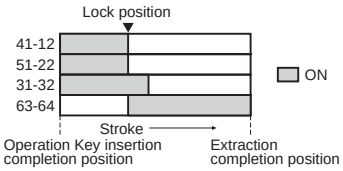
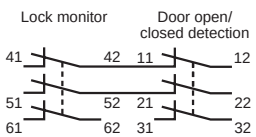
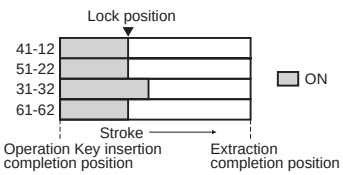
(Examples for the D4JL-□NF□-□)

- Terminals 11-42 and terminals 21-52 are connected internally and so connect terminals 12-41 and 22-51 for safety-circuit input. (GS-ET-19).



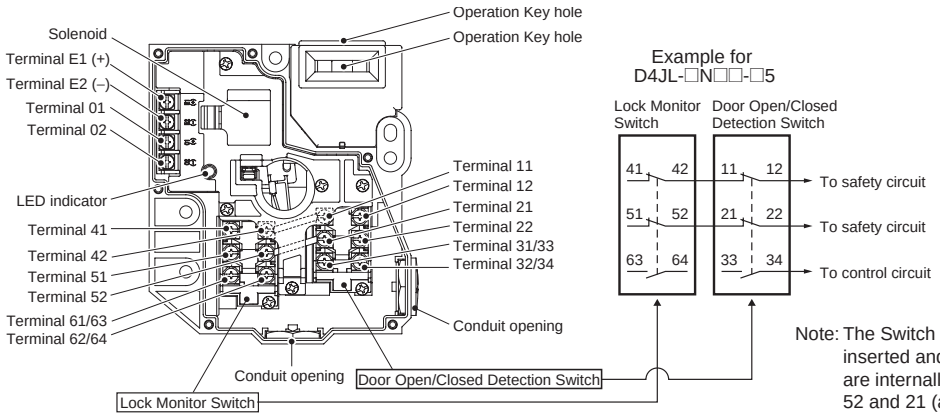
■ Contact Forms

Indicates conditions where the Key is inserted and the lock is applied. Terminals 42-11 and terminals 52-21 are connected internally (as per BIA GS-ET-19).

Model	Contacts (door open/closed detection and lock monitor)	Contact forms		Operating pattern	Remarks
		Lock monitor	Door open/ closed detection		
D4JL-□NF□-□	2NC/1NO+2NC/1NO				NC contacts 11-12 and 21-22 have a certified direct opening mechanism (⊖). The terminals 41-12, 51-22, 33-34, and 63-64 can be used as unlike poles.
D4JL-□PF□-□	2NC/1NO+3NC				NC contacts 11-12 and 21-22 have a certified direct opening mechanism (⊖). The terminals 41-12, 51-22, 33-34, and 61-62 can be used as unlike poles.
D4JL-□QF□-□	3NC+2NC/1NO				NC contacts 11-12, 21-22 and 31-32 have a certified direct opening mechanism (⊖). The terminals 41-12, 51-22, 31-32, and 63-64 can be used as unlike poles.
D4JL-□RF□-□	3NC+3NC				NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism (⊖). The terminals 41-12, 51-22, 31-32, and 61-62 can be used as unlike poles.

Nomenclature

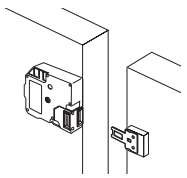
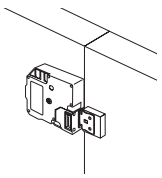
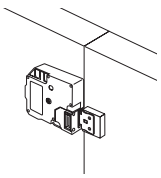
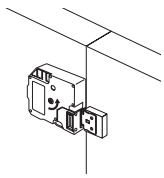
■ Structure of D4JL-□□□A-5 and D4JL-□□□G-□5



Note: The Switch is shown with the key inserted and locked. Terminals 42 and 11 are internally connected, as are terminals 52 and 21 (according to GS-ET-19).

■ Operating Cycle Examples for Standard Models

D4JL-□□□A-□5 (Mechanical Lock Models with Special Release Keys)

Door condition		Condition 1	Condition 2	Condition 3		Turning the special release key
		 Door open. The door will lock when the door closes.	 Door closed. The door is locked.	 Door closed. The door can be opened.	Return to condition 1	 Door closed. No power is supplied to the solenoid. The door is unlocked manually.
Terminal No. and function						
E1-E2	**Solenoid ON**			■		
41-12 (NC) **51-22 (NC)**	**Door open/closed detection and lock monitor contacts**		■			
31-32 (NC)	**Door open/closed detection contact**		■	■		■
33-34 (NO)	**Door open/closed detection contact**	■				
61-62 (NC)	**Lock monitor contact**		■			
63-64 (NO)	**Lock monitor contact**	■		■		■

D4JL-□□□G-□5 (Solenoid Lock Models with Special Release Keys)

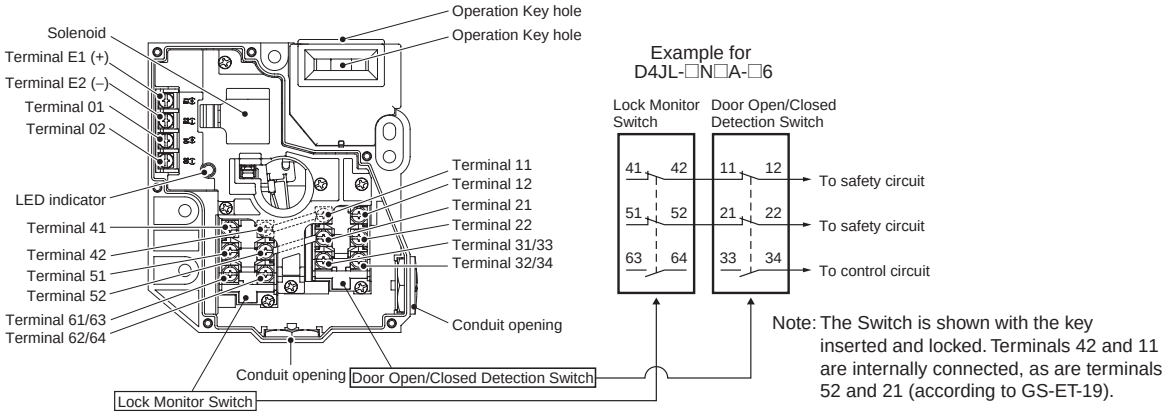
Door condition		Even when the door is closed, it does not lock until power is supplied to the solenoid.	Door closed. The door is locked.	Door closed. The door can be opened.
Terminal No. and function				
E1-E2	**Solenoid ON**		■	
41-12 (NC) **51-22 (NC)**	**Door open/closed detection and lock monitor contacts**		■	
31-32 (NC)	**Door open/closed detection contact**		■	■
33-34 (NO)	**Door open/closed detection contact**	■		
61-62 (NC)	**Lock monitor contact**		■	
63-64 (NO)	**Lock monitor contact**	■		■

■ The shaded areas indicate the contact is closed and power is supplied to the solenoid.

Door open/closed detection and lock monitor contacts: Can be used in safety circuits because of the direct opening mechanisms.
Door open/closed detection contact: Can be used to confirm whether the key is inserted and to monitor the open/closed status of a door.
Lock monitor contact: Can be used to confirm whether power is supplied to the solenoid and to monitor whether or not a door can be opened or closed.

Note: The door open/closed detection and lock monitor contact configuration depends on the model.

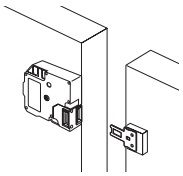
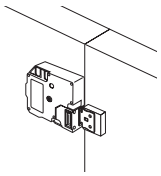
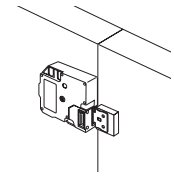
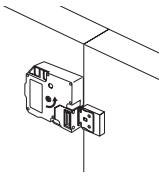
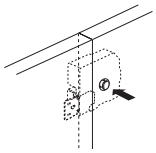
■ Structure of D4JL-□□□A-□6



Note: The Switch is shown with the key inserted and locked. Terminals 42 and 11 are internally connected, as are terminals 52 and 21 (according to GS-ET-19).

■ Operating Cycle Examples for Models with Rear Release Buttons

D4JL-□□□A-□6 (Mechanical Lock Models with Special Release Keys and Rear Release Buttons)

Door condition		Condition 1	Condition 2	Condition 3		Turning the special release key	Pressing the rear release button
							
Terminal No. and function		Door open. The door will lock when the door closes.	Door closed. The door is locked.	Door open. The door can be opened.	Return to condition 1	Door closed. No power is supplied to the solenoid. The door is unlocked manually.	Door closed. No power is supplied to the solenoid. The door is unlocked manually.
E1-E2	Solenoid ON						
41-12 (NC) 51-22 (NC)	Door open/ closed detection and lock monitor contacts						
31-32 (NC)	Door open/ closed detection contact						
33-34 (NO)	Door open/ closed detection contact						
61-62 (NC)	Lock monitor contact						
63-64 (NO)	Lock monitor contact						

The shaded areas indicate the contact is closed and power is supplied to the solenoid.

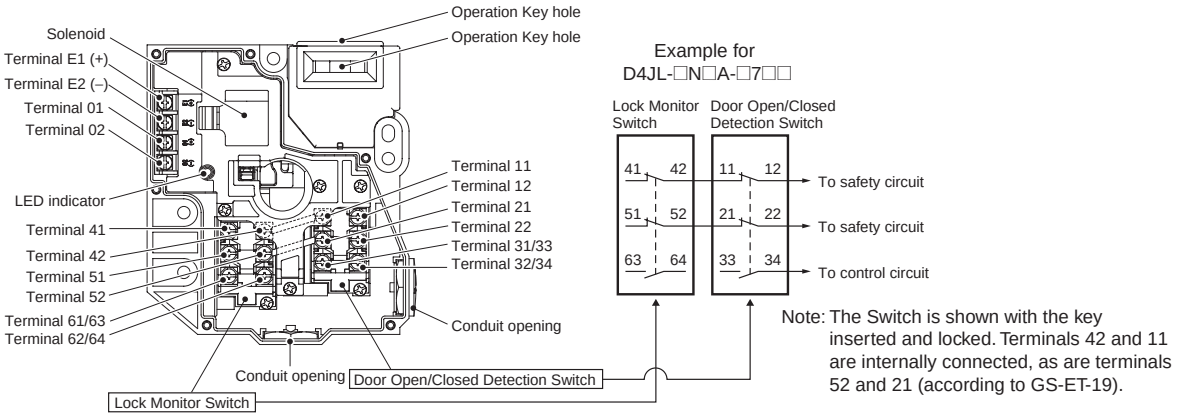
Door open/closed detection and lock monitor contacts: Can be used in safety circuits because of the direct opening mechanisms.

Door open/closed detection contact: Can be used to confirm whether the key is inserted and to monitor the open/closed status of a door.

Lock monitor contact: Can be used to confirm whether power is supplied to the solenoid and to monitor whether or not a door can be opened or closed.

Note: The door open/closed detection and lock monitor contact configuration depends on the model.

■ Structure of D4JL-□□□A-□7-□□



Note: The Switch is shown with the key inserted and locked. Terminals 42 and 11 are internally connected, as are terminals 52 and 21 (according to GS-ET-19).

■ Operating Cycle Examples for Models with Trapped Keys

D4JL-□□□A-□7□□ (Models with Trapped Keys)

Door condition		Condition 1	Condition 2	Condition 3	Condition 4	Condition 5	Condition 6
		Door open. The Key is not inserted. The door will not lock when the door closes.	Door closed. The Key is not inserted. The door is not locked.	Door closed. The Key is inserted. The door is locked.	Door closed. The Key is inserted. The door remains locked.	Door closed. The Key is not inserted. The door can be opened.	Door closed. The Key is not inserted. The door will not lock when the door closes.
Terminal No. and function							
E1-E2	**Solenoid ON**				■	■	■
41-12 (NC) 51-22 (NC)	**Door open/ closed detection and lock monitor contacts**			■			
31-32 (NC)	**Door open/ closed detection contact**		■	■	■	■	
33-34 (NO)	**Door open/ closed detection contact**	■					■
61-62 (NC)	**Lock monitor contact**			■			
63-64 (NO)	**Lock monitor contact**	■	■		■	■	■

Return to condition 1

■ The shaded areas indicate the contact is closed and power is supplied to the solenoid.

Door open/closed detection and lock monitor contacts: Can be used in safety circuits because of the direct opening mechanisms.

Door open/closed detection contact: Can be used to confirm whether the key is inserted and to monitor the open/closed status of a door.

Lock monitor contact: Can be used to confirm whether power is supplied to the solenoid and to monitor whether or not a key can be removed.

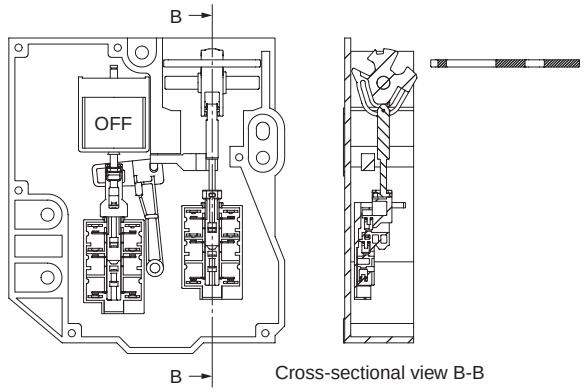
Note: 1. Door open/closed detection and lock monitor contact configuration depends on the model.
2. If power is supplied to the solenoid, the door cannot be unlocked until the Key is turned to the left and removed.

Operation Method

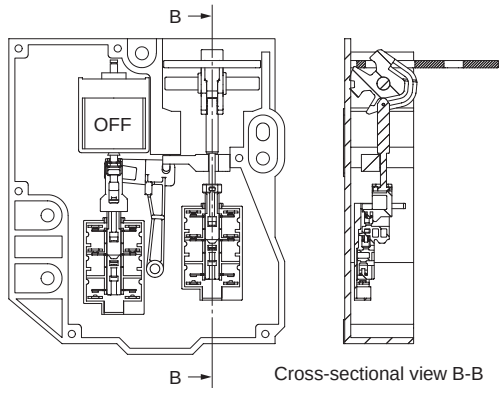
■ Operation Principles

Mechanical Lock Models

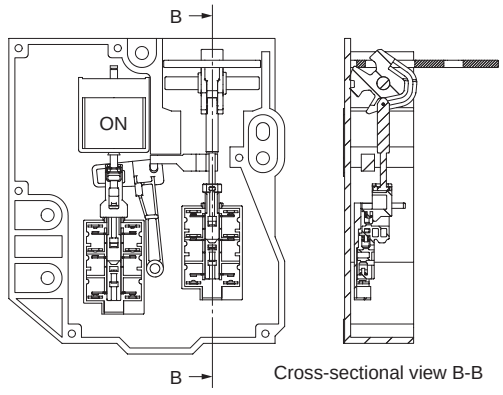
Operation Key removed.



Operation Key inserted: Door locked.

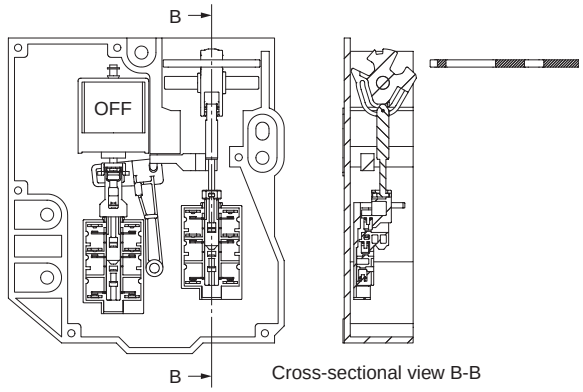


Solenoid ON: Door unlocked.

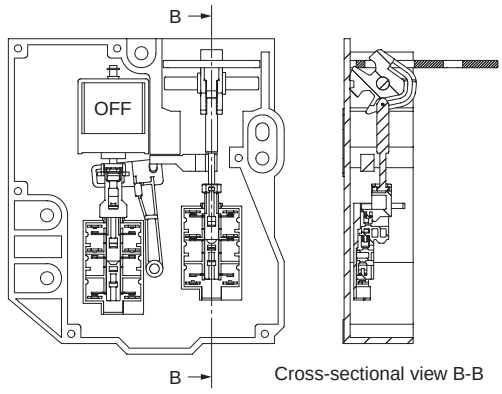


Solenoid Lock Models

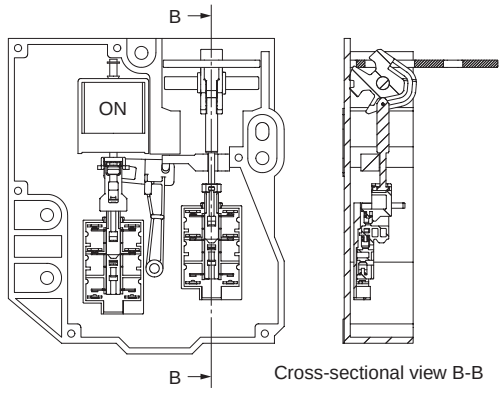
Operation Key removed.



Operation Key inserted: Door unlocked.

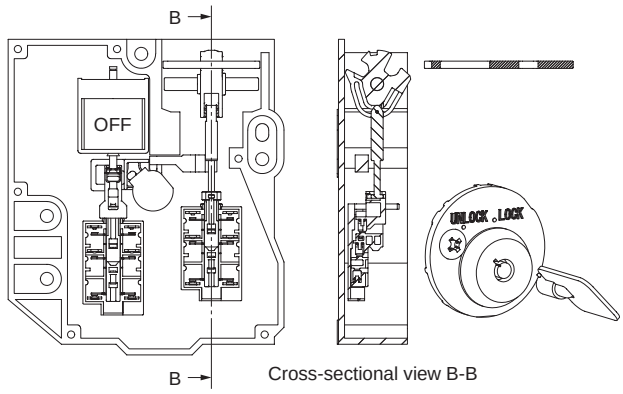


Solenoid ON: Door locked.

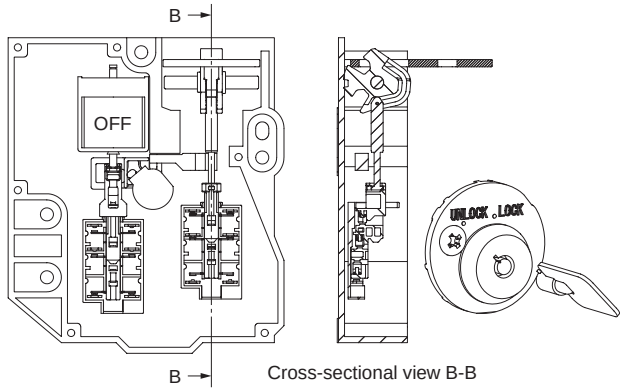


Trapped Key Models

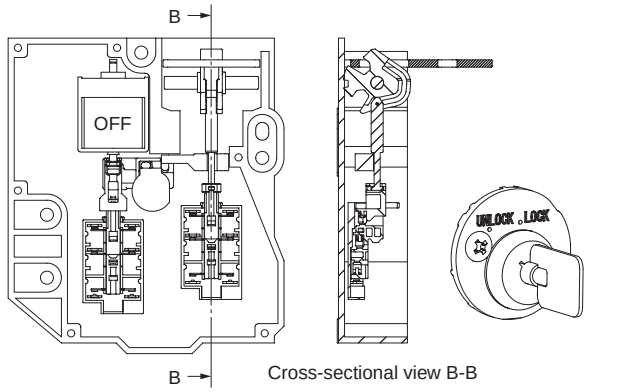
(1) Operation Key removed, solenoid OFF, and trapped key removed.



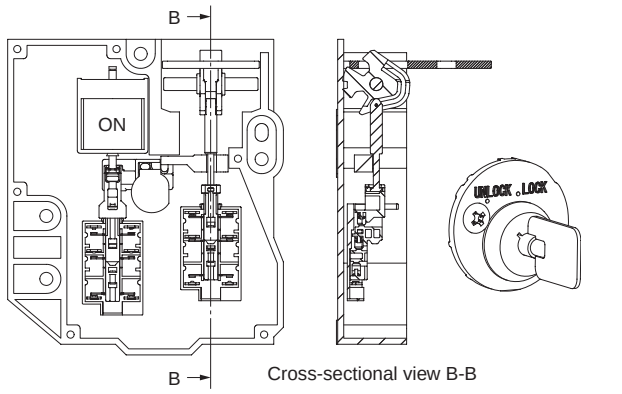
(2) Operation Key inserted, solenoid OFF, and trapped key removed. Status: Door unlocked.



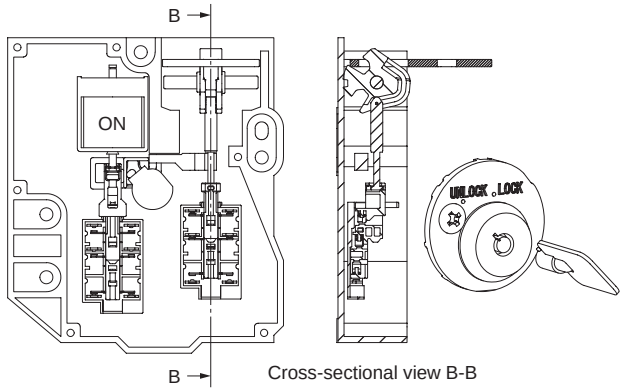
(3) Operation Key inserted, solenoid OFF, and trapped key inserted. Status: Door locked and trapped key cannot be removed.



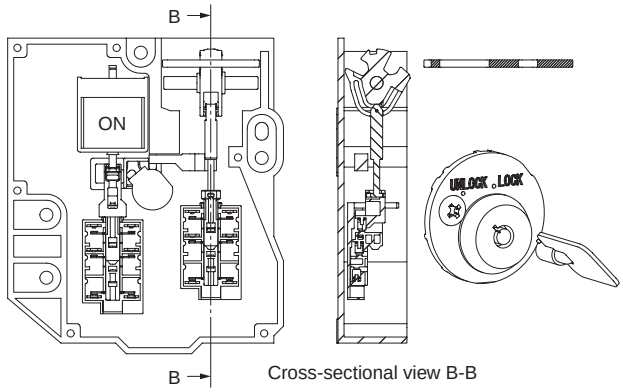
(4) Operation Key inserted, solenoid ON, and trapped key inserted. Status: Door locked and trapped key can be removed.



(5) Operation Key inserted, solenoid ON, and trapped key removed. Status: Door unlocked.



(6) Operation Key removed, solenoid ON, and trapped key removed.



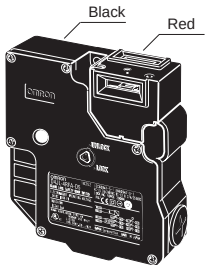
Dimensions

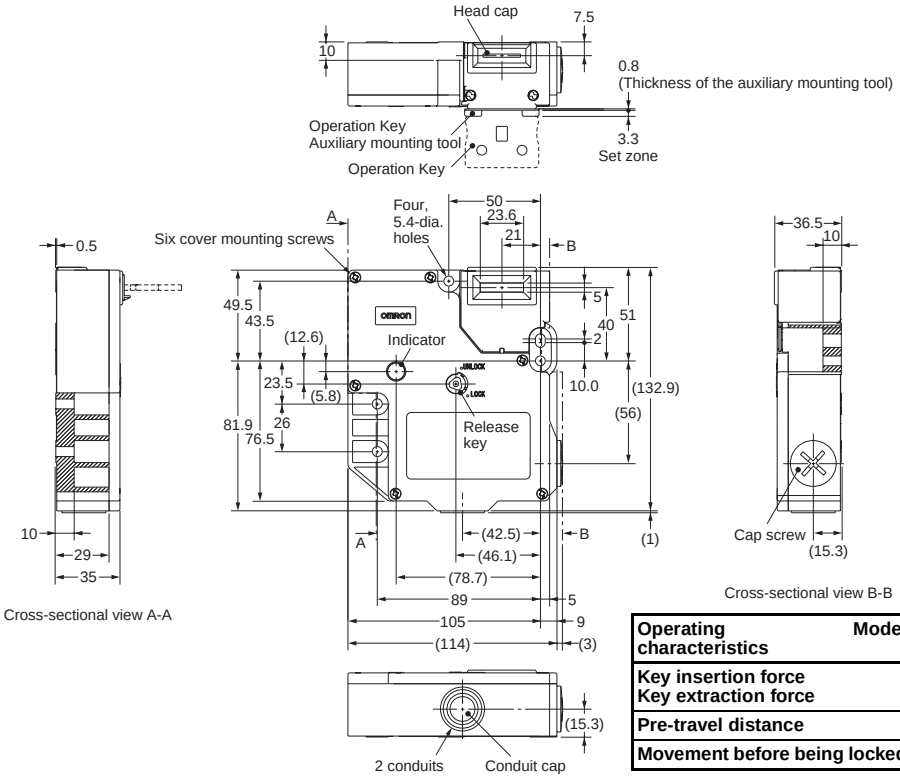
Note: All units are in millimeters unless otherwise indicated.

■ Dimensions and Operating Characteristics

Switches

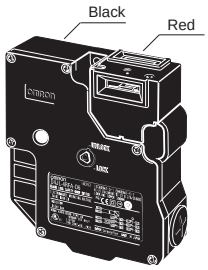
D4JL-□□F□-C5
D4JL-□□F□-D5

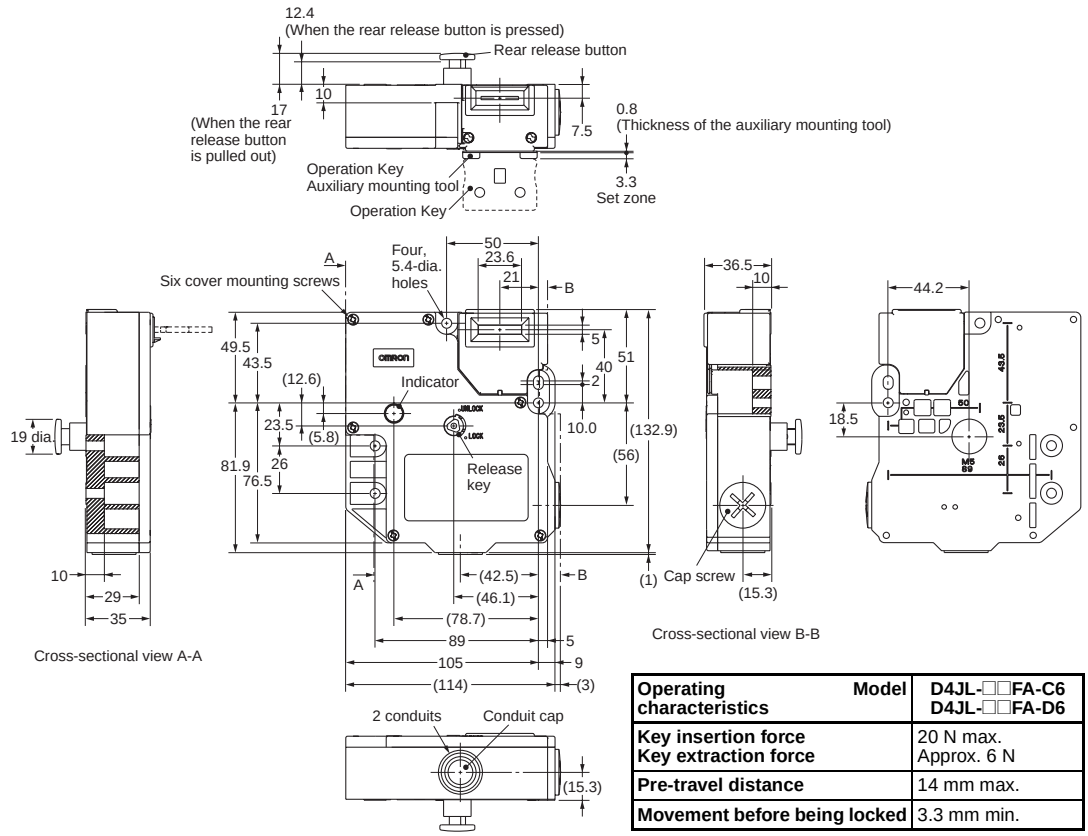




Operating characteristics / Model	D4JL-□□F□-C5 D4JL-□□F□-D5
Key insertion force **Key extraction force**	20 N max. Approx. 6 N
Pre-travel distance	14 mm max.
Movement before being locked	3.3 mm min.

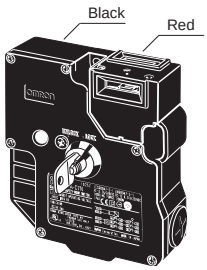
D4JL-□□FA-C6
D4JL-□□FA-D6

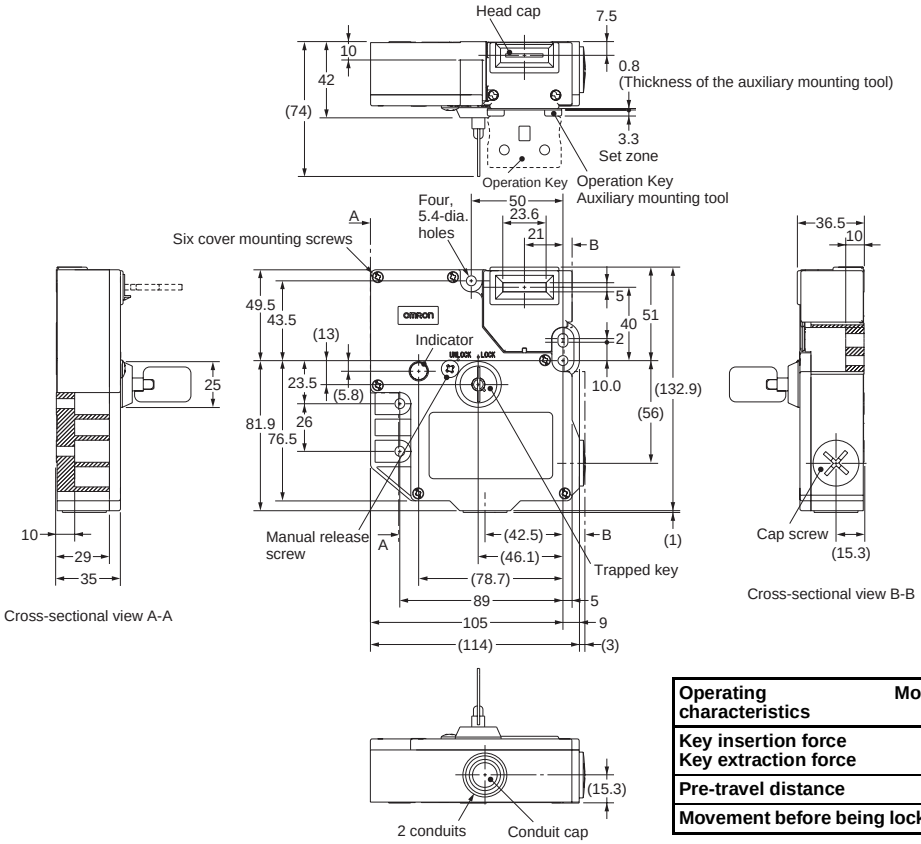




Operating characteristics / Model	D4JL-□□FA-C6 D4JL-□□FA-D6
Key insertion force **Key extraction force**	20 N max. Approx. 6 N
Pre-travel distance	14 mm max.
Movement before being locked	3.3 mm min.

D4JL-□□FA-C7
D4JL-□□FA-D7

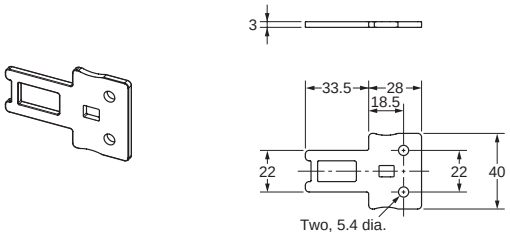




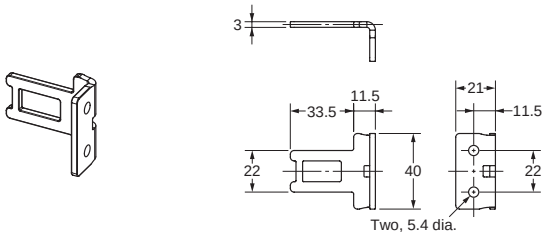
Operating characteristics / Model	D4JL-□□FA-C7 D4JL-□□FA-D7
Key insertion force **Key extraction force**	20 N max. Approx. 6 N
Pre-travel distance	14 mm max.
Movement before being locked	3.3 mm min.

Operation Keys

D4JL-K1



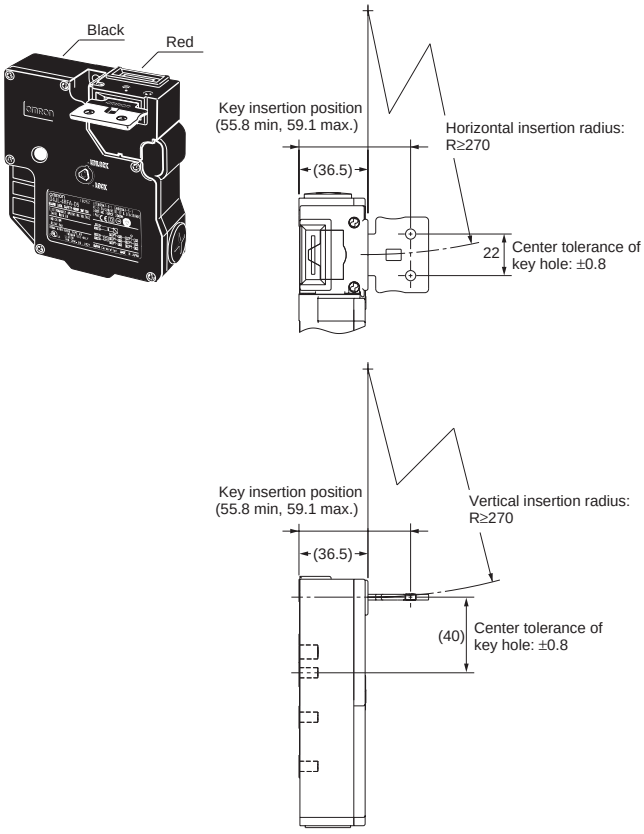
D4JL-K2



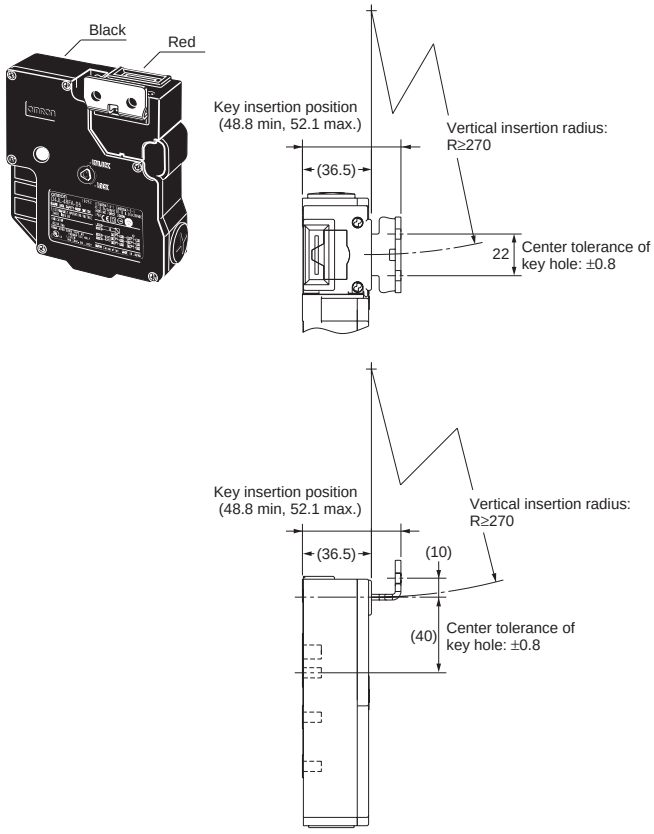
Note: Unless otherwise specified, a tolerance of ±0.8 mm applies to all Switch dimensions and a tolerance of ±0.4 mm applies to Operation Key dimensions.

With Operation Key Inserted

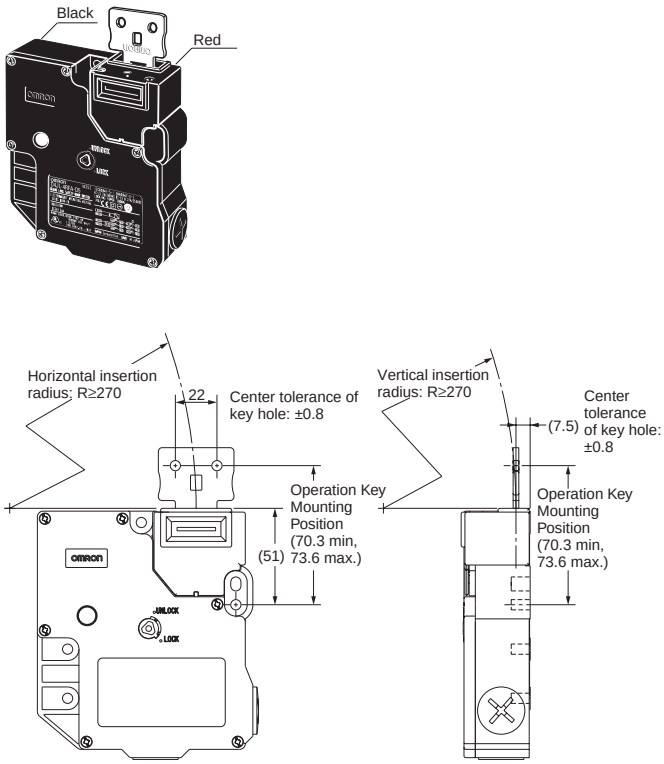
D4JL+D4JL-K1 (with Front-inserted Operation Key)



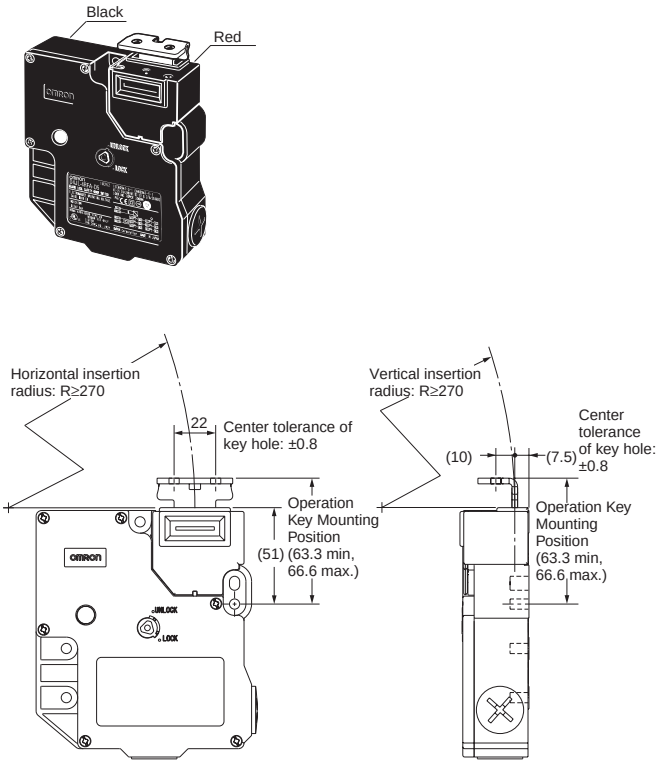
D4JL+D4JL-K2 (with Front-inserted Operation Key)



D4JL+D4JL-K1 (with Top-inserted Operation Key)



4JL+D4JL-K2 (with Top-inserted Operation Key)

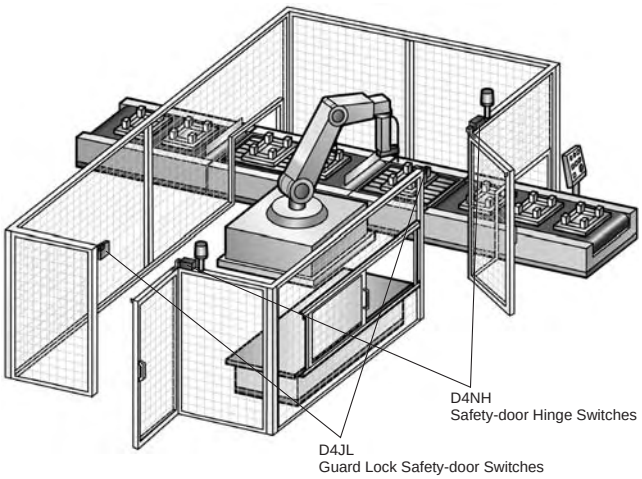


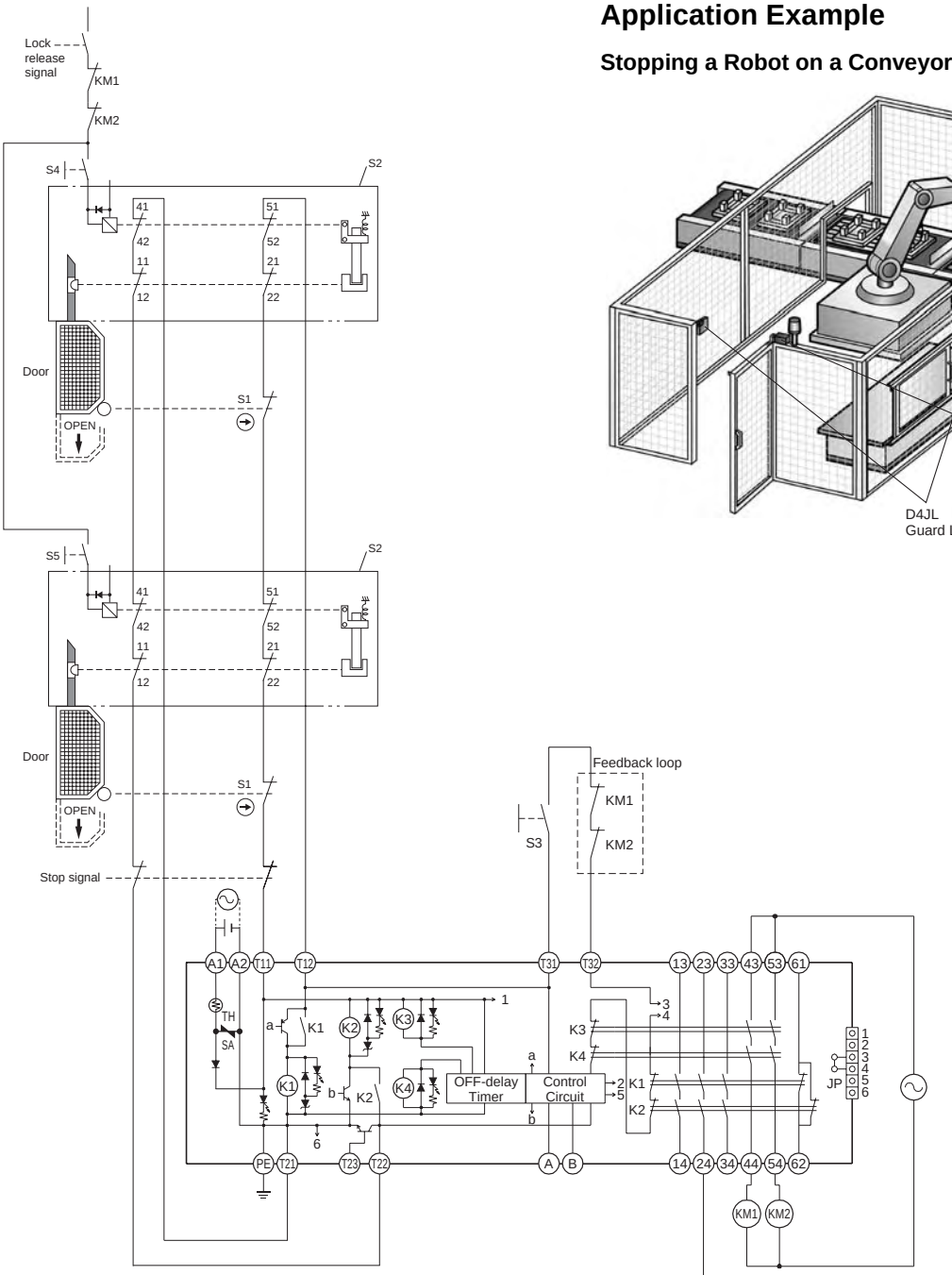
Application Examples

G9SA-321-T□ (24 VAC/VDC) + D4JL-□□□A-□□ (Mechanical Lock Models) Manual Reset

Application Example

Stopping a Robot on a Conveyor Line





S1:	Safety-door Switch with direct opening contact
S2:	Guard Lock Safety-door Switch
S3:	Reset switch
S4 and S5:	Lock release switches
KM1 and KM2:	Magnetic contactors
M:	3-phase motor

Note: 1. This circuit conforms to EN954-1 Safety Category 3.

2. When the release button is pressed on rear release models, the solenoid contacts are turned OFF.

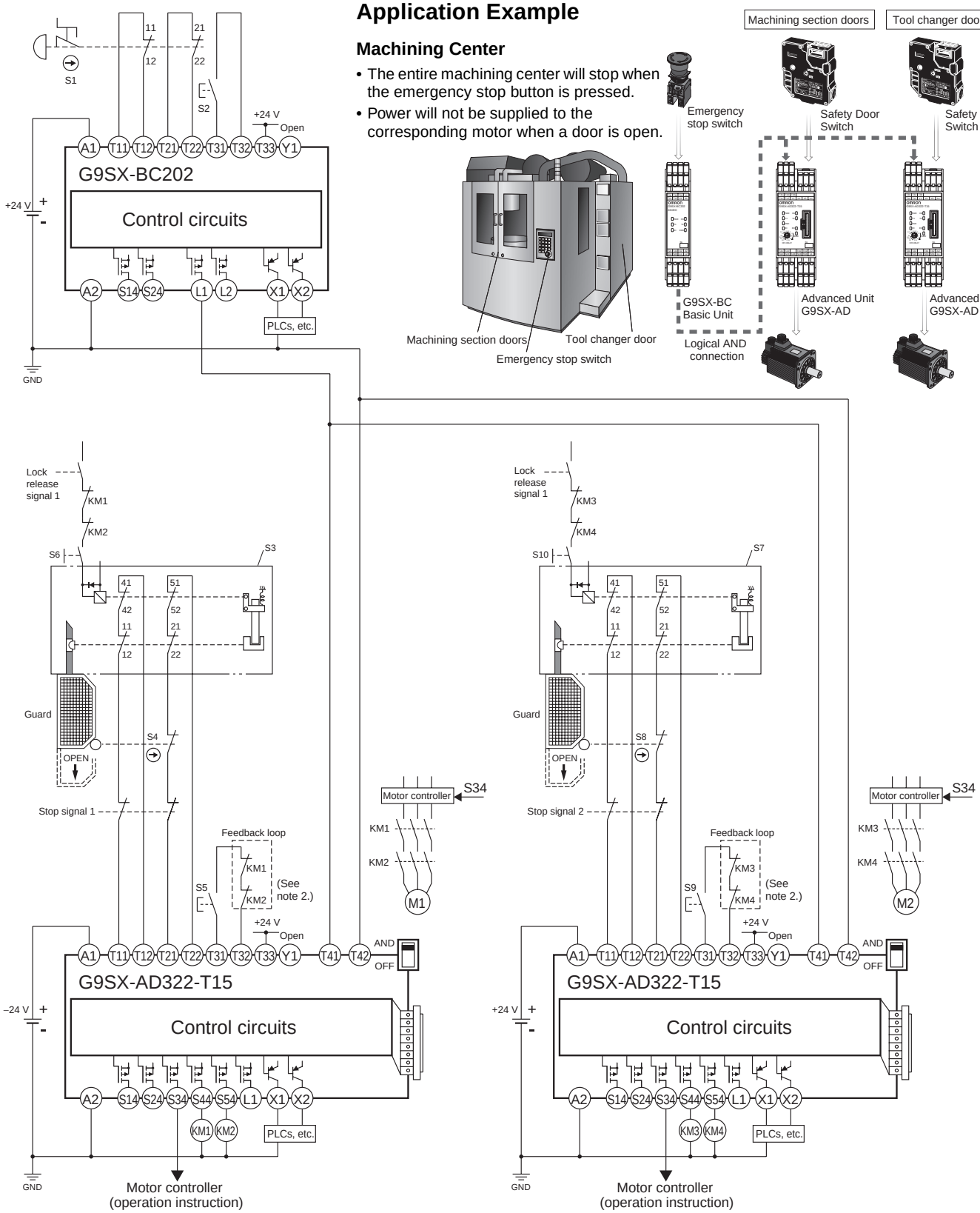
3. With Trapped Key Models, the door will not lock when it is closed with the trapped key removed.

G9SX-AD322-T15 (24 VDC) + D4JL-□□□A-□□ (Mechanical Lock Models)/Manual Reset

Application Example

Machining Center

- The entire machining center will stop when the emergency stop button is pressed.
- Power will not be supplied to the corresponding motor when a door is open.



S1:	Emergency stop switch
S3 and S7:	Guard Lock Safety-door Switches
S2, S5, and S9:	Reset switches
S6 and S10:	Lock release switches
S4 and S8:	Safety-door Limit Switches with direct opening contacts
KM 1, KM 2, KM3, and KM4:	Magnetic contactors
M1 and M2:	3-phase motors

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

@ DANGER

Always verify the operation of the safety functions before starting the system. Not doing so may result in the safety functions not performing as expected if the wiring or settings are incorrect or the Switches have failed. The system being controlled may continue to operate and possibly cause injury or death.

Always ensure that the release key is set to the "LOCK" position before starting the system. If the release key remains set to "UNLOCK", the electromagnetic lock function will not operate and the system may continue to operate, possibly causing injury or death. Always monitor the solenoid NC contact (Terminal 41-42) in your safety circuit. Do not connect indicator devices (like LED) to safety circuit connected to terminal 41-42.

Do not apply force exceeding the specified maximum holding force. Doing so may damage the Switch lock mechanism and the system may continue to operate, possibly causing injury or death. Either install another locking component (e.g., a stopper) in addition to the Switch, or use a warning method or indicator to show that the controlled system is locked to avoid overloading the holding force in lock mode.

⚠ CAUTION

Do not insert the Operation Key when the door is open. The machine may operate, possibly causing injury.

Do not use metal conduits or wiring ducts. Electric shock may occasionally occur.

■ Precautions for Safe Use

Installation Environment

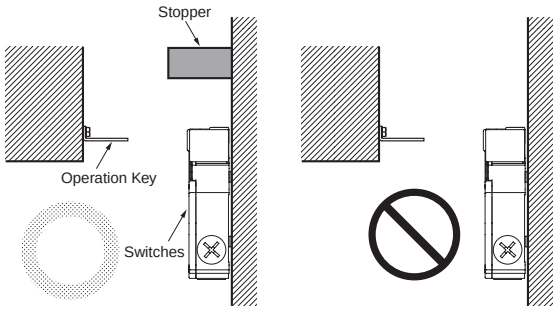
- Do not use the Switch in locations where explosive or flammable gases may be present.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head. Otherwise, the Switch may wear out more quickly or be damaged.

Wiring

- Connect a fuse in series with the D4JL to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%. When using the D4JL for an EN rating, use a 10-A fuse of type gI or gG that complies with IEC 60269.
- Do not switch circuits for two or more standard loads (3 A at 250 VAC) at the same time. Doing so may adversely affect insulation performance.
- Do not allow the load current to exceed the rated value.
- Do not use screws longer than 9 mm when using metal connectors. Otherwise it may result in electric shock.
- Do not use metal conduits. Damage to the conduit opening may result in an improper seal or electric shock.
- Do not use metal connectors or metal conduits when using ½-14NPT connectors. Damage to the conversion adapter may result in an improper seal or electric shock.
- Always attach the cover after completing wiring and before using the Switch. Do not supply power when the cover is not attached. Electric shock may occur if the Switch is used without the cover attached.

Installation

- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capability.
- Make sure the Switch is mounted securely to prevent it from falling off. Otherwise injury may result.
- Mount the Operation Key so that it will not come into contact with persons in the area when the door is opened and closed. Injury may result.
- Do not use the Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.



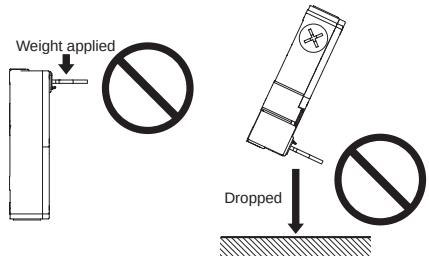
Other Precautions

- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- The durability of the Switch is greatly influenced by the switching conditions. Always test the switch under actual working conditions before application and use it in a switching circuit for which there are no problems with performance.
- The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.

■ Precautions for Correct Use

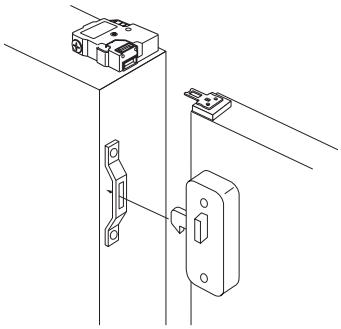
Operation Key

- Be sure to use the designated Operation Key only. The Head has been designed so that operation is not possible with a screwdriver or other tools.
- Do not operate the Switch with anything other than the special OMRON Operation Key, otherwise the Switch may break or the safety of the system may not be maintained.
- Do not impose excessive force on the Operation Key inserted into the Switch or drop the Switch with the Operation Key inserted, otherwise the Operation Key may deform or break.



Securing the Door

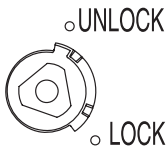
If the Operation Key on the closed door is pulled outside the set zone by force caused by vibration, the door's weight, or the door cushion rubber, the Switch may be damaged.
Also, it may not be possible to unlock the Switch if weight is placed on the Operation Key.
Secure the door with hooks so that it will remain within the set zone.



Switch Contacts

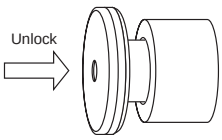
The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surface will become rough and contact reliability may be reduced.

Release Key



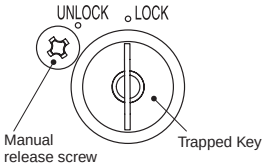
- The release key is used to unlock the Switch in case of emergency or if the power supply to the Switch stops.
- If the release key setting is changed from LOCK to UNLOCK using an appropriate tool, the lock will be released and the safety door can be opened (mechanical lock models only).
- After setting the release key to UNLOCK to, for example, change the head direction or perform maintenance, be sure to return it to the LOCK setting before resuming operation.
- The release key is set in the unlock position at the factory for the D4JL-□□□A-□5 and D4JL-□□□A-□6 and in the lock position for the D4JL-□□□G-□5 and D4JL-□□□A-□7-□□.
- If the release key is set to UNLOCK when the Switch is used for the door of a machine room to ensure the safety of people performing adjustment work inside, the door will not be locked when the door is closed and no power will be supplied to the equipment.
- Do not use the release key to start or stop machines.
- The auxiliary lock must be released using the release key only by authorized personnel.
- Do not impose a force exceeding 1 N·m on the release key screws. The release key may be damaged and may not operate properly.
- To prevent the release key from being used by unauthorized personnel, set it to LOCK and seal it with sealing wax.

Rear Release Button



- The rear release button is used for emergency escapes when someone locks a worker in the work area (hazardous area).
- The door can be unlocked by pressing the rear release button.
- After the rear release button is used to unlock the door, pull the button out to restore it to its original state. If the button is left pressed in, the door will not lock when the door is closed and power will not be supplied to the equipment.
- Mount the Switch so that the rear release button can be operated by a worker inside the work area (hazardous area).

Trapped Key



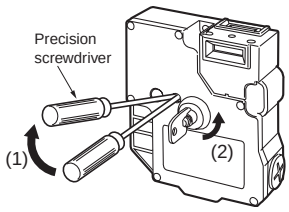
- The trapped key is released when power is supplied to the solenoid. Turn the trapped key to the UNLOCK position and remove the key to unlock the door. The door cannot be unlocked solely by supplying power to the solenoid. As long as a worker has the trapped key with him when he enters the work area (hazardous area), he cannot be locked inside by another worker.
- Do not impose a force exceeding 1 N·m when operating the key. Otherwise, the Switch may be damaged and may not operate properly.

Attaching a Cover

- Make sure the release key is set to the LOCK position before covering the D4JL.
- Always confirm that the seal rubber has no abnormalities before using it. The seal rubber will lose its sealing capability if the seal rubber is out of place or not properly seated, or if foreign material is adhering to it.
- Use only the correct screw. Using an incorrect screw will reduce the sealing capability of the seal rubber.
- Use one of the following methods when covering a Trapped Key Switch.
  When the Operation Key is removed (door open):
  Cover with the trapped key removed (UNLOCK).
  When the Operation Key is inserted (door closed):
  Cover with the trapped key inserted (LOCK).

Manual Release

- Manual release is used to unlock the Switch when power cannot be supplied to the solenoid, such as when power is interrupted or the equipment is being repaired.
  1. Use a Phillips screwdriver to remove the manual release screw. Use a precision screwdriver to press down the lever inside the Switch far enough to release the trapped key.
  2. The door is unlocked when the trapped key is turned to the UNLOCK position and removed.
- Do not use manual release to stop machines.
- After the Switch has been manually released, re-install the manual release screw in its proper position on the Switch using the specified torque.



Hinged Doors

If the Switch is mounted too close to the hinge, the force imposed on the lock will be much larger than for locations far from the hinge and the lock may be damaged. Mount the Switch close to the handle.

Solenoid Lock Models

The solenoid lock locks the door only when power is supplied to the solenoid. The door will be unlocked if the power supply to the solenoid stops. Therefore, do not use the solenoid lock models for machines that may be operating and dangerous even after the machine stops operating.

Mounting Methods

Tightening Torque

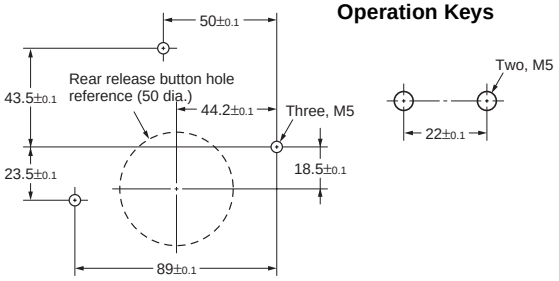
Be sure to tighten each screw of the Switch properly. Loose screws may result in malfunction.

Type	Tightening torque
Terminal screw	0.6 to 0.8 N·m
Cover mounting screw	0.7 to 0.9 N·m
Manual release screw	0.6 to 0.8 N·m
Operation Key mounting screw	2.4 to 2.8 N·m
Switch mounting screw	3.2 to 3.8 N·m
Connector	1.8 to 2.2 N·m (excluding 1/2-14NPT) 1.4 to 1.8 N·m (1/2-14NPT)
Cap screw	1.3 to 1.7 N·m

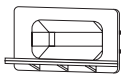
Switch and Operation Key Mounting

- Mount the Switch and Operation Key securely to the applicable tightening torque with M5 screws.

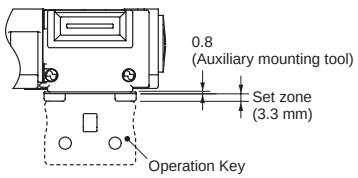
Mounting Holes for Switches **Mounting Holes for Operation Keys**



- Do not operate the Switch with anything other than the special OMRON Operation Key. Otherwise, the Switch may be damaged and the safety of the system may not be maintained.
- Ensure that the alignment offset between the Operation Key and the key hole does not exceed ±0.8 mm. If the Operation Key is offset or at an angle, premature wear or damage to the Switch may result.
- When inserting the Operation Key, install the provided mounting auxiliary tool in the key hole and use the tool to position the key in the key hole center and set zone.
- Remove the mounting auxiliary tool from the Switch after the Operation Key is properly inserted.



- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.



- Do not impose excessive force on the Key top while the Operation Key is inserted into the Switch body or drop the Switch with the Operation Key inserted. Doing either of these may deform the Key or break the Switch body.
- Attach the enclosed cap head to any Operation Key hole that is not used.

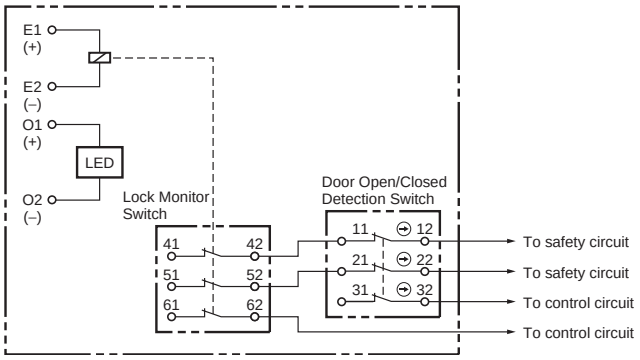
Securing Doors

When the door is closed (with the Operation Key inserted), it may be pulled beyond the set zone because of, for example, the door's weight, or the door cushion rubber.
Use hooks to ensure that the door stays within the set zone.

Wiring

Circuit Connection Example

- Direct opening contacts used for safety circuit inputs are indicated with the ⊖ mark. Terminals 12-41 and terminals 22-51 have direct opening contacts.
- Connect the indicators in parallel to the auxiliary circuits or terminals E1 and E2. Do not connect the indicators in parallel with the direct opening contact. If the indicators are broken, a short-circuit current may flow, causing equipment to malfunction.
- Do not switch circuits for two or more standard loads at the same time. Doing so may adversely affect insulation performance.
- The 24-VDC solenoid terminals have polarity (E1: +, E2: –). Confirm the polarity before wiring.
- The contact ON/OFF timing for Switches is not synchronized. Confirm performance before application.

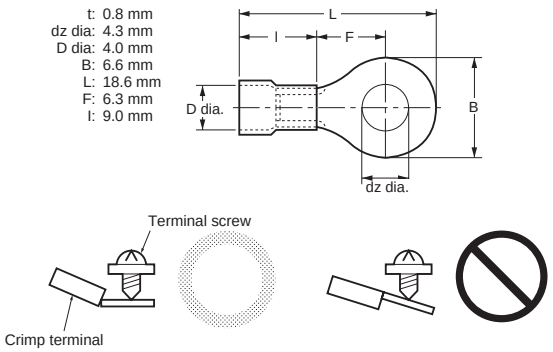


Wiring

- Do not wire the Switch while power is being supplied. Doing so may result in electric shock.
- Do not let particles, such as small pieces of lead wire, enter the switch body when wiring.
- Make sure that the wiring does not hide the LED indicator when wiring E1/E2 or 01/02.
- When connecting to the terminals via insulating tube and M3.5 crimp terminals, arrange the crimp terminals so that they do not rise up onto the case or the cover.
- Applicable lead wire size: AWG22 to AWG18 (0.3 to 0.75 mm^2). Use lead wires of an appropriate length. Not doing so may result in excess length causing the cover to rise and not fit properly.
- Do not pull on the lead wires with excessive force. Doing so may disconnect them.
- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.

Recommended Crimp Terminals

Manufacturer	Model
J.S.T. Mfg Co.	FN1.25-M4 (F Type) N1.25-M4 (Straight Type)



Processing the Conduit Opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the proper torque. The case may be damaged if excessive tightening torque is applied.
- When using a 1/2-14NPT conduit, wind sealing tape around the conduit end of the connector so that the enclosure will conform to IP67.
- Make sure that the outer diameter of the cable connected to the connector is correct.
- Attach a conduit cap to the unused conduit opening when wiring and tighten it to a suitable torque. The conduit cap is provided with the Switch.

Recommended Connectors

Use a connector with a screw section not exceeding 9 mm. Otherwise, the screws will protrude into the case interior. The connectors given in the following table have connectors with screw sections not exceeding 9 mm. Use the following connectors to ensure conformance to IP67.

Size	Manufacturer	Model		Applicable cable diameter
G1/2	LAPP	ST-PF1/2	5380-1002	6.0 to 12.0 mm
PG13.5	LAPP	ST-13.5	5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5	5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2	5301-6030	6.0 to 12.0 mm

Use LAPP connectors together with Seal Packing (JPK-16, GP-13.5, or GPM20), and tighten to the applicable torque. Seal Packing is sold separately.

- Lapp product distributor: HAGITEC CO, LTD., Tel: 043-423-8741
- For a 1/2-14NPT conduit, use the above connector after attaching the provided Adaptor to the Switch and wrapping it with sealing tape.

Operating Environment

- The Switch is intended for indoor use only.
  Do not use the Switch outdoors. Doing so may cause the Switch to malfunction.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or Cl_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch caused by contact failure or corrosion.
- Do not use the Switch in the following locations.
  - Locations subject to severe temperature changes.
  - Locations subject to high humidity or condensation.
  - Locations subject to severe vibration.
  - Locations where the interior of the Protective Door may come into direct contact with cutting chips, metal filings, oil, or chemicals.
  - Locations where the Switch may come into contact with thinner or detergents.
  - Locations where explosive or flammable gases are present.

Maintenance and Repairs

The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.

Storage

Do not store the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or Cl_2) or dust is present, or in locations subject to high temperature or high humidity.

Other Precautions

- A Guard Lock Safety-door Switch will heat when power is supplied to the solenoid. Do not touch these Switches.
- Perform maintenance inspections periodically.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C135-E1-03

Guard Lock Safety-door Switch
D4NL

Best-selling Guard Lock Safety-door Switch Available in Several Compact, Multi-contact Models

- Selectable Operation Key insertion direction and adjustable mounting ensure installation flexibility.
- Built-in switches with multiple-contact construction are available.
- Key holding force of 1,300 N minimum.
- Can be used for either standard loads or microloads.
- Lineup includes models with a conduit size of M20.
- IP67 degree of protection.

Note: Be sure to read the *"Safety Precautions"* on page 400 and the *"Precautions for All Safety Door Switches"* on page 317.

Model Number Structure

■ Model Number Legend

Switch

D4NL-□□□□-□□□
1 2 3 4 5 6 7

1. **Conduit Size**
   - 1: Pg13.5
   - 2: G1/2
   - 4: M20
2. **Built-in Switch (with Door Open/Closed Detection Switch and Lock Monitor Switch Contacts)**
   - A: 1NC/1NO slow-action contacts plus 1NC/1NO slow-action contacts
   - B: 1NC/1NO slow-action contacts plus 2NC slow-action contacts
   - C: 2NC slow-action contacts plus 1NC/1NO slow-action contacts
   - D: 2NC slow-action contacts plus 2NC slow-action contacts
   - E: 2NC/1NO slow-action contacts plus 1NC/1NO slow-action contacts
   - F: 2NC/1NO slow-action contacts plus 2NC slow-action contacts
   - G: 3NC slow-action contacts plus 1NC/1NO slow-action contacts
   - H: 3NC slow-action contacts plus 2NC slow-action contacts
3. **Head Mounting Direction and Material**
   - F: Four mounting directions possible (Front-side mounting at time of delivery)/plastic
   - D: Four mounting directions possible (Front-side mounting at time of delivery)/metal
4. **Door Lock and Release**
   - A: Mechanical lock/24-VDC solenoid release
   - B: Mechanical lock/110-VAC solenoid release
   - C: Mechanical lock/230-VAC solenoid release
   - G: 24-VDC solenoid lock/mechanical release
   - H: 110-VAC solenoid lock/mechanical release
   - J: 230-VAC solenoid lock/mechanical release
5. **Indicator**
   - B: 10 to 115 VAC/VDC (orange LED indicator)
6. **Release Key Type**
   - Blank: Standard
   - 4: Special release key
7. **Release Key Position**
   - Blank: Bottom
   - S: Front

Note: Models with M20 conduits are also available with an M20 to 1/2-14NPT Adaptor.

Operation Key

D4DS-K□
1

1. **Operation Key Type**
   - 1: Horizontal mounting
   - 2: Vertical mounting
   - 3: Adjustable mounting (horizontal)
   - 5: Adjustable mounting (horizontal/vertical)

Ordering Information

■ List of Models

Switches (Operation Keys are sold separately.)

: Models with certified direct opening contacts.

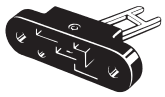
Head material	Release key position	Release key type	Solenoid voltage/ indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts) (slow-action) Certified direct opening NC contact	Conduit opening	Model
Plastic (See note.)	Bottom	Standard	Solenoid: 24 VDC Orange LED: 10 to 115 VAC/VDC	Mechanical lock Solenoid release	1NC/1NO+1NC/1NO	Pg13.5	D4NL-1AFA-B
						G1/2	D4NL-2AFA-B
						M20	D4NL-4AFA-B
					1NC/1NO+2NC	Pg13.5	D4NL-1BFA-B
						G1/2	D4NL-2BFA-B
						M20	D4NL-4BFA-B
					2NC+1NC/1NO	Pg13.5	D4NL-1CFA-B
						G1/2	D4NL-2CFA-B
						M20	D4NL-4CFA-B
					2NC+2NC	Pg13.5	D4NL-1DFA-B
						G1/2	D4NL-2DFA-B
						M20	D4NL-4DFA-B
					2NC/1NO+1NC/1NO	Pg13.5	D4NL-1EFA-B
						G1/2	D4NL-2EFA-B
						M20	D4NL-4EFA-B
					2NC/1NO+2NC	Pg13.5	D4NL-1FFA-B
						G1/2	D4NL-2FFA-B
						M20	D4NL-4FFA-B
					3NC+1NC/1NO	Pg13.5	D4NL-1GFA-B
						G1/2	D4NL-2GFA-B
						M20	D4NL-4GFA-B
					3NC+2NC	Pg13.5	D4NL-1HFA-B
						G1/2	D4NL-2HFA-B
						M20	D4NL-4HFA-B
				Solenoid lock Mechanical release	1NC/1NO+1NC/1NO	Pg13.5	D4NL-1AFG-B
						G1/2	D4NL-2AFG-B
						M20	D4NL-4AFG-B
					1NC/1NO+2NC	Pg13.5	D4NL-1BFG-B
						G1/2	D4NL-2BFG-B
						M20	D4NL-4BFG-B
					2NC+1NC/1NO	Pg13.5	D4NL-1CFG-B
						G1/2	D4NL-2CFG-B
						M20	D4NL-4CFG-B
					2NC+2NC	Pg13.5	D4NL-1DFG-B
						G1/2	D4NL-2DFG-B
						M20	D4NL-4DFG-B
					2NC/1NO+1NC/1NO	Pg13.5	D4NL-1EFG-B
						G1/2	D4NL-2EFG-B
						M20	D4NL-4EFG-B
					2NC/1NO+2NC	Pg13.5	D4NL-1FFG-B
						G1/2	D4NL-2FFG-B
						M20	D4NL-4FFG-B
					3NC+1NC/1NO	Pg13.5	D4NL-1GFG-B
						G1/2	D4NL-2GFG-B
						M20	D4NL-4GFG-B
					3NC+2NC	Pg13.5	D4NL-1HFG-B
						G1/2	D4NL-2HFG-B
						M20	D4NL-4HFG-B

Note: Switches with metal heads can also be manufactured upon request. Ask your OMRON representative for details.

Head material	Release key position	Release key type	Solenoid voltage/ indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts) (slow-action) Certified direct opening NC contact	Conduit opening	Model
Plastic (See note.)	Bottom	Special release key	Solenoid: 24 VDC Orange LED: 10 to 115 VAC/VDC	Mechanical lock Solenoid release	1NC/1NO+1NC/1NO	Pg13.5	D4NL-1AFA-B4
						G1/2	D4NL-2AFA-B4
						M20	D4NL-4AFA-B4
					1NC/1NO+2NC	Pg13.5	D4NL-1BFA-B4
						G1/2	D4NL-2BFA-B4
						M20	D4NL-4BFA-B4
					2NC+1NC/1NO	Pg13.5	D4NL-1CFA-B4
						G1/2	D4NL-2CFA-B4
						M20	D4NL-4CFA-B4
					2NC+2NC	Pg13.5	D4NL-1DFA-B4
						G1/2	D4NL-2DFA-B4
						M20	D4NL-4DFA-B4
					2NC/1NO+1NC/1NO	Pg13.5	D4NL-1EFA-B4
						G1/2	D4NL-2EFA-B4
						M20	D4NL-4EFA-B4
					2NC/1NO+2NC	Pg13.5	D4NL-1FFA-B4
						G1/2	D4NL-2FFA-B4
						M20	D4NL-4FFA-B4
					3NC+1NC/1NO	Pg13.5	D4NL-1GFA-B4
						G1/2	D4NL-2GFA-B4
						M20	D4NL-4GFA-B4
					3NC+2NC	Pg13.5	D4NL-1HFA-B4
						G1/2	D4NL-2HFA-B4
						M20	D4NL-4HFA-B4
				Solenoid lock Mechanical release	1NC/1NO+1NC/1NO	Pg13.5	D4NL-1AFG-B4
						G1/2	D4NL-2AFG-B4
						M20	D4NL-4AFG-B4
					1NC/1NO+2NC	Pg13.5	D4NL-1BFG-B4
						G1/2	D4NL-2BFG-B4
						M20	D4NL-4BFG-B4
					2NC+1NC/1NO	Pg13.5	D4NL-1CFG-B4
						G1/2	D4NL-2CFG-B4
						M20	D4NL-4CFG-B4
					2NC+2NC	Pg13.5	D4NL-1DFG-B4
						G1/2	D4NL-2DFG-B4
						M20	D4NL-4DFG-B4
					2NC/1NO+1NC/1NO	Pg13.5	D4NL-1EFG-B4
						G1/2	D4NL-2EFG-B4
						M20	D4NL-4EFG-B4
					2NC/1NO+2NC	Pg13.5	D4NL-1FFG-B4
						G1/2	D4NL-2FFG-B4
						M20	D4NL-4FFG-B4
					3NC+1NC/1NO	Pg13.5	D4NL-1GFG-B4
						G1/2	D4NL-2GFG-B4
						M20	D4NL-4GFG-B4
					3NC+2NC	Pg13.5	D4NL-1HFG-B4
						G1/2	D4NL-2HFG-B4
						M20	D4NL-4HFG-B4

Note: Switches with metal heads can also be manufactured upon request. Ask your OMRON representative for details.

Operation Keys

Type	Model
Horizontal mounting 	D4DS-K1
Vertical mounting 	D4DS-K2
Adjustable mounting (Horizontal) 	D4DS-K3
Adjustable mounting (Horizontal/Vertical) 	D4DS-K5

Specifications

■ Standards and EC Directives

- Machinery Directive
- Low Voltage Directive
- EN1088
- EN60204-1
- GS-ET-19

■ Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN60947-5-1 (certified direct opening)	(See note 1.)
UL (See note 2.)	UL508, CSA C22.2 No.14	E76675
CQC (CCC)	GB14048.5	2003010305064267

Note: 1. Consult your OMRON representative for details.
2. Certification for CSA C22.2 No. 14 is authorized by the UL mark.
3. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item / Utilization category	AC-15	DC-13
Rated operating current (I_e)	3 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC60269 as a short-circuit protection device. This fuse is not built into the Switch.

UL/CSA (UL508, CSA C22.2 No. 14)

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

Q300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VDC		0.27 A	0.27 A		

Solenoid Coil Characteristics

Item	24 VDC	110 VAC	230 VAC
Rated operating voltage (100% ED)	24 VDC $^{+10\%}_{-10\%}$	110 VAC ±10%	230 VAC ±10%
Current consumption	Approx. 200 mA	Approx. 50 mA	Approx. 30 mA
Insulation	Class F (130°C max.)		

Indicator Characteristics

Item	LED
Rated voltage	10 to 115 VAC/VDC
Current leakage	Approx. 1 mA
Color (LED)	Orange

■ Characteristics

Degree of protection (see note 3)		IP67 (EN60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)	
Durability (see note 4)	**Mechanical**	1,000,000 operations min.	
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC (see note 5)	
Operating speed		0.05 to 0.5 m/s	
Operating frequency		30 operations/minute max.	
Rated frequency		50/60 Hz	
Contact gap		2 x 2 mm min	
Direct opening force (see note 6)		60 N min. (EN60947-5-1)	
Direct opening travel (see note 6)		10 mm min. (EN60947-5-1)	
Holding force (see note 7)		1,300 N min.	
Insulation resistance		100 MΩ min. (at 500 VDC)	
Minimum applicable load (see note 8)		Resistive load of 1 mA at 5 VDC (N-level reference value)	
Rated insulation voltage (U_i)		300 V (EN60947-5-1)	
Rated open thermal current (I_{th})		10 A (EN60947-5-1)	
Impulse withstand voltage (EN60947-5-1)		Between terminals of the same polarity	2.5 kV
		Between terminals of different polarities	4 kV
		Between other terminals and uncharged metallic parts	6 kV
Conditional short-circuit current		100 A (EN60947-5-1)	
Pollution degree (operating environment)		3 (EN60947-5-1)	
Protection against electric shock		Class II (double insulation)	
Contact resistance		25 mΩ max. per contact (initial value)	
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude	
Shock resistance	**Destruction**	1,000 m/s^2 min.	
	Malfunction	100 m/s^2 min.	
Ambient temperature		Operating: –10°C to 55°C with no icing	
Ambient humidity		Operating: 95% max.	
Weight		Approx. 370 g (D4NL-IAFA-B)	

Note: 1. The above values are initial values.

2. The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4NL in places where foreign material may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.

4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.

5. Do not pass the 3-A, 250-VAC load through more than 2 circuits.

6. These figures are minimum requirements for safe operation.

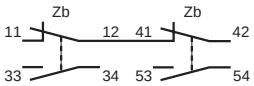
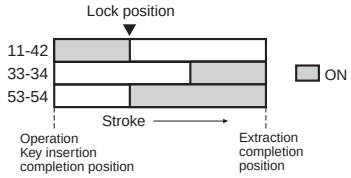
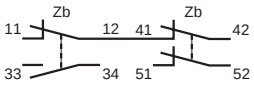
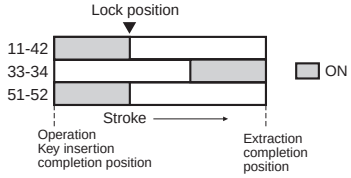
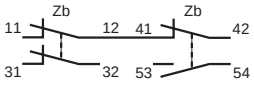
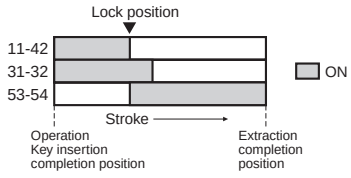
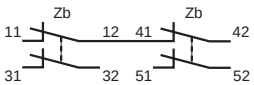
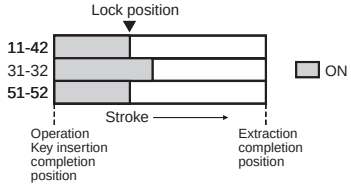
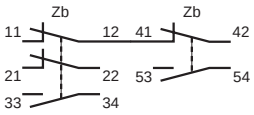
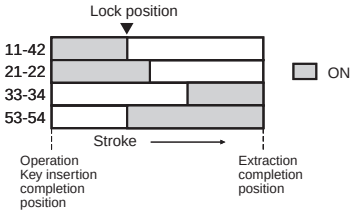
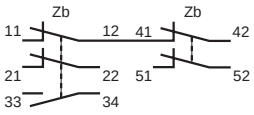
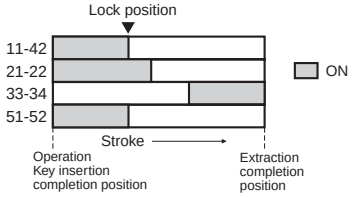
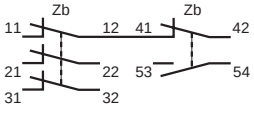
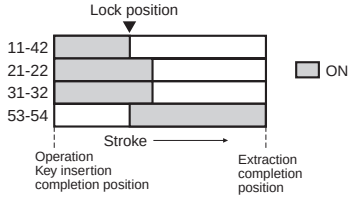
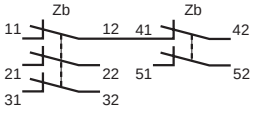
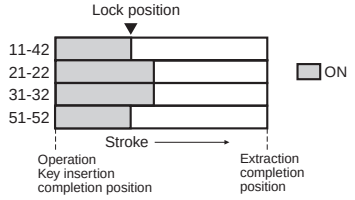
7. This figure is based on the GS-ET-19 evaluation method.

8. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

Connections

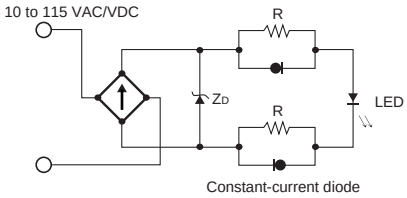
■ Contact Form

Indicates conditions where the Key is inserted and the lock is applied. Terminals 12 and 41 are connected internally (as per GS-ET-19).

Model	Contact	Contact form	Operating pattern	Remarks
D4NL-□AF□-□	1NC/1NO + 1NC/1NO			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-42, 33-34, and 53-54 can be used as unlike poles.
D4NL-□BF□-□	1NC/1NO + 2NC			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-42, 33-34, and 51-52 can be used as unlike poles.
D4NL-□CF□-□	2NC + 1NC/1NO			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-42, 31-32, and 53-54 can be used as unlike poles.
D4NL-□DF□-□	2NC + 2NC			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-42, 31-32, and 51-52 can be used as unlike poles.
D4NL-□EF□-□	2NC/1NO + 1NC/1NO			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 33-34, and 53-54 can be used as unlike poles.
D4NL-□FF□-□	2NC/1NO + 2NC			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 33-34, and 51-52 can be used as unlike poles.
D4NL-□GF□-□	3NC + 1NC/1NO			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 31-32, and 53-54 can be used as unlike poles.
D4NL-□HF□-□	3NC + 2NC			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-42, 21-22, 31-32, and 51-52 can be used as unlike poles.

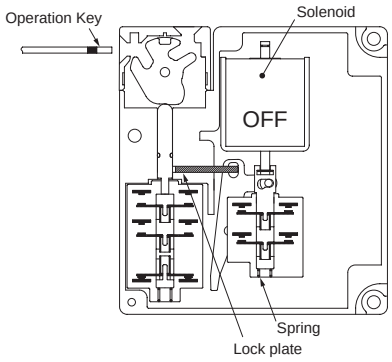
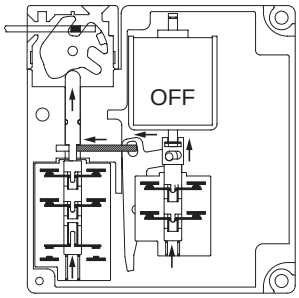
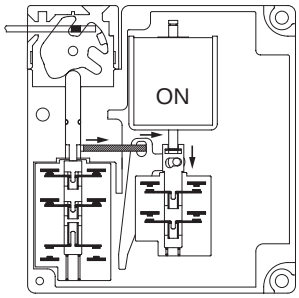
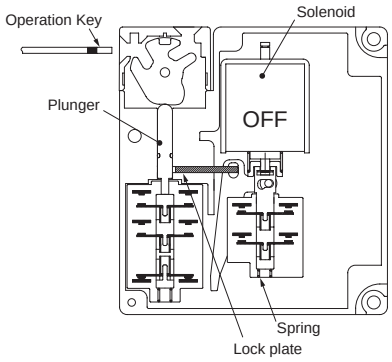
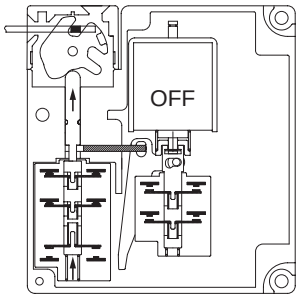
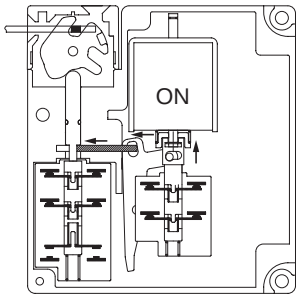
■ Indicator

Internal Circuit Diagram



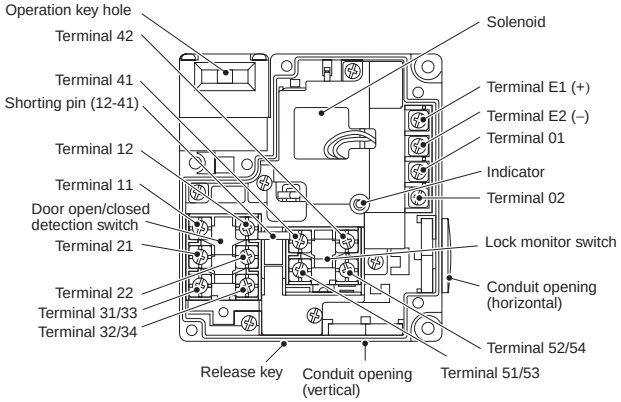
Operation Method

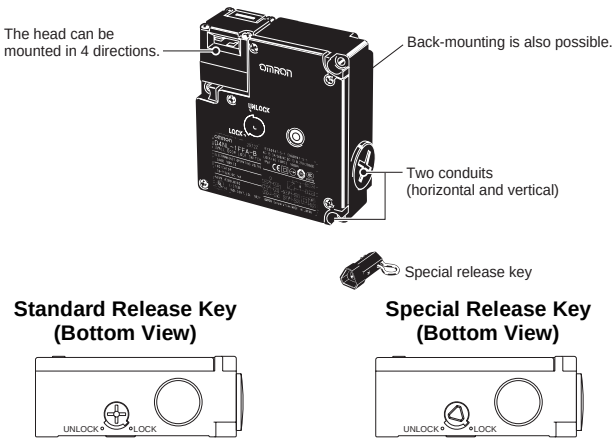
■ Operation Principles

Mechanical lock models		 When the Operation Key is inserted, it is locked by the lock spring. The door will stay locked even if there is a power interruption.	 The solenoid is released only when the lock is turned ON.
Solenoid lock models		 If the solenoid is OFF, the door will not be locked when the Operation Key is inserted. This means that the door can be opened and closed easily when replacing workpieces or parts.	 The door is locked only when the solenoid is turned ON. This means that the door will be unlocked if there is a power interruption and so this model cannot be used in systems that would maintain a hazardous state (e.g., systems requiring toxic gases, high temperatures, or gears that would continue to turn due to inertia).

Nomenclature

■ Structure





Note: Terminal numbers vary with the model.

Dimensions

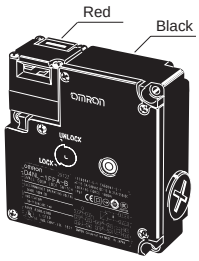
Note: All units are in millimeters unless otherwise indicated.

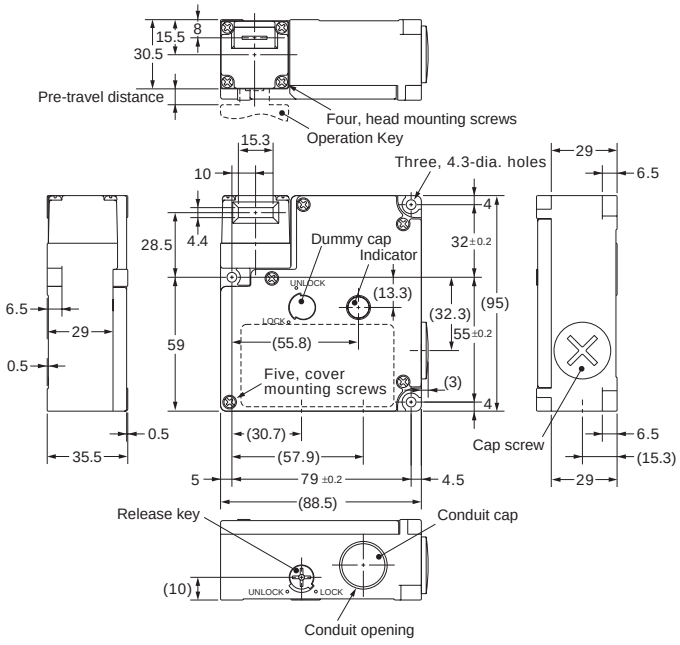
Switches

Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

2. There are fluctuations in the contact ON/OFF timing for Switches with multiple poles (2NC, 2NC/1NO, or 3NC). Confirm performance before application.

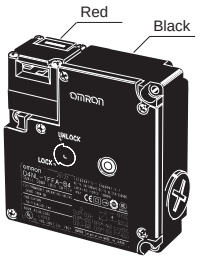
D4NL-□□□□-B

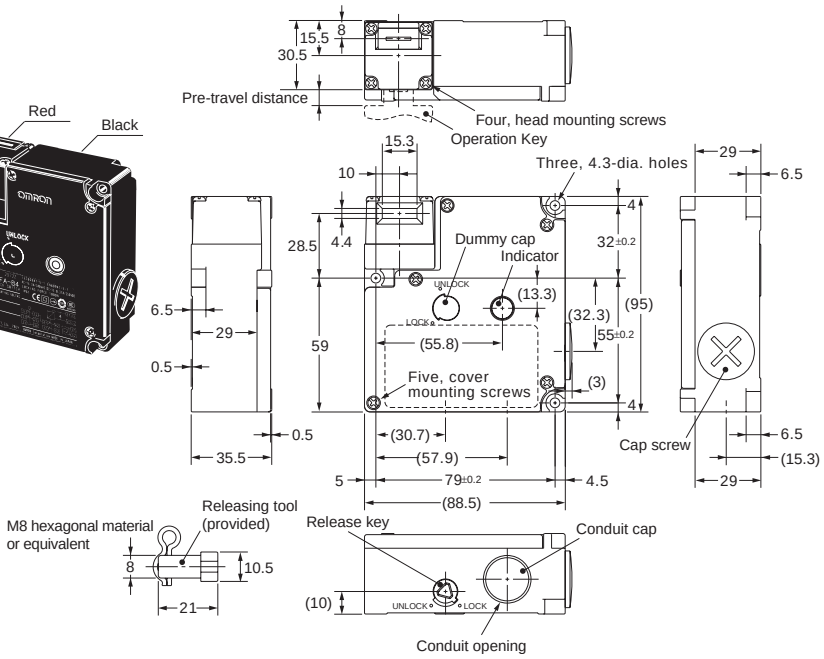




Operating characteristics	D4NL-□□□□-B
Key insertion force Key extraction force	15 N max. 30 N max.
Pre-travel distance	9 mm max.
Movement before being locked	3 mm min.

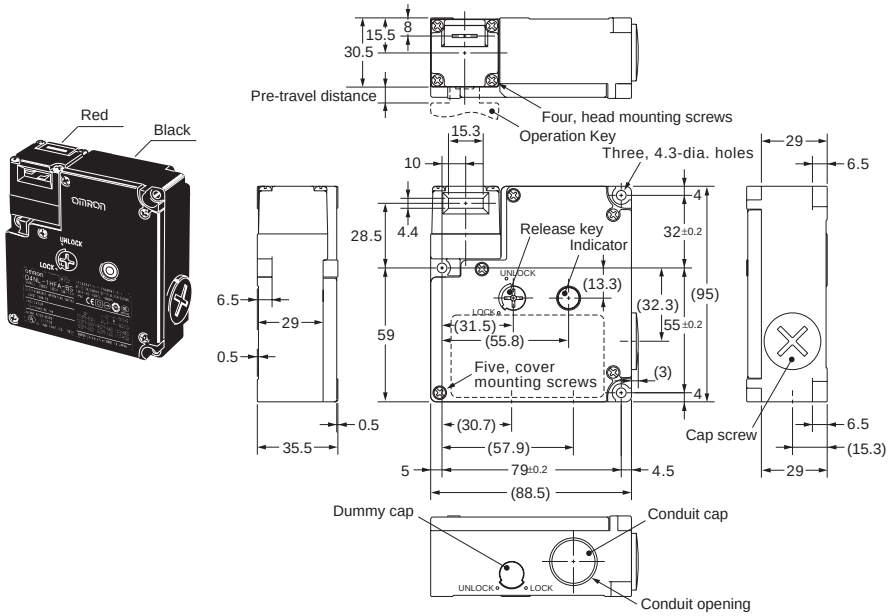
D4NL-□□□□-B4





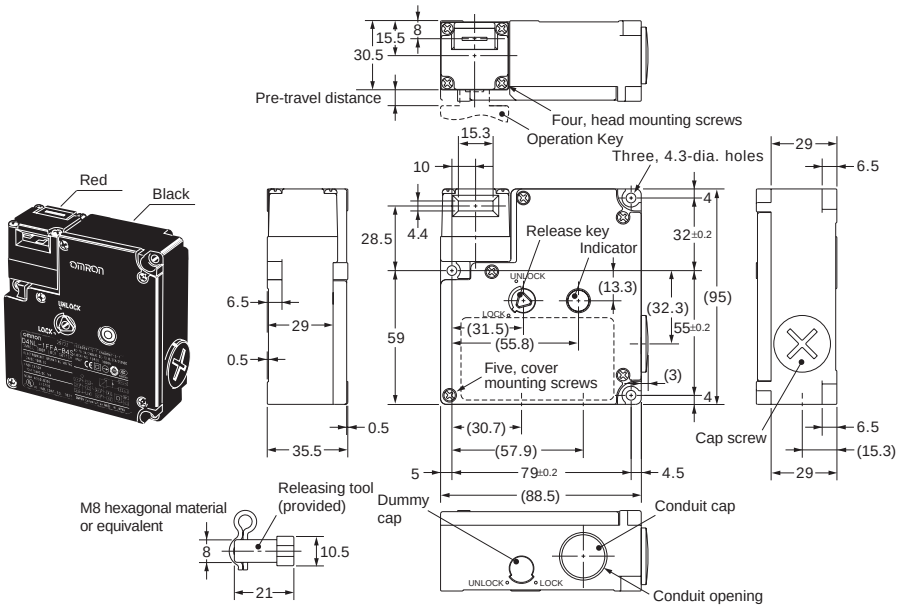
Operating characteristics	D4NL-□□□□-B4
Key insertion force Key extraction force	15 N max. 30 N max.
Pre-travel distance	9 mm max.
Movement before being locked	3 mm min.

D4NL-□□□□-BS



Operating characteristics	D4NL-□□□□-BS
Key insertion force Key extraction force	15 N max. 30 N max.
Pre-travel distance	9 mm max.
Movement before being locked	3 mm min.

D4NL-□□□□-B4S

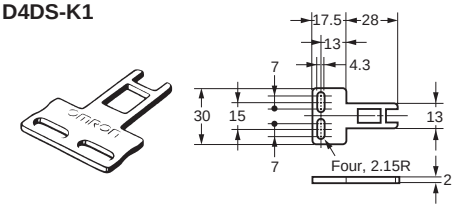


Operating characteristics	D4NL-□□□□-B4S
Key insertion force Key extraction force	15 N max. 30 N max.
Pre-travel distance	9 mm max.
Movement before being locked	3 mm min.

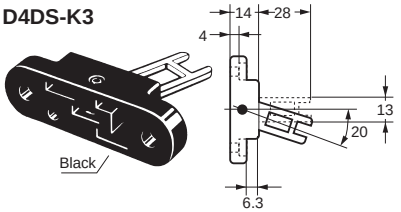
Operation Keys

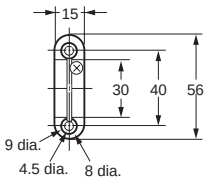
Note: Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

D4DS-K1

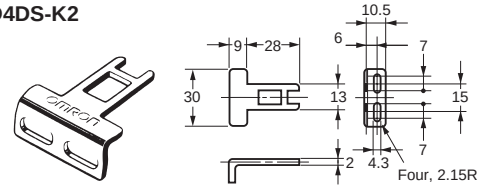


D4DS-K3

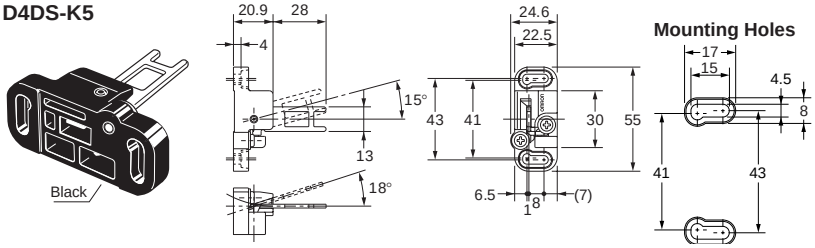




D4DS-K2

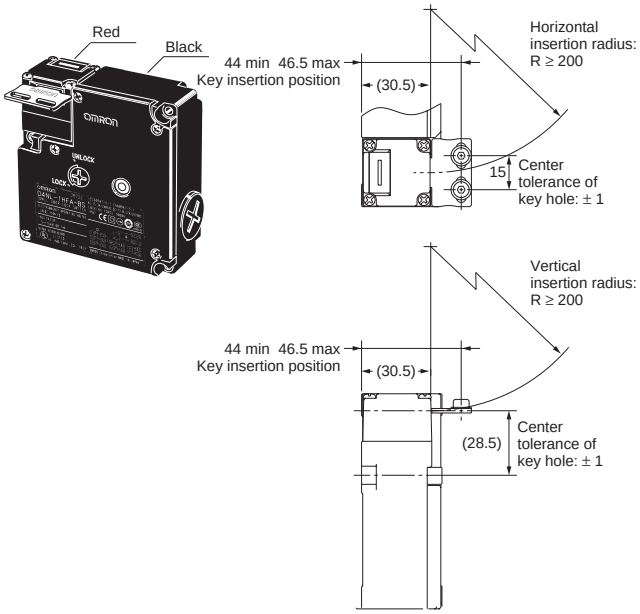


D4DS-K5

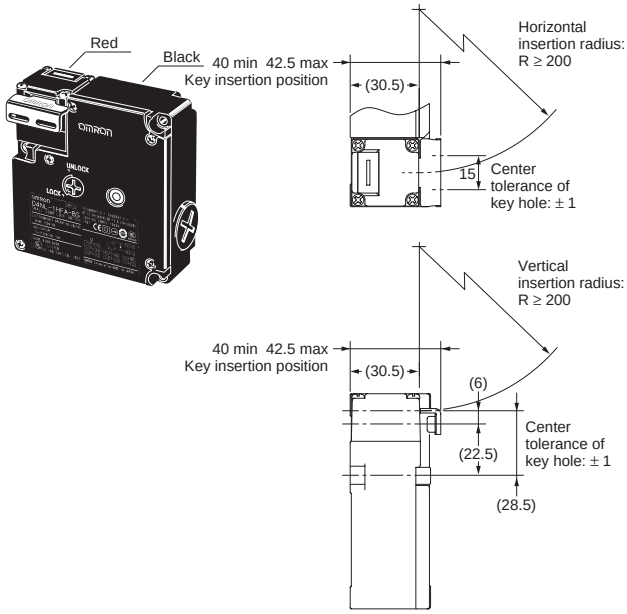


With Operation Key Inserted

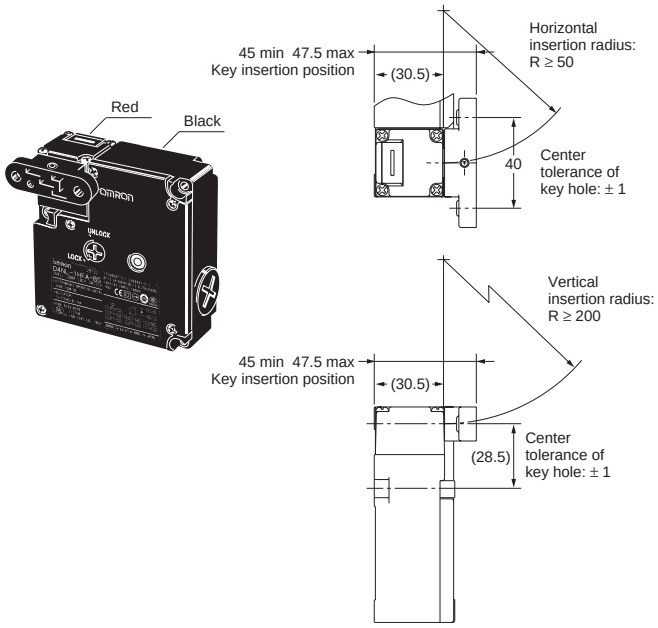
D4NL + D4DS-K1



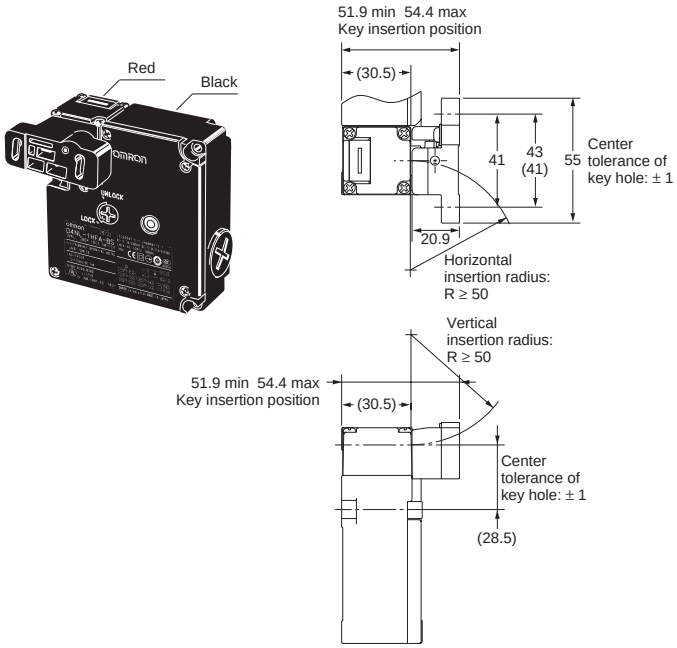
D4NL + D4DS-K2



D4NL + D4DS-K3

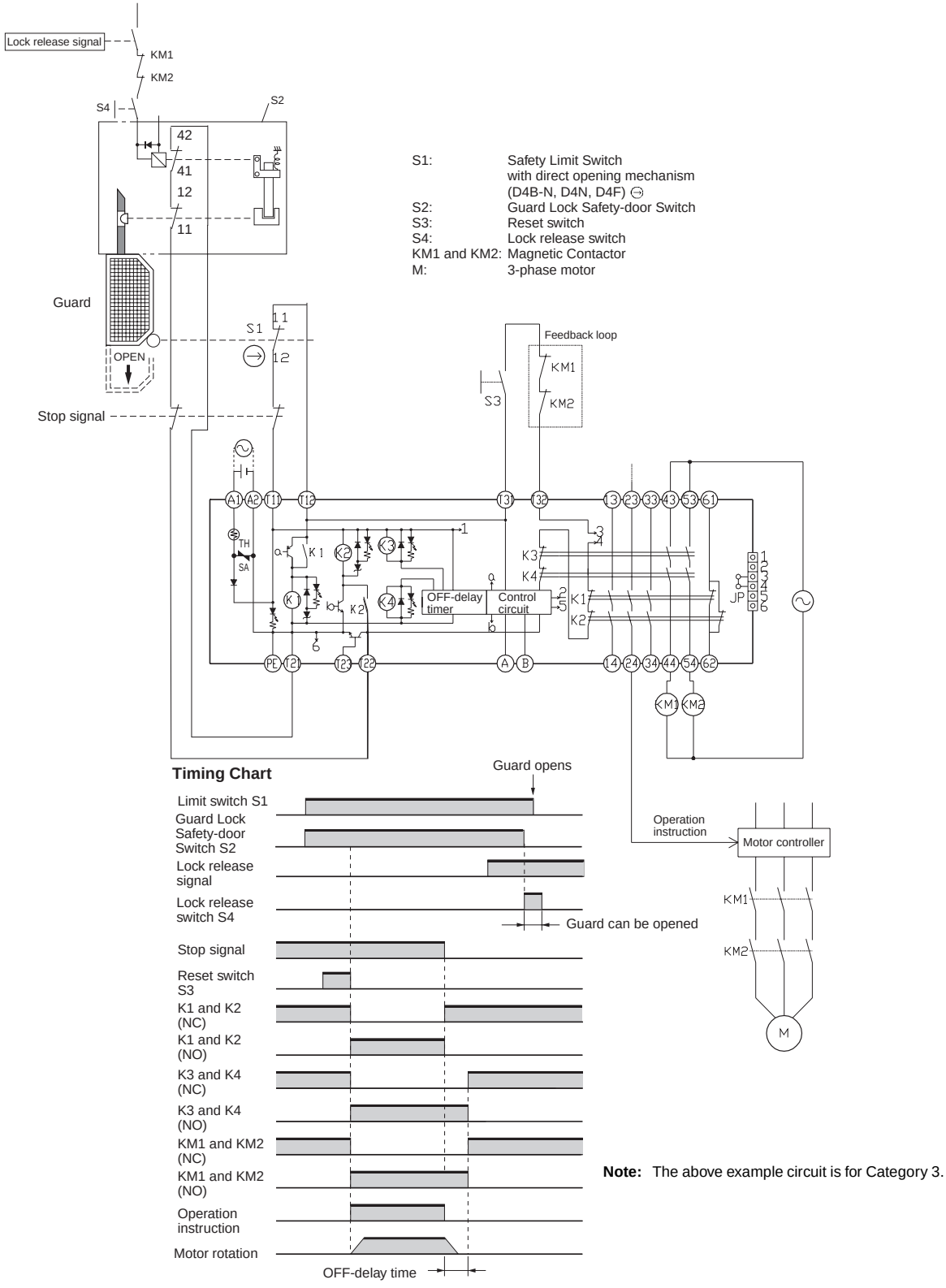


D4NL + D4DS-K5



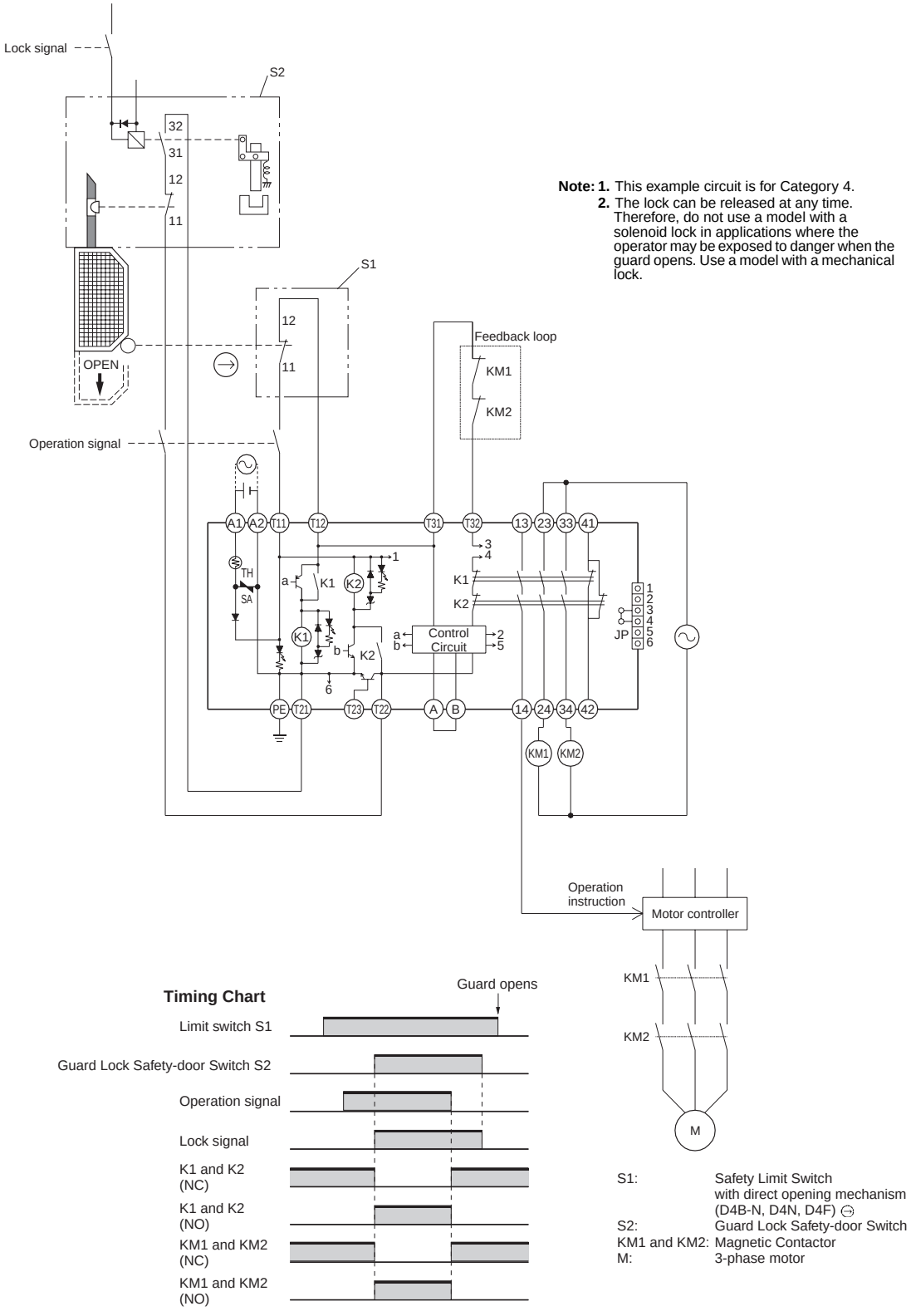
Application Examples

■ G9SA-321-T□ (24 VAC/VDC) + D4NL-□A-□, □B-□, □C-□ (Mechanical Lock Type) Circuit Diagram (Manual Reset)



Note: The above example circuit is for Category 3.

■ G9SA-301 (24 VAC/VDC) + D4NL-□G-□, □H-□, □J-□ (Solenoid Lock Type) Circuit Diagram (Auto-reset)



Note: 1. This example circuit is for Category 4.
2. The lock can be released at any time. Therefore, do not use a model with a solenoid lock in applications where the operator may be exposed to danger when the guard opens. Use a model with a mechanical lock.

Timing Chart

S1: Safety Limit Switch with direct opening mechanism (D4B-N, D4N, D4F) ⇔
S2: Guard Lock Safety-door Switch
KM1 and KM2: Magnetic Contactor
M: 3-phase motor

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

@ DANGER

Always verify the operation of the safety functions before starting the system. Not doing so may result in the safety functions not performing as expected if the wiring or settings are incorrect or the Switches have failed. The system being controlled may continue to operate and possibly cause injury or death.

Always ensure that the release key is set to the "LOCK" position before starting the system. If the release key remains set to "UNLOCK", the electromagnetic lock function will not operate and the system may continue to operate, possibly causing injury or death. Always monitor the solenoid NC contact (Terminal 41-42) in your safety circuit.
Do not connect indicator devices (like LED) to safety circuit connected to terminal 41-42.

Before changing the head direction always ensure that the release key is set to "UNLOCK", or that the Operation Key is inserted. Not doing so may damage the Switch and the system may continue to operate, possibly causing injury or death. Refer to *"Release Key"* on page 401.

Do not apply force exceeding the specified maximum holding force. Doing so may damage the Switch lock mechanism and the system may continue to operate, possibly causing injury or death. Either install another locking component (e.g., a stopper) in addition to the Switch, or use a warning method or indicator to show that the controlled system is locked to avoid overloading the holding force in lock mode.

⚠ CAUTION

Do not insert the Operation Key when the door is open. The machine may operate, possibly causing injury.

Do not use metal conduits or wiring ducts. Electric shock may occasionally occur.

■ Precautions for Safe Use

Installation Environment

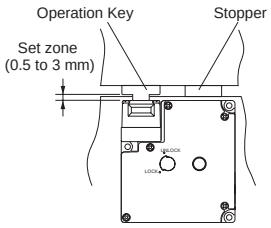
- Do not use the Switch in locations where explosive or flammable gases may be present.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the Switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head.
  Otherwise, accelerated wear or breaking may result.

Wiring

- Connect a fuse in series with the D4NL to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%. When using the D4NL for an EN rating, use a 10-A fuse of type gI or gG that complies with IEC 60269.
- When switching general loads (250 VAC/3 A), do not operate two circuits or more at the same time. Otherwise, insulation performance may be degraded.
- Do not allow the load current to exceed the rated value.
- Always attach the cover after completing wiring and before using the Switch. Do not supply power when the cover is not attached. Electric shock may occur if the Switch is used without the cover attached.

Installation

- Do not drop the Switch. Doing so may prevent the Switch from functioning to its full capability.
- Make sure the Switch is mounted securely to prevent it from falling off. Otherwise injury may result.
- Mount the Operation Key so that it will not come into contact with persons in the area when the door is opened and closed. Injury may result.
- Do not use the Switch as a stopper.
  Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the base of the Operation Key does not strike the Head.



Other Precautions

- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- The durability of the Switch is greatly influenced by the switching conditions. Always test the switch under actual working conditions before application and use it in a switching circuit for which there are no problems with performance.
- The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.

■ Precautions for Correct Use

The Switch contacts can be used with either standard loads or microloads. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.

Operating Environment

- This Switch is designed for use indoors. Using the Switch outdoors may damage it.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or Cl_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch as a result of contact failure or corrosion.
- Do not use the Switch in any of the following locations.
  - Locations subject to extreme temperature changes
  - Locations subject to high humidity or condensation
  - Locations subject to excessive vibration
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door
  - Locations subject to detergents, thinners, or other solvents

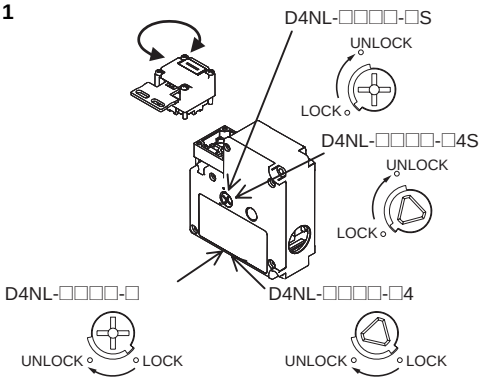
Storage

Do not store the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or Cl_2) or dust is present, or in locations subject to high temperature or high humidity.

Release Key

- The release key is used to unlock the Switch in case of emergency or if the power supply to the Switch stops.
- If the release key setting is changed from LOCK to UNLOCK, the lock will be released and the safety door can be opened (mechanical lock models only).
- The release key is set in the unlock position at the factory for the D4NL-□□□A/B/C and to the lock position for the D4NL-□□□G/H/J.
- Do not use the release key to start or stop machines.
- The auxiliary lock must only be released by authorized personnel.
- Do not impose a force exceeding 1 N·m on the release key screws. The release key may be damaged and may not operate properly.
- To prevent the release key from being used by unauthorized personnel, set it to LOCK and seal it with sealing wax.

Figure 1



Hinged Door

If an attempt is made to open the door beyond the lock position when the Switch is used for a hinged door at a location near to the hinged side, where the Operation Key's insertion radius is comparatively small, the force imposed will be much larger than for locations far from the hinged side, and the lock may be damaged. Mount the Switch close to the handle.

Solenoid Lock Models

The solenoid lock locks the door only when power is supplied to the solenoid. Therefore, the door will be unlocked if the power supply to the solenoid stops. Therefore, do not use solenoid lock models for machines that may be operating and dangerous even after the machine stops operating.

Mounting

Tightening Torque

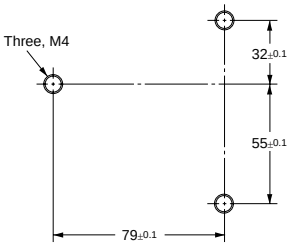
Be sure to tighten each screw of the Switch properly. Loose screws may result in malfunction.

Type	Tightening torque
Terminal screw	0.59 to 0.78 N·m
Cover mounting screw	0.49 to 0.69 N·m
Head mounting screw	0.49 to 0.59 N·m
Operation Key mounting screw	2.35 to 2.75 N·m
Switch mounting screw	0.49 to 0.69 N·m
Connector	1.77 to 2.16 N·m
Cap screw	1.27 to 1.67 N·m

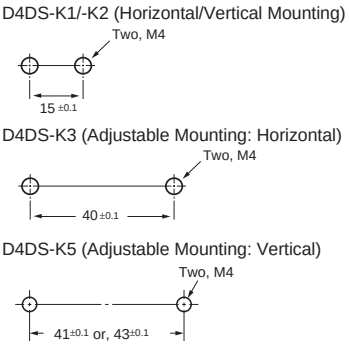
Switch and Operation Key Mounting

- Use M4 screws to mount the Switch and Operation Key. Always use washers and tighten the screw to a suitable torque. To ensure safety, use screws that cannot be easily removed or take suitable measures so that the screws cannot be easily removed.

Mounting Holes for Switches



Mounting Holes for Operation Keys



- If the Switch is back-mounted, the release key can be operated only from the bottom and the indicator cannot be used.
- Ensure that the alignment offset between the Operation Key and the key hole does not exceed ±1 mm. If the Operation Key is offset or at an angle, premature wear or damage to the Switch may result.
- Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.
- Do not impose excessive force on the Key top while the Operation Key is inserted into the Switch body or drop the Switch with the Operation Key inserted. Doing either of these may deform the Key or break the Switch body.

Head Direction

Remove the four screws of the head to enable changing the mounting direction of the head. The head can be mounted in four directions.

Ensure that no foreign material enters the interior of the Switch.

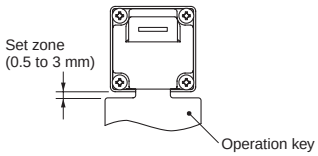
Attaching a Cover

Always confirm that the seal rubber has no abnormalities before using it. The seal rubber will lose its sealing capability if the seal rubber is out of place or not properly seated, or if foreign material is adhering to it.

Use only the correct screw. Using an incorrect screw will reduce the sealing capability of the seal rubber.

Securing the Door

When the door is closed (with the Operation Key inserted), it may be pulled beyond the set zone because of, for example, the door's weight, or the door cushion rubber, preventing releasing the lock. Use hooks to ensure that the door stays within the set zone.



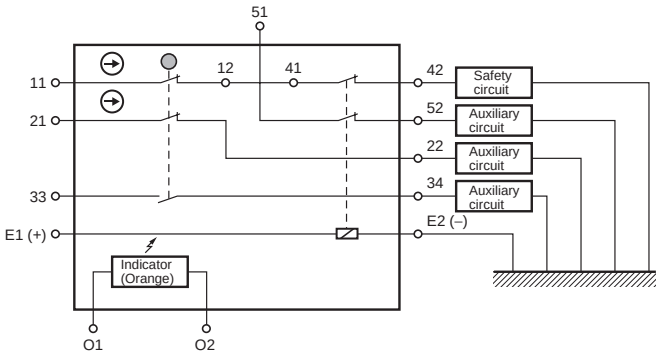
Solenoid

- The solenoid will heat when it carries current. Do not touch it.
- A DC solenoid has polarity. Confirm terminal polarity before wiring it.

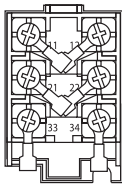
Wiring

Circuit Connection Example for the D4NL-□F□□-B

- Direct opening contacts used as safety-circuit inputs are indicated with the ⊖ mark. Terminals 11 and 42, and terminals 21 and 22 have direct opening contacts.
- Connect terminals 21 and 22 and terminals 51 and 52 in series when using as safety-circuit inputs (redundancy circuit for terminals 11 and 12 and terminals 41 and 42 below). Connect the terminals individually when using as auxiliary-circuit inputs (e.g., terminals 21 and 22 for safety-door open/closed monitoring and terminals 51 and 52 for monitoring the lock status).
- In the following connection example, terminals 21 and 22 and terminals 51 and 52 are used as auxiliary-circuit inputs.
- Connect the indicators in parallel to the auxiliary circuits or terminals E1 and E2 (D4NL-□□□A-B, -□□□G-B, -□□□B-B, and -□□□H-B only). Connecting to contacts with direct opening mechanisms may result in short-circuit current flowing if the indicator is destroyed, possibly resulting in incorrect equipment operation.



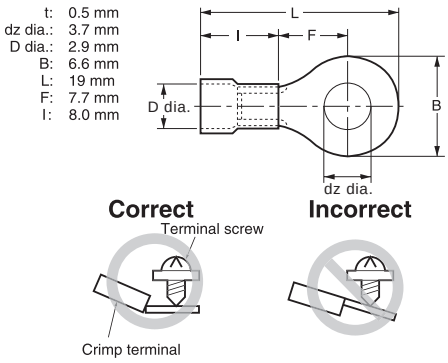
Wiring Precautions



- Do not wire the Switch while power is being supplied. Doing so may result in electric shock.
- Do not let particles, such as small pieces of lead wire, enter the switch body when wiring.
- When connecting to the terminals via insulating tube and M3.5 crimp terminals, cross the crimp terminals as shown above so that they do not rise up onto the case or the cover.
- Applicable lead wire size: AWG20 to AWG18 (0.5 to 0.75 mm^2). Use lead wires of an appropriate length. Not doing so may result in excess length causing the cover to rise and not fit properly.
- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.
- Use crimp terminals that will not interfere with other components inside the case.

Recommended Crimp Terminals

Manufacturer	Model
J.S.T. Mfg Co.	FN0.5-3.7 (type F) No. 5-3.7 (straight)



Processing the Conduit Opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the proper torque. The case may be damaged if excessive tightening torque is applied.
- When using a 1/2-14NPT conduit, wind sealing tape around the conduit end of the connector so that the enclosure will conform to IP67.
- Make sure that the outer diameter of the cable connected to the connector is correct.
- Attach a conduit cap to the unused conduit opening when wiring and tighten it to a suitable torque. The conduit cap is provided with the Switch.

Recommended Connectors

- Use a connector with a screw section not exceeding 11 mm. Otherwise the screws will protrude into the case interior. The connectors given in the following table have connectors with screw sections not exceeding 11 mm.

  Use the following connectors to ensure conformance to IP67.

Size	Manufacturer	Model	Applicable cable diameter
$G^1/_2$	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
Pg13.5	LAPP	S-13.5 5301-5030	5.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5 5311-1020	7.0 to 13.0 mm

Use LAPP connectors together with Seal Packing (JPK-16, GP-13.5, or GPM20), and tighten to the applicable torque. Seal Packing is sold separately.

Other Precautions

- Perform maintenance inspections periodically.

Production Discontinuation

The D4DL Series was discontinued from the end of November 2003. Use D4NL-series Switches as substitutes.

Substitute Products

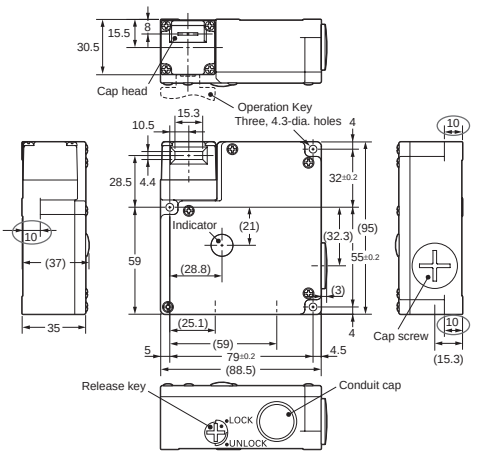
The D4DL and D4NL have basically the same structure, and use the same mounting method and Operation Keys. There are differences, however, in the external appearance and the mounting sections.

Comparison of the D4DL and Substitute Products

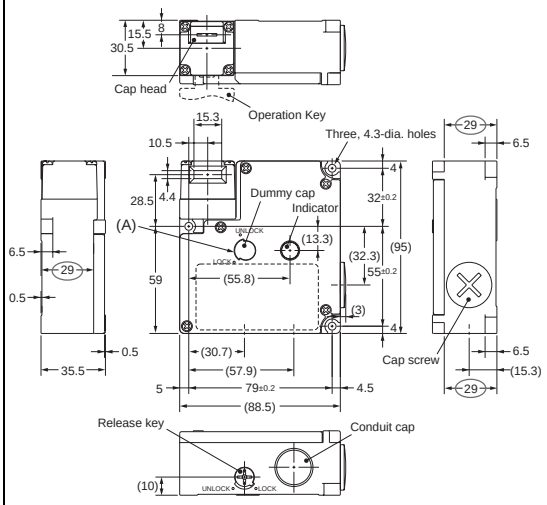
Model	D4NL-□
Switch color	Very similar
Dimensions	Very similar
Wiring/connection	Significantly different
Mounting method	Very similar
Ratings/performance	Very similar
Operating characteristics	Very similar
Operating method	Completely compatible

Dimensions

Discontinued models (D4DL)



Substitute products (D4NL Series)



The above diagram is for Switches with the release key on the bottom. For Switches with the release key on the front, interchange the positions of the release key and dummy cap (A).

Differences: The depth of the M4 mounting screw holes is 29 mm for the D4NL, as opposed to 10 mm for the D4DL. Therefore, when replacing the D4DL with the D4NL, use M4 screws that are 19 mm longer than the ones used before.

List of Recommended Substitute Products

Switch

D4DL product	Recommended substitute product
D4DL-1CFA-B	D4NL-1AFA-B, D4NL-1BFA-B
D4DL-2CFA-B	D4NL-2AFA-B, D4NL-2BFA-B
D4DL-1DFA-B	D4NL-1CFA-B, D4NL-1DFA-B
D4DL-2DFA-B	D4NL-2CFA-B, D4NL-2DFA-B
D4DL-1CFG-B	D4NL-1AFG-B, D4NL-1BFG-B
D4DL-2CFG-B	D4NL-2AFG-B, D4NL-2BFG-B
D4DL-1DFG-B	D4NL-1CFG-B, D4NL-1DFG-B
D4DL-2DFG-B	D4NL-2CFG-B, D4NL-2DFG-B
D4DL-1CFB-B	D4NL-1AFB-B, D4NL-1BFB-B
D4DL-2CFB-B	D4NL-2AFB-B, D4NL-2BFB-B
D4DL-1DFB-B	D4NL-1CFB-B, D4NL-1DFB-B
D4DL-2DFB-B	D4NL-2CFB-B, D4NL-2DFB-B
D4DL-1CFH-B	D4NL-1AFH-B, D4NL-1BFH-B
D4DL-2CFH-B	D4NL-2AFH-B, D4NL-2BFH-B
D4DL-1DFH-B	D4NL-1CFH-B, D4NL-1DFH-B
D4DL-2DFH-B	D4NL-2CFH-B, D4NL-2DFH-B
D4DL-1CFC-E*	D4NL-1AFC-B, D4NL-1BFC-B
D4DL-2CFC-E*	D4NL-2AFC-B, D4NL-2BFC-B
D4DL-1DFC-E*	D4NL-1CFC-B, D4NL-1DFC-B
D4DL-2DFC-E*	D4NL-2CFC-B, D4NL-2DFC-B
D4DL-1CFJ-E*	D4NL-1AFJ-B, D4NL-1BFJ-B
D4DL-2CFJ-E*	D4NL-2AFJ-B, D4NL-2BFJ-B
D4DL-1DFJ-E*	D4NL-1CFJ-B, D4NL-1DFJ-B
D4DL-2DFJ-E*	D4NL-2CFJ-B, D4NL-2DFJ-B
D4DL-1CFA-B-HT	D4NL-1AFA-B4, D4NL-1BFA-B4
D4DL-2CFA-B-HT	D4NL-2AFA-B4, D4NL-2BFA-B4
D4DL-1DFA-B-HT	D4NL-1CFA-B4, D4NL-1DFA-B4
D4DL-2DFA-B-HT	D4NL-2CFA-B4, D4NL-2DFA-B4
D4DL-1CFG-B-HT	D4NL-1AFG-B4, D4NL-1BFG-B4
D4DL-2CFG-B-HT	D4NL-2AFG-B4, D4NL-2BFG-B4
D4DL-1DFG-B-HT	D4NL-1CFG-B4, D4NL-1DFG-B4
D4DL-2DFG-B-HT	D4NL-2CFG-B4, D4NL-2DFG-B4

Note: With standard products, terminals 12 and 41 are connected with a shorting pin. If D4DL terminals 11 and 12 and terminals 41 and 42 are currently being used independently, remove the shorting pin.

* Use a voltage of 115 VAC/VDC max. for the D4NL-□□□□-B. Do not apply a voltage exceeding 115 VAC/VDC.

Operation Keys

- D4DS-K1
- D4DS-K2
- D4DS-K3
- D4DS-K5

All of the above Operation Keys can be used with the D4NL.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C126-E1-05

Guard Lock Safety-door Switch
D4BL

Release Protective Cover Locks Using Controller Signals or Pushbutton Switches after the Cutting Tool Stops Moving Due to Inertia

- A mechanical lock is applied automatically when the Operation Key is inserted. A high level of safety is achieved using a mechanism where the lock is only released when voltage is applied to the solenoid.
- Conforms to EN (TÜV) standards corresponding to the CE marking.
- Certified by UL, CSA, BIA, SUVA and CCC standards.
- The Switch contact is opened by a direct opening mechanism (NC contacts only) when the protective cover is opened. Direct opening mechanism that is EN-certified is indicated by ⊖ on the Switch.
- Auxiliary release key ensures easy maintenance and unlocks the door in the case of a power failure.
- Tough aluminum die-cast body incorporating a switch box with degree of protection satisfying IP67, UL, and CSA TYPE6P, 13.
- Equipped with a horizontal and vertical conduit opening.
- Models incorporating easy-to-see indicators for monitoring and those using an adjustable Operation Key for a double door are available.
- The mounting direction of the head can be changed to allow the Operation Key to be inserted from four directions.

Note: Be sure to read the *"Safety Precautions"* on page 416 and the *"Precautions for All Safety Door Switches"* on page 317.

Model Number Structure

■ Model Number Legend

Switch

D4BL - □ □ □ □ **-** □
1 2 3 4 5

1. Conduit Size (2-conduit)
1: PG13.5
2: G1/2
3: 1/2-14NPT

2. Built-in Switch (with Safety Switch and Lock Monitor Switch Contacts)
C: 1NC/1NO (slow-action) + 1NC (slow-action)
D: 2NC (slow-action) + 1NC (slow-action)

3. Head Mounting Direction
R: Four mounting directions possible (right-side mounting at shipping)

4. Door Lock and Release (Auxiliary Release Key is Incorporated by All Models)
A: Mechanical lock/24-VDC solenoid release
B: Mechanical lock/110-VAC solenoid release
G: 24-VDC Solenoid lock/Mechanical release

5. Indicator
Blank: Without indicator
A: 10 to 115 VAC or VDC driving (with orange and green LED indicator unit)

Operation Key (Order Separately)

D4BL - K □
1

1. Operation Key Type
1: Horizontal mounting
2: Vertical mounting
3: Adjustable mounting (Horizontal)

Ordering Information

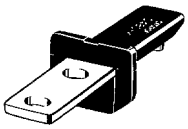
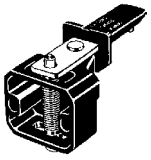
■ List of Models

Switches (Operation Keys are sold separately.)

: Models with certified direct opening contacts.

Lock method	Conduit size	Voltage for solenoid	Without indicator 1NC/1NO+ 1NC (Slow-action)	With LED indicator 1NC/1NO+ 1NC (Slow-action)	Without indicator 2NC+ 1NC (Slow-action)	With LED indicator 2NC+ 1NC (Slow-action)
Mechanical lock	PG13.5	24 VDC	D4BL-1CRA	D4BL-1CRA-A	D4BL-1DRA	D4BL-1DRA-A
		110 VAC	D4BL-1CRB	D4BL-1CRB-A	D4BL-1DRB	D4BL-1DRB-A
	G1/2	24 VDC	D4BL-2CRA	D4BL-2CRA-A	D4BL-2DRA	D4BL-2DRA-A
		110 VAC	D4BL-2CRB	D4BL-2CRB-A	D4BL-2DRB	D4BL-2DRB-A
	1/2-14NPT	24 VDC	D4BL-3CRA	D4BL-3CRA-A	D4BL-3DRA	D4BL-3DRA-A
		110 VAC	D4BL-3CRB	D4BL-3CRB-A	D4BL-3DRB	D4BL-3DRB-A
Solenoid lock	Pg 13.5	24 VDC	D4BL-1CRG	D4BL-1CRG-A	D4BL-1DRG	D4BL-1DRG-A
	G1/2	24 VDC	D4BL-2CRG	D4BL-2CRG-A	D4BL-2DRG	D4BL-2DRG-A
	1/2-14NPT	24 VDC	D4BL-3CRG	D4BL-3CRG-A	D4BL-3DRG	D4BL-3DRG-A

Operation Keys (Order Separately)

Mounting type	Model
Horizontal mounting 	D4BL-K1
Vertical mounting 	D4BL-K2
Adjustable mounting (Horizontal) 	D4BL-K3

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN1088

■ Certified Standards

Certification body	Standard	File No.
TÜV Rheinland	EN60947-5-1	R9451050 ⊖ (certified direct opening)
BIA	GS-ET-19	Mechanical lock: 9402293 Solenoid lock: 1998 20462-01
SUVA	SUVA	E6186/2.d
UL	UL508	E76675
CSA	CSA C22.2, No.14	LR45746
CQC (CCC)	GB14048.5	2003010305073836

Note: Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1), CCC (GB14048.5)

Item	Standard model	Indicator model
Utilization category	AC-15	AC-15
Rated operating current (I_e)	3 A	6 A
Rated operating voltage (U_e)	250 V	115 V

Use a 10-A fuse type gI or gG that conforms to IEC60269 as a short-circuit protection device.

UL/CSA (UL508, CSA C22.2 No. 14)

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

Note: The UL/CSA certified rating for products with indicators (-A) is 6 A/115 VAC.

■ Characteristics

Degree of protection (See note 2.)	IP67 (EN60947-5-1) (This applies for the Switch only. The degree of protection for the key hole is IP00.)
Durability (See note 3.)	Mechanical: 1,000,000 operations min. Electrical: 500,000 operations min. (10-A resistive load at 250 VAC)
Operating speed	0.05 to 0.5 m/s
Operating frequency	30 operations/min max.
Rated frequency	50/60 Hz
Contact gap	2 x 2 mm min.
Operating characteristics	Direct opening force: 19.61 N min. (EN60947-5-1) (See note 4.) Direct opening travel: 20 mm min. (EN60947-5-1) (See note 4.) All stroke: 23 mm min.
Lock holding strength	700 N min. (GS-ET-19)
Insulation resistance	100 MΩ min. (at 500 VDC)
Rated insulation voltage (U_i)	300 V (EN60947-5-1)
Conventional enclosed thermal current (I_{the})	10 A (EN60947-5-1)
Dielectric strength (U_{imp})	Impulse dielectric strength (U_{imp}) 4 kV (EN60947-5-1) between terminals of different polarity, between each terminal and ground, and between each terminal and non-current-carrying metal part; 2.5 kV between solenoid and ground (EN60947-5-1)
Conditional short-circuit current	100 A (EN60947-5-1)
Pollution degree (operating environment)	3 (EN60947-5-1)
Protection against electric shock	Class I (with ground terminal)
Switching overvoltage	1,500 V max. (EN60947-5-1)
Contact resistance	50 mΩ max. (initial value)
Vibration resistance	Malfunction: 10 to 55 Hz, 0.35-mm single amplitude
Shock resistance	Destruction: 1,000 m/s^2 min. (IEC68-2-27) Malfunction: 300 m/s^2 min. (IEC68-2-27)
Ambient temperature	Operating: –10°C to 55°C (with no icing)
Ambient humidity	Operating: 95% max.
Weight	Approx. 800 g

Note: 1. The above values are initial values.

2. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust, oil or water penetration, do not use the D4BL in places where dust, oil, water, or chemicals may enter through the key hole on the head, otherwise Switch damage or malfunctioning may occur.

3. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%.

4. These figures are minimum requirements for safe operation.

Solenoid Coil Characteristics

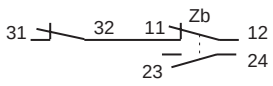
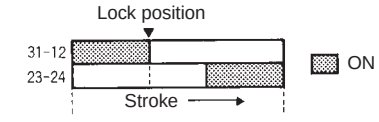
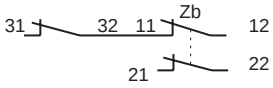
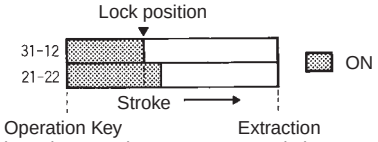
Item	24-VDC mechanical lock models	110-VAC mechanical lock models	24-VDC solenoid lock models
Rated operating voltage	24 VDC $^{+10\%}_{-15\%}$ (100% ED)	110 VAC ±10% (50/60 Hz)	24 VDC $^{+10\%}_{-15\%}$ (100% ED)
Current consumption	Approx. 300 mA	Approx. 98 mA	Approx. 300 mA
Insulation	Class F (130°C or less)		

Indicator Characteristics

Item	LED
Rated voltage	10 to 115 VAC/VDC
Current leakage	Approx. 1 mA
Color (LED)	Orange, green

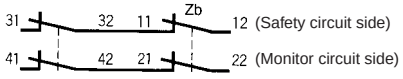
Connections

■ Contact Form (Diagrams Show State with Key Inserted and Lock Engaged)

Model	Contact		Operating pattern	Remarks
D4BL-□C□□-□	1NC/1NO+1NC			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 23-24 can be used as unlike poles.
D4BL-□D□□-□	2NC+1NC			NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 21-22 can be used as unlike poles.

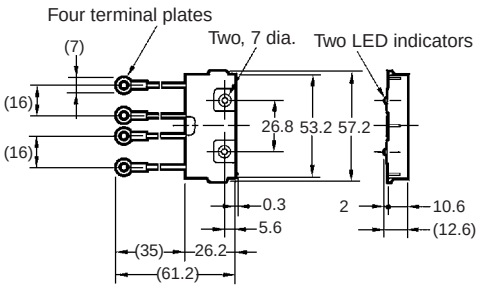
Note: The EN-certified direct opening mechanism is indicated by ⊖ on the Switch.

■ Contact Form 2NC + 2NC

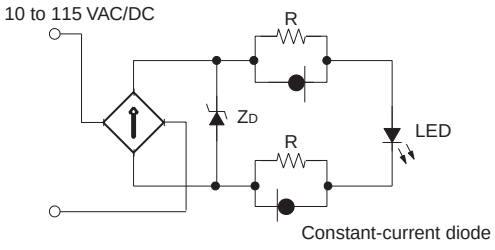


■ Indicator Unit

Dimensions



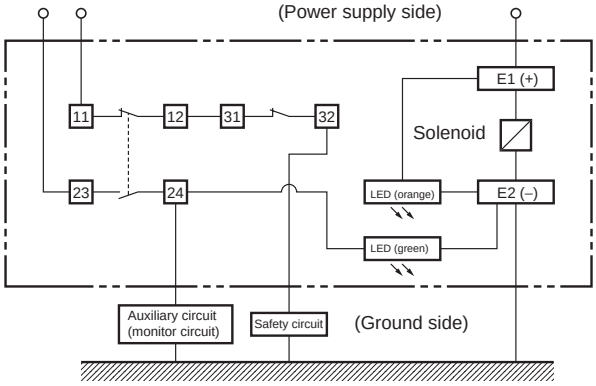
Internal Circuit



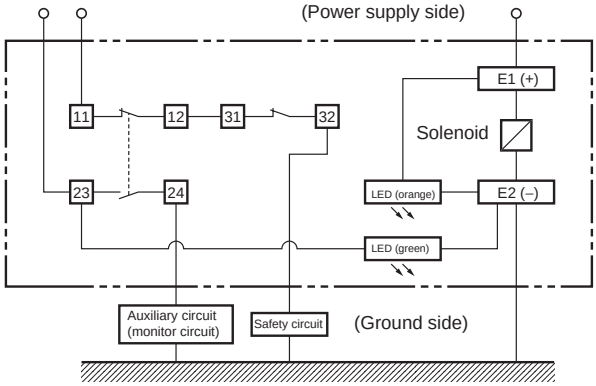
■ Circuit Connection Example

- Terminals 11 and 32 are connected internally and so connect terminals 12 and 31 for safety-circuit input. (GS-ET-19).
- When using indicators, connect them to the auxiliary circuit side (monitor circuit) or the solenoid input terminals as shown below.
- The indicators can be used to confirm the open/closed status of the door, the ON/OFF status of the power supply, and the ON/OFF status of the solenoid.
- Do not connect the indicators in parallel with the direct opening contact. If the indicators are broken, a short-circuit current may flow, causing equipment to malfunction.
- The 24-VDC solenoid terminals have polarity. Confirm the polarity before wiring.
- Be sure to use a special pushbutton switch to stop and start machinery and release locks.

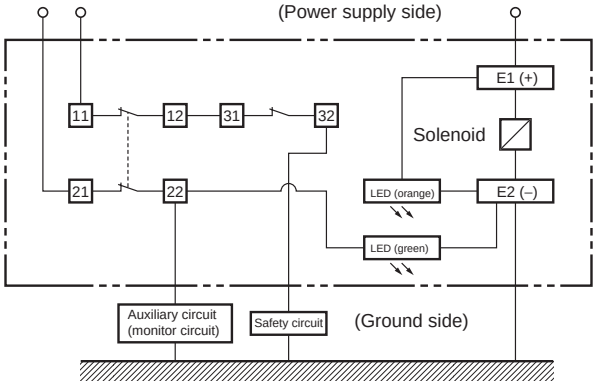
1. Orange: Lights when the solenoid turns ON.
Green: Lights when the door opens.



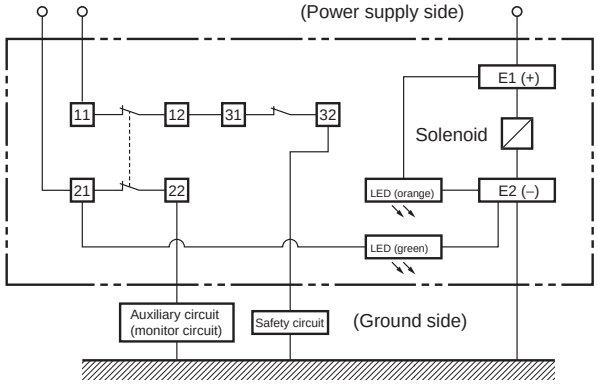
2. Orange: Lights when the solenoid turns ON.
Green: Lights when power turns ON.



3. Orange: Lights when the solenoid turns ON.
Green: Lights when door closes.



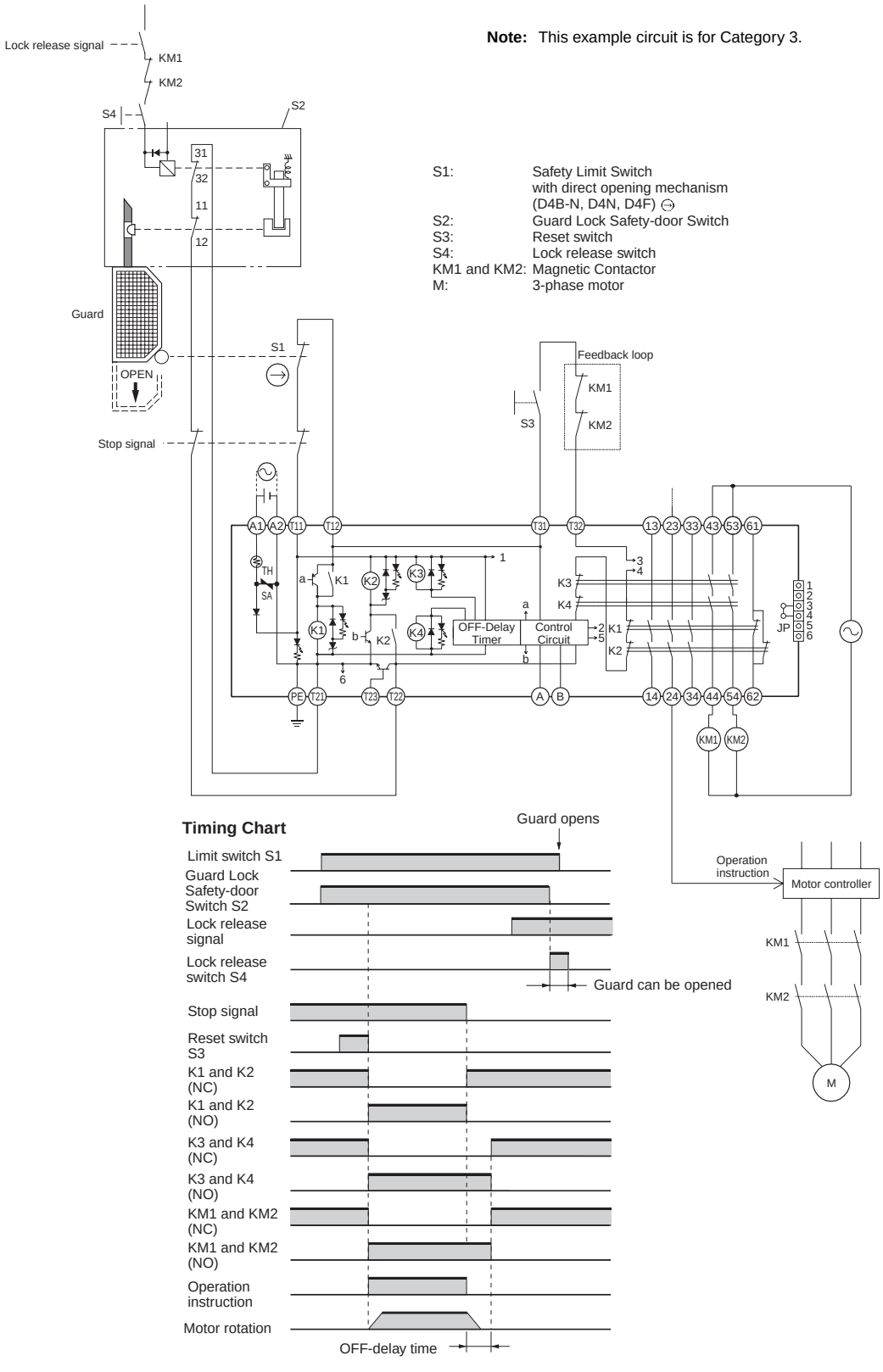
4. Orange: Lights when the solenoid turns ON.
Green: Lights when power turns ON.



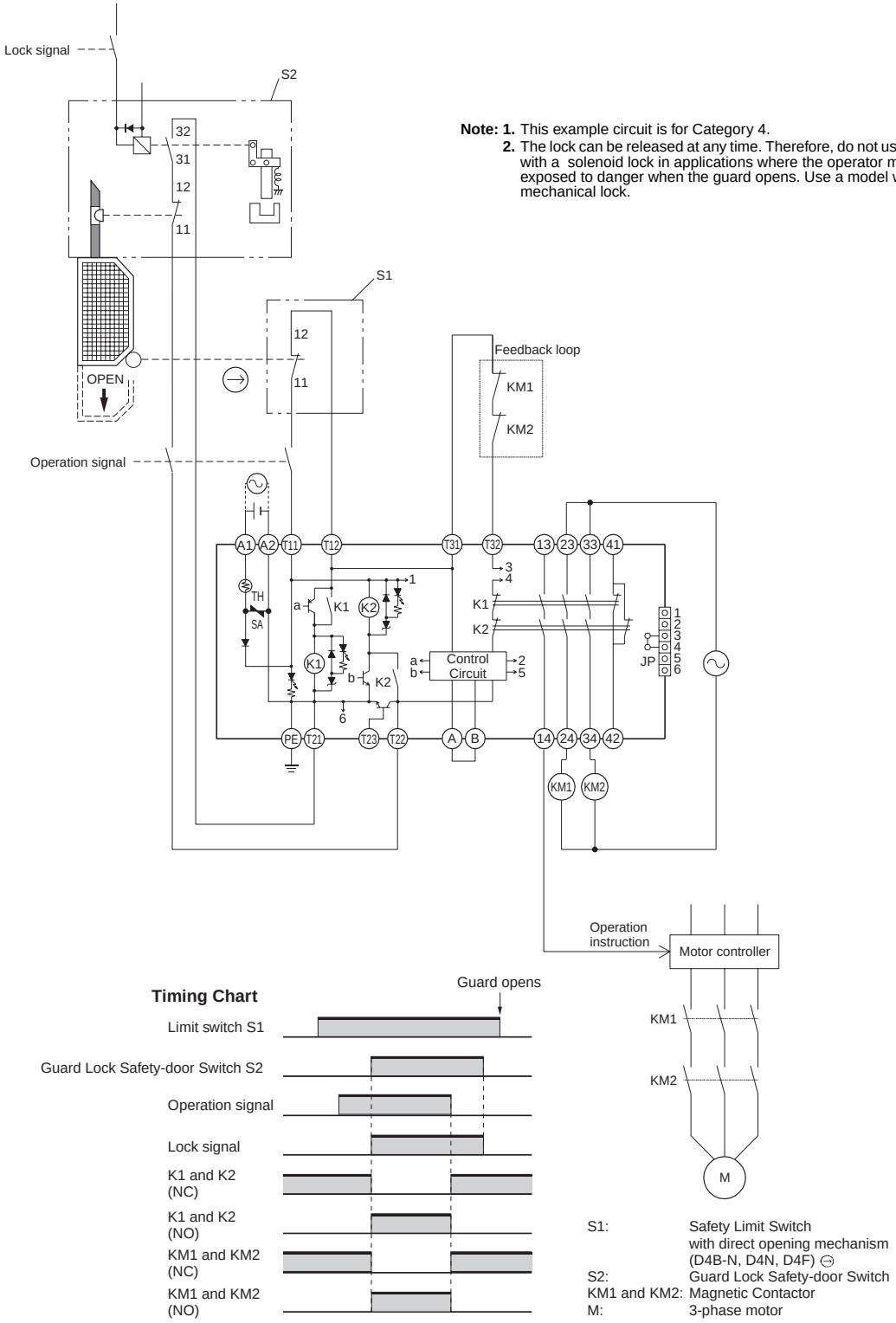
■ Connection Example with OMRON's G9SA Safety Relay Unit

G9SA-321-T□ (24 VAC/VDC) + D4BL-□A-□, □B-□ (Mechanical Lock Type) Circuit Diagram (Manual Reset)

Note: This example circuit is for Category 3.



G9SA-301 (24 VAC/VDC) + D4BL-□G-□ (Solenoid Lock Type) Circuit Diagram (Auto-reset)

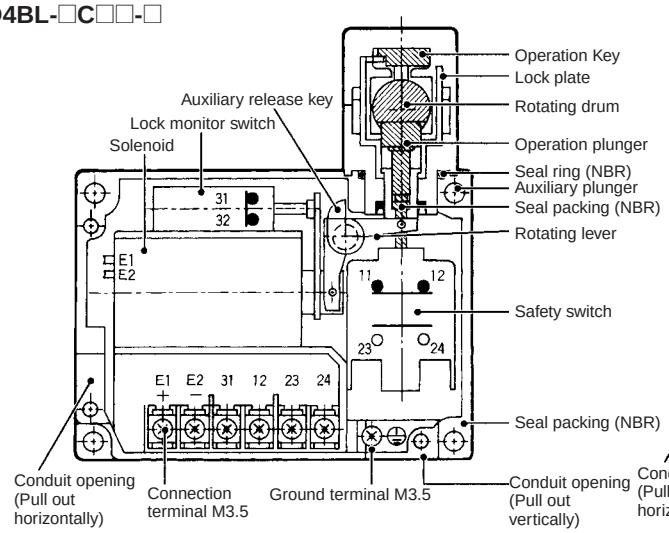


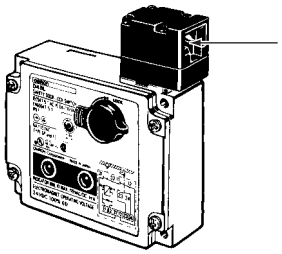
Note: 1. This example circuit is for Category 4.
2. The lock can be released at any time. Therefore, do not use a model with a solenoid lock in applications where the operator may be exposed to danger when the guard opens. Use a model with a mechanical lock.

S1: Safety Limit Switch with direct opening mechanism (D4B-N, D4N, D4F) ⊖
S2: Guard Lock Safety-door Switch
KM1 and KM2: Magnetic Contactor
M: 3-phase motor

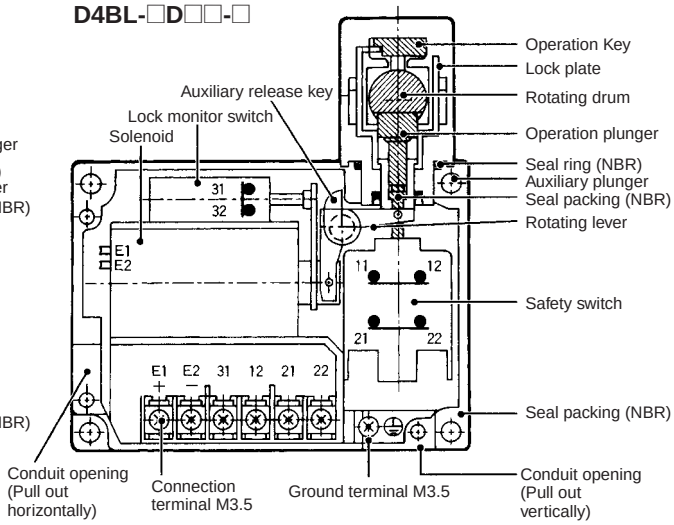
Nomenclature

D4BL-□C□□-□





D4BL-□D□□-□

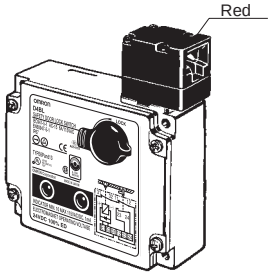


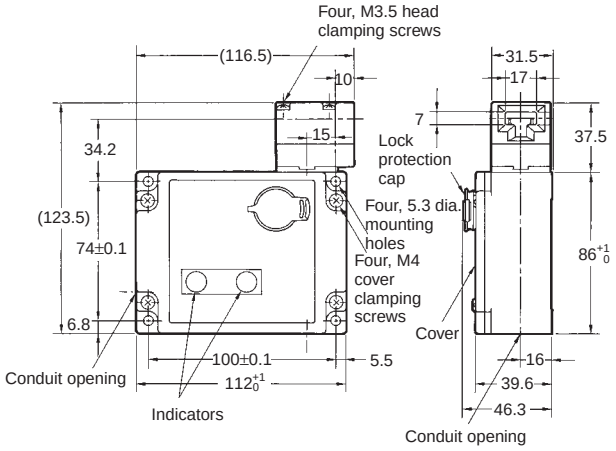
Dimensions

Note: 1. All units are in millimeters unless otherwise indicated.
2. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
3. There are fluctuations in the contact ON/OFF timing for 2NC contacts. Confirm performance before application.

■ Switches

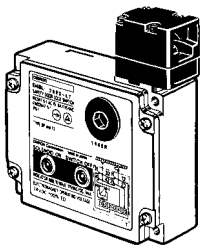
D4BL-□□□□-□

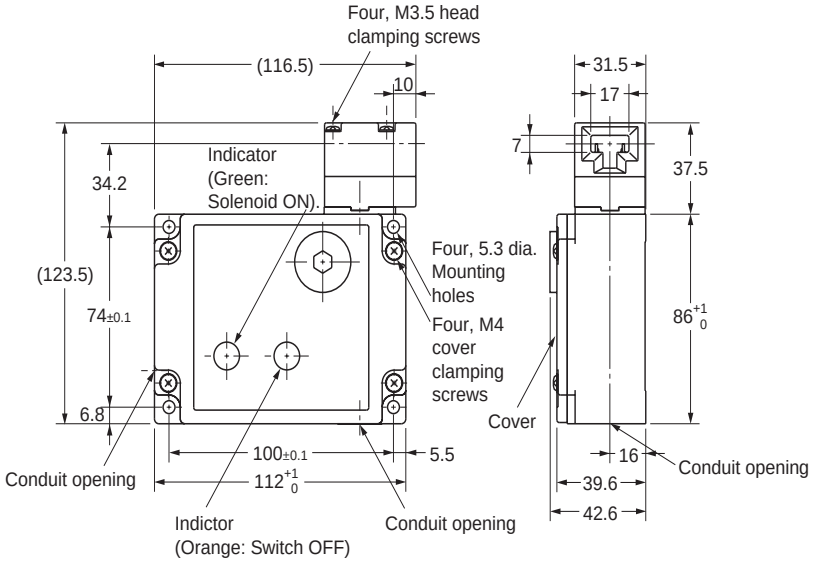




Operating Characteristics	D4BL-□□□□
Key insertion force	19.61 N max.
Key extraction force	19.61 N max.
Movement before being locked	15 mm max.

D4BL-2GRD-AT

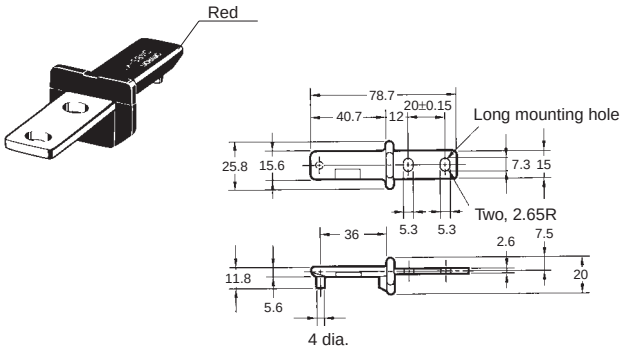




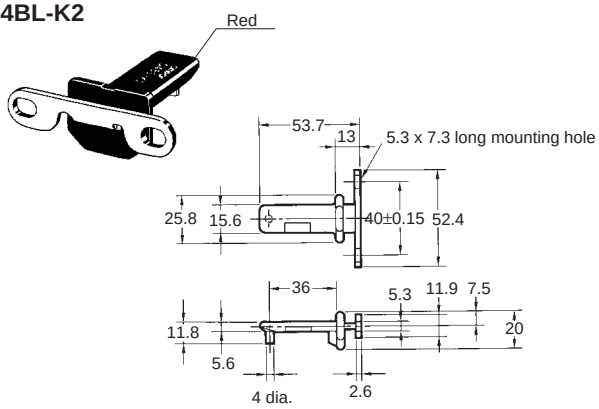
Operating Characteristics	D4BL-2GRD-AT
Key insertion force	19.61 N max.
Key extraction force	19.61 N max.
Movement before being locked	15 mm max.

■ Operation Keys

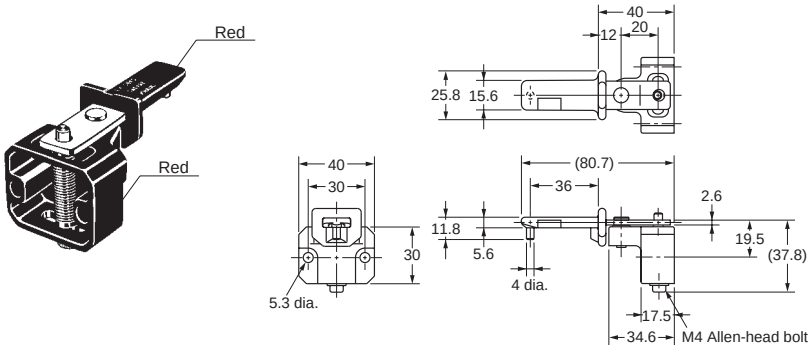
Horizontal Mounting
D4BL-K1



Vertical Mounting
D4BL-K2



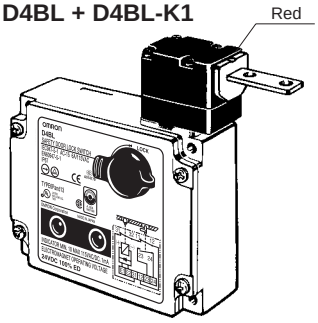
Adjustable Mounting (Horizontal)
D4BL-K3

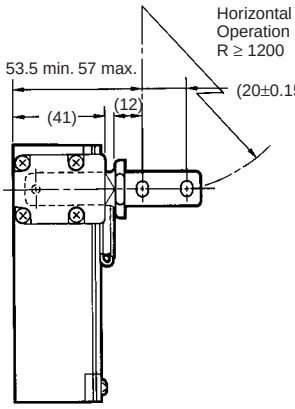


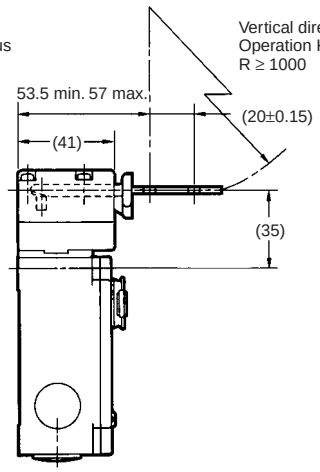
■ With Operation Key Inserted

Horizontal Mounting

D4BL + D4BL-K1

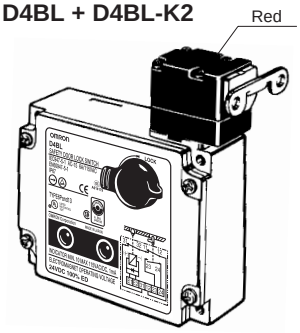


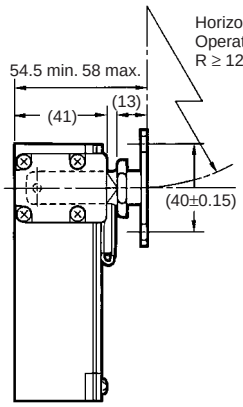


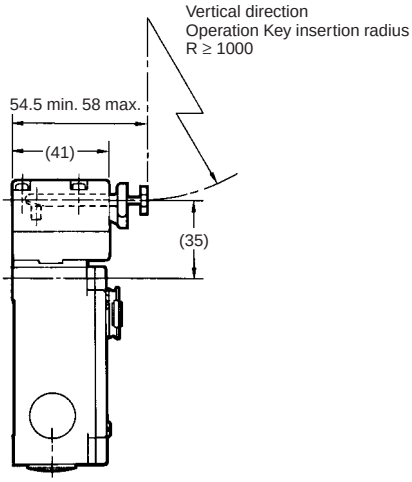


Vertical Mounting

D4BL + D4BL-K2

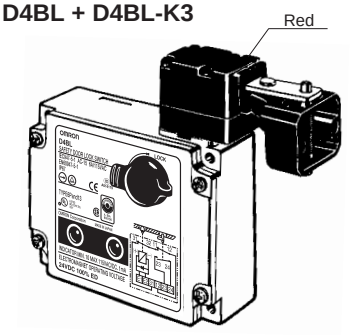


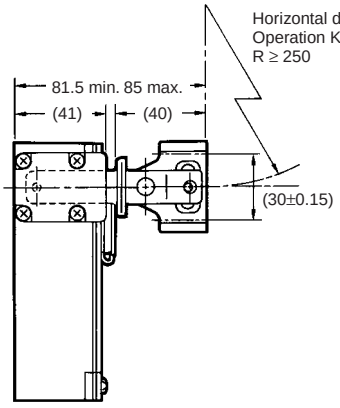


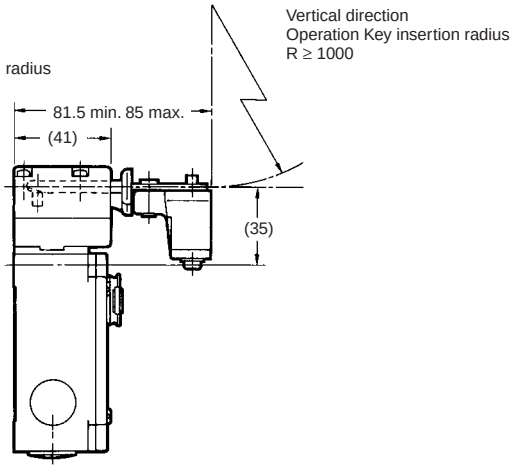


Adjustable Mounting (Horizontal)

D4BL + D4BL-K3







Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.

2. In the above diagrams, the Operation Key is inserted from the front.

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

⚠ CAUTION

Do not insert the Operation Key when the door is open. The machine may operate, possibly resulting in injury. Before using the machine, be sure to remove the shock-absorbing damper, which is provided before shipping.

■ Precautions for Safe Use

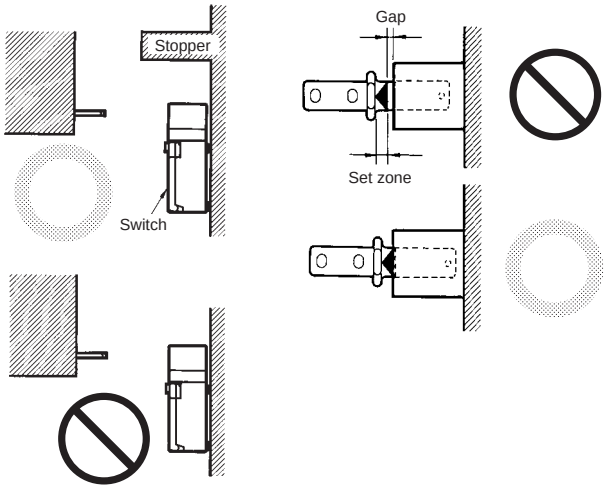
- Do not use the Switch in locations where explosive or flammable gases may be present.
- Do not use the Switch submersed in oil or water or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch. (The IP67 degree of protection of the Switch specifies the amount of water penetration after the Switch is submerged in water for a certain period of time.)
- Although the Switch body is protected from the ingress of dust or water, avoid the ingress of foreign substance through the key hole on the head.
  Otherwise, accelerated wear or breaking may result.
- Always attach the cover after completing wiring and before using the Switch. Electric shock may occur if the Switch is used without the cover attached.

Connect a fuse in series with the D4BL in series to protect it from short-circuit damage. The value of the breaking current of the fuse must be calculated by multiplying the rated current by 150% to 200%.

To prevent the D4BL from burning due to overvoltage, insert a protection fuse into the solenoid circuit.

Stopper Installation

Do not use a Switch as a stopper. Be sure to install a stopper as shown in the following illustration when mounting the Switch so that the Operation Key is within 0.5 to 5 mm of the set zone.



■ Precautions for Correct Use

Operating Environment

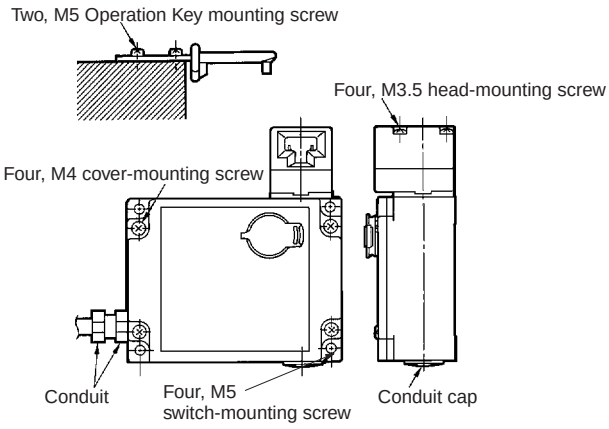
- This Switch is designed for use indoors. Using the Switch outdoors may damage it.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch as a result of contact failure or corrosion.
- Do not use the Switch in any of the following locations.
  - Locations subject to extreme temperature changes
  - Locations subject to high humidity or condensation
  - Locations subject to excessive vibration
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door
  - Locations subject to detergents, thinners, or other solvents

Tightening Torque

Loose screws may result in malfunction. Tighten the screws to the specified torques.

	Type	Torque
1	M3.5 terminal screw (including terminal screw)	0.59 to 0.78 N·m
2	Cover mounting screw	1.18 to 1.37 N·m
3	Head mounting screw	0.78 to 0.98 N·m
4	M5 body mounting screw (See note.)	4.90 to 5.88 N·m
5	Operation Key mounting screw	2.35 to 2.75 N·m
6	Connector	1.77 to 2.16 N·m
7	Cap screw	1.27 to 1.67 N·m

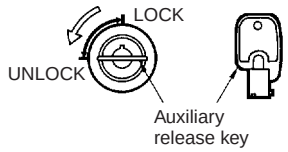
Note: Use M5 screws. Apply a torque of 4.90 to 5.88 N·m for an Allen-head bolt. For a pan head screw, apply a torque of 2.35 to 2.75 N·m



Auxiliary Release Key

The auxiliary release key is used to unlock the D4BL in case of emergency or in case the power supply to the D4BL fails.

Use the enclosed Release Key to change the lock from LOCK to UNLOCK so that the lock will be released and the door can be opened. (Applies only to mechanical locks.)



The auxiliary release key applied to the door of a machine room ensures the safety of people adjusting the equipment in the machine room. If the auxiliary release key is set to UNLOCK, the door will not be locked when the door is closed and no power will be supplied to the equipment.

Whenever the lock has been changed to UNLOCK, always return it to LOCK before using the Switch.

Do not use the auxiliary release key to start or stop machines.

To prevent the auxiliary release key from being handled carelessly by unauthorized people, seal the auxiliary release key with sealing wax and the provided seal cap to ensure IP67.

Make sure that the auxiliary release key is kept with the person in charge.

Before attaching the cover to the D4BL, make sure that the auxiliary release key position is set to LOCK.

Solenoid Lock Models

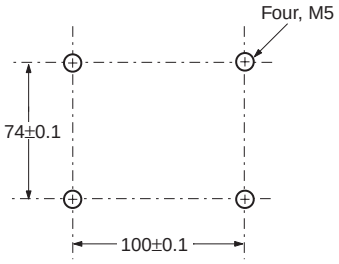
The solenoid lock locks the door only when power is supplied to the solenoid. Therefore, the door will be unlocked if the power supply to the solenoid stops. Therefore, do not use solenoid lock models for machines that may be operating and dangerous even after the machine stops operating.

Switch and Operation Key Mounting

Mount the D4BL and Operation Key with four M5 screws with washers and tighten each screw to the specified torque.

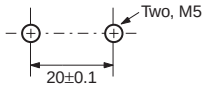
Mounting Dimensions

Switch Mounting Dimensions

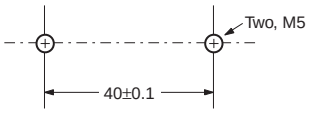


Operation Key Mounting Holes

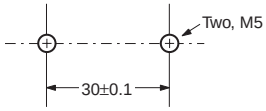
- Horizontal Mounting
  D4BL-K1



- Vertical Mounting
  D4BL-K2



- Adjustable Mounting (Horizontal)
  D4BL-K3

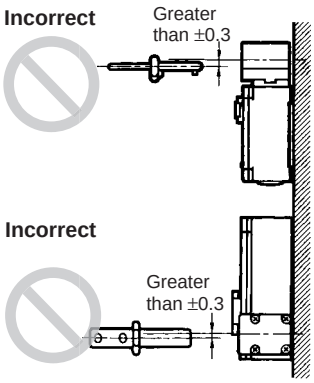


Operation Key

The D4BL is provided with a shock-absorbing damper to protect the D4BL from damage that may result from dropping the D4BL during transportation. Be sure to remove the damper after mounting the D4BL.

The mounting tolerance of the Operation Key is ±0.3 mm vertically or horizontally. Be sure to mount the D4BL correctly without leaning, otherwise the D4BL may soon break or wear out.

Observe the specified insertion radius for the Operation Key and insert it in a direction perpendicular to the key hole.



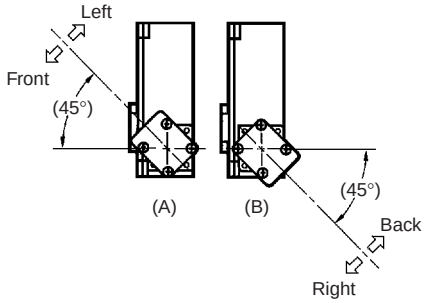
The Operation Key for the D4BL is different from the one for the D4BS.

Head Direction

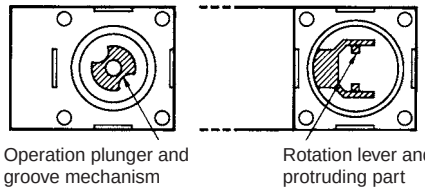
The head can be mounted in four directions. To remove the head, turn the head by 45° as shown in figures (A) and (B) below.

To change the direction of the head, make sure that the protruding part of the rotating lever engages with the groove of the plunger. Then turn the head clockwise or counterclockwise to the desired direction. At that time, make sure that the groove of the plunger is located under the rotating lever. If the direction of the head is not set when the plunger is rotated by 45°, the groove of the plunger presses the rotating lever. The head, plunger, or the built-in switch may be damaged as a result.

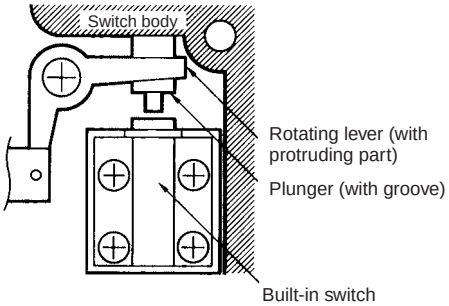
Head Direction Changes



Head Bottom View **Switch Top View**



Normal Positions of Rotating Lever and Plunger



Be sure to check the mechanical lock and solenoid release functions when mounting the D4BL.

If the head direction is changed, recheck the tightening torque of each of screw. Make sure that no foreign materials will enter through the key hole on the head.

Mounting the Cover

When tightening the cover, first check the specified torque, and then tighten each screw to the that torque. Also, make sure that no foreign material has entered the Switch.

When mounting the cover, make sure that the cover and switch box are properly aligned.

■ Processing and Connecting Cable/Conduit

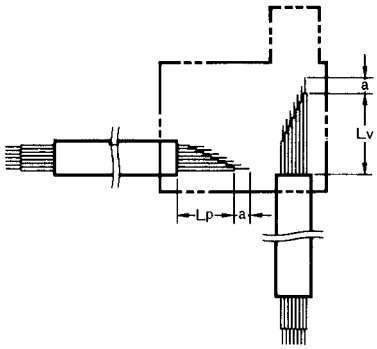
The following procedures are recommended for mounting and wiring the indicator unit securely.

To ensure IP67, use OMRON's SC-□M and Nippon Flex's ABS-08Pg13.5 and ABS-12 Pg13.5 Connectors.

Recommended cable: UL2464-type cable that is AWG20 to AWG18 (0.5 to 1.0 mm^2) in size and has seven conductors

If the 1/2-14NPT is used, cover the cable and conduit end with sealing tape to ensure IP67. Tighten the connector to a torque of 1.77 to 2.16 N·m.

Connect the indicator unit after connecting the seven-conductor cable.

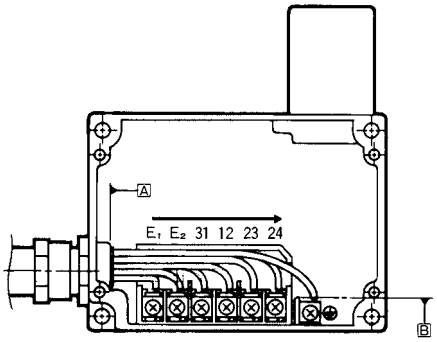


Terminal no.	Lp (mm)	Lv (mm)	a (mm)
E_1	30±2	80±2	8±1
E_2	35±2	75±2	
31	45±2	60±2	
12	55±2	50±2	
23 (21)	65±2	45±2	
24 (22)	70±2	35±2	
⏚	90±2	50±2	

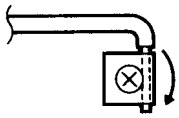
Properly attach and securely tighten the provided conduit cap to the unused conduit opening when wiring the D4BL.

Cable Connection Example

1. Connect the wires to the terminals in the order shown below for wiring efficiency.

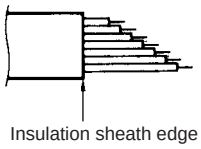


Tighten each wired terminal clockwise to a torque of 0.59 to 0.78 N·m.



Twist the wire two or three times and make sure that no bare wire exists outside the terminal when tightening the terminal.

2. The insulation sheath of the seven-conductor cable must come into contact with the wall of the conduit mouth, side A or side B.



Others

Do not touch the solenoid because the solenoid radiates heat while power is being supplied.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C100-E1-07

Safety-door Hinge Switch
D4NH

Compact, Plastic-body Safety-door Hinge Switch Designed for Saving Space in Machines and Other Equipment

- Lineup includes three contact models with 2NC/1NO and 3NC contact forms in addition to the previous contact forms 1NC/1NO, and 2NC. Models with MBB contacts are also available.
- M12-connector models are available, saving on labor and simplifying replacement.
- Standardized gold-clad contacts provide high contact reliability Can be used with both standard loads and microloads.
- Free of lead, cadmium, and hexavalent chrome, reducing the burden on the environment.

Note: Be sure to read the *"Safety Precautions"* on page 428 and the *"Precautions for All Safety Door Switches"* on page 317.

Note: Contact your sales representative for details on models with safety standard certification.

Model Number Structure

■ Model Number Legend

D4NH-□□□
1 2 3

1. Conduit/Connector size
1: Pg13.5 (1-conduit)
2: G1/2 (1-conduit)
3: 1/2-14NPT (1-conduit)
4: M20 (1-conduit)
5: Pg13.5 (2-conduit)
6: G1/2 (2-conduit)
7: 1/2-14NPT (2-conduit)
8: M20 (2-conduit)
9: M12 connector (1-conduit)

2. Built-in Switch
A: 1NC/1NO (slow-action)
B: 2NC (slow-action)
C: 2NC/1NO (slow-action)
D: 3NC (slow-action)
E: 1NC/1NO (MBB contact) (slow-action)
F: 2NC/1NO (MBB contact) (slow-action)

3. Actuator
AS:Shaft
BC:Arm lever

Ordering Information

■ List of Models

Switches

Actuator	Conduit size		Built-in switch mechanism		
			1NC/1NO (Slow-action)	2NC (Slow-action)	2NC/1NO (Slow-action)
Shaft	1-conduit	Pg13.5	D4NH-1AAS	D4NH-1BAS	D4NH-1CAS
		G1/2	D4NH-2AAS	D4NH-2BAS	D4NH-2CAS
		1/2-14NPT	D4NH-3AAS	D4NH-3BAS	D4NH-3CAS
		M20	D4NH-4AAS	D4NH-4BAS	D4NH-4CAS
		M12 connector	D4NH-9AAS	D4NH-9BAS	---
	2-conduit	Pg13.5	D4NH-5AAS	D4NH-5BAS	D4NH-5CAS
		G1/2	D4NH-6AAS	D4NH-6BAS	D4NH-6CAS
		1/2-14NPT (See note 3.)	D4NH-7AAS	D4NH-7BAS	D4NH-7CAS
		M20	D4NH-8AAS	D4NH-8BAS	D4NH-8CAS
Arm lever	1-conduit	Pg13.5	D4NH-1ABC	D4NH-1BBC	D4NH-1CBC
		G1/2	D4NH-2ABC	D4NH-2BBC	D4NH-2CBC
		1/2-14NPT	D4NH-3ABC	D4NH-3BBC	D4NH-3CBC
		M20	D4NH-4ABC	D4NH-4BBC	D4NH-4CBC
		M12 connector	D4NH-9ABC	D4NH-9BBC	---
	2-conduit	Pg13.5	D4NH-5ABC	D4NH-5BBC	D4NH-5CBC
		G1/2	D4NH-6ABC	D4NH-6BBC	D4NH-6CBC
		1/2-14NPT (See note 3.)	D4NH-7ABC	D4NH-7BBC	D4NH-7CBC
		M20	D4NH-8ABC	D4NH-8BBC	D4NH-8CBC

Actuator	Conduit size		Built-in switch mechanism		
			3NC (Slow-action)	1NC/1NO MBB (Slow-action)	2NC/1NO MBB (Slow-action)
Shaft	1-conduit	Pg13.5	D4NH-1DAS	D4NH-1EAS	D4NH-1FAS
		G1/2	D4NH-2DAS	D4NH-2EAS	D4NH-2FAS
		1/2-14NPT	D4NH-3DAS	D4NH-3EAS	D4NH-3FAS
		M20	D4NH-4DAS	D4NH-4EAS	D4NH-4FAS
		M12 connector	---	D4NH-9EAS	---
	2-conduit	Pg13.5	D4NH-5DAS	D4NH-5EAS	D4NH-5FAS
		G1/2	D4NH-6DAS	D4NH-6EAS	D4NH-6FAS
		1/2-14NPT (See note 3.)	D4NH-7DAS	D4NH-7EAS	D4NH-7FAS
		M20	D4NH-8DAS	D4NH-8EAS	D4NH-8FAS
Arm lever	1-conduit	Pg13.5	D4NH-1DBC	D4NH-1EBC	D4NH-1FBC
		G1/2	D4NH-2DBC	D4NH-2EBC	D4NH-2FBC
		1/2-14NPT	D4NH-3DBC	D4NH-3EBC	D4NH-3FBC
		M20	D4NH-4DBC	D4NH-4EBC	D4NH-4FBC
		M12 connector	---	D4NH-9EBC	---
	2-conduit	Pg13.5	D4NH-5DBC	D4NH-5EBC	D4NH-5FBC
		G1/2	D4NH-6DBC	D4NH-6EBC	D4NH-6FBC
		1/2-14NPT (See note 3.)	D4NH-7DBC	D4NH-7EBC	D4NH-7FBC
		M20	D4NH-8DBC	D4NH-8EBC	D4NH-8FBC

Note: 1. It is recommended that M20 be used for Switches to be exported to Europe and 1/2-14NPT be used for Switches to be exported to North American countries.

2. All models have slow-action contacts with certified direct opening mechanisms on NC contacts only.

3. The 1/2-14NPT 2-conduit models include an M20-to-1/2-14NPT changing adaptor.

Specifications

■ Standards and EC Directives

- Conforms to the following EC Directives:
  Machinery Directive
  Low Voltage Directive
  EN50047
  EN60204-1
  EN1088
  GS-ET-15

■ Certified Standards

Certification body	Standard	File No.
TÜV Product Service	EN60947-5-1 (certified direct opening)	Ask your OMRON representative.
UL (See note 1.)	UL508, CSA C22.2 No.14	E76675
CCC (CQC)	GB14048.5	2004010305105973

Note: 1. Certification for CSA C22.2 No. 14 is authorized by the UL mark.
2. Ask your OMRON representative for information on certified models.

■ Certified Standard Ratings

TÜV (EN60947-5-1)

Item / Utilization category	AC-15	DC-13
Rated operating current (I_e)	3 A	0.27 A
Rated operating voltage (U_e)	240 V	250 V

Note: Use a 10-A fuse type gI or gG that conforms to IEC269 as a short-circuit protection device. This fuse is not built into the Switch.

UL/CSA (UL508, CSA C22.2 No. 14)

A300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
120 VAC	10 A	60 A	6 A	7,200 VA	720 VA
240 VAC		30 A	3 A		

Q300

Rated voltage	Carry current	Current		Volt-amperes	
		Make	Break	Make	Break
125 VDC	2.5 A	0.55 A	0.55 A	69 VA	69 VA
250 VDC		0.27 A	0.27 A		

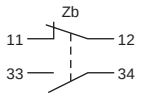
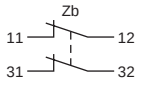
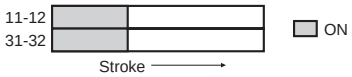
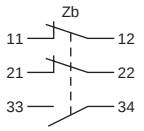
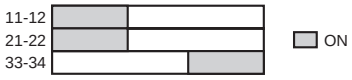
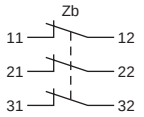
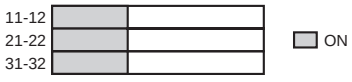
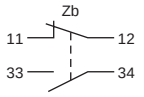
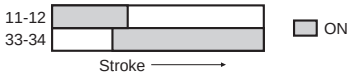
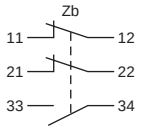
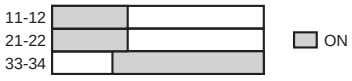
■ Characteristics

Degree of protection (See note 3.)		IP67 (EN60947-5-1)
Durability (See note 4.)	**Mechanical**	1,000,000 operations min.
	Electrical	500,000 operations min. for a resistive load of 3 A at 250 VAC (See note 5.) 300,000 operations min. for a resistive load of 10 A at 250 VAC
Operating speed		2 to 360°/s (See note 6.)
Operating frequency		30 operations/minute max.
Contact resistance		25 mΩ max.
Minimum applicable load (See note 7.)		Resistive load of 1 mA at 5 VDC (N-level reference value)
Rated insulation voltage (U_i)		300 V
Protection against electric shock		Class II (double insulation)
Pollution degree (operating environment)		Level 3 (EN60947-5-1)
Impulse withstand voltage (EN60947-5-1)		Between terminals of the same polarity: 2.5 kV
		Between terminals of different polarities: 4 kV
		Between other terminals and uncharged metallic parts: 6 kV
Insulation resistance		100 MΩ min.
Contact gap		Snap-action: 2 x 9.5 mm min Slow-action: 2 x 2 mm min
Vibration resistance	**Malfunction**	10 to 55 Hz, 0.75-mm single amplitude
Shock resistance	**Destruction**	1,000 m/s^2
	Malfunction	300 m/s^2
Conditional short-circuit current		100 A (EN60947-5-1)
Rated open thermal current (I_{th})		10 A (EN60947-5-1)
Ambient temperature		Operating: –30°C to 70°C with no icing
Ambient humidity		Operating: 95% max.
Weight		Approx. 87 g (D4NH-1AAS) Approx. 97 g (D4NH-1ABC)

Note: 1. The values in the table on the previous page are initial values.
2. Once the contacts have been used to switch a load, however, they cannot be used to switch smaller loads. The contact surfaces will become rough once they have been used and contact reliability for smaller loads may be reduced.
3. The degree of protection is tested using the method specified by the standard (EN60947-5-1). Confirm that sealing properties are sufficient for the operating conditions and environment beforehand. Although the switch box is protected from dust or water penetration, do not use the D4NH in places where foreign material such as dust, dirt, oil, water, or chemicals may enter through the head. Otherwise, premature wear, Switch damage, or malfunctioning may occur.
4. The durability is for an ambient temperature of 5°C to 35°C and an ambient humidity of 40% to 70%. For more details, consult your OMRON representative.
5. Do not pass the 3-A, 250-VAC load through more than 2 circuits.
6. For safe use, make sure that the allowable operating speed is not exceeded.
7. This value will vary with the switching frequency, environment, and reliability level. Confirm that correct operation is possible with the actual load beforehand.

Connections

■ Contact Form

Model	Contact	Contact form	Operating pattern	Remarks
D4NH-□A□	1NC/1NO			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4NH-□B□	2NC			Only NC contacts 11-12 and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 31-32 can be used as unlike poles.
D4NH-□C□	2NC/1NO			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 33-34 can be used as unlike poles.
D4NH-□D□	3NC			Only NC contacts 11-12, 21-22, and 31-32 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22, and 31-32 can be used as unlike poles.
D4NH-□E□	1NC/1NO MBB			Only NC contacts 11-12 have a certified direct opening mechanism. ⊖ The terminals 11-12 and 33-34 can be used as unlike poles.
D4NH-□F□	2NC/1NO MBB			Only NC contacts 11-12 and 21-22 have a certified direct opening mechanism. ⊖ The terminals 11-12, 21-22 and 33-34 can be used as unlike poles.

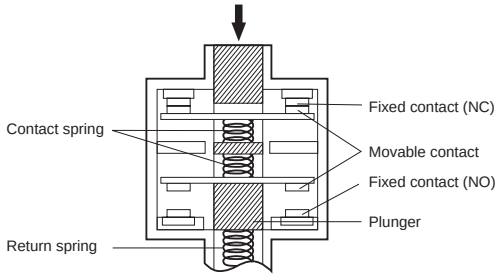
Note: 1. Terminals are numbered according to EN50013. Contact forms are according to EN60947-5-1.

2. MBB (Make Before Break) contacts have an overlapping structure, so that before the normally closed contact (NC) opens, the normally open contact (NO) closes.

Operation

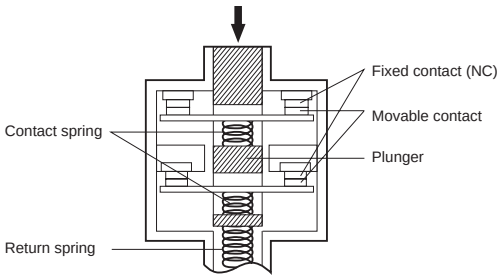
■ Direct Opening Mechanism

1NC/1NO Contact (Slow-action)



Only the NC contact side has a direct opening mechanism. When contact welding occurs, the contacts are separated from each other by the plunger being pushed in. (Conforms to EN60947-5-1 Direct Opening Operation.)

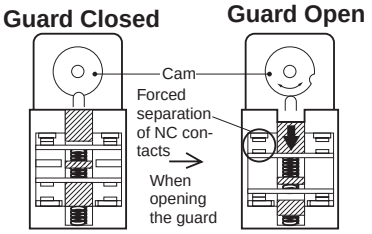
2NC Contact (Slow-action)



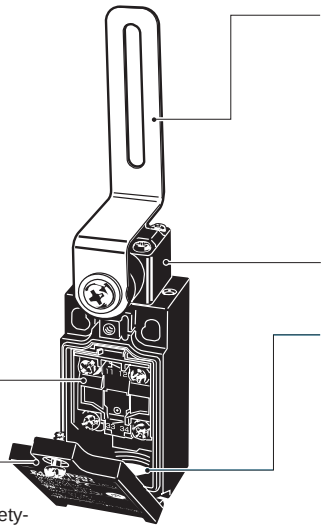
Both NC contacts have a direct opening mechanism. When contact welding occurs, the contacts are separated from each other by the plunger being pushed in. (Conforms to EN60947-5-1 Direct Opening Operation.)

Nomenclature

■ Structure (D4NH-□□BC)



When the guard is opened, the cam that is directly coupled to the shaft rotates to press the Switch in the direction shown by the (vertical) arrow. This action separates the contacts to stop the machine.



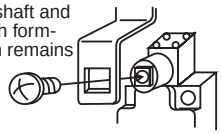
Built-in Switch
The built-in switch has a direct opening mechanism that forcibly separates the NC contact even when there is contact deposit.

Cover
The cover, with a hinge on its lower part, can be opened by removing the screw of the cover, which ensures ease of maintenance and wiring.

* The housing and head of the D4NH are made of resin. Use D4BS Safety-door Switches for applications requiring safety door switches of tough, high-sealing, or oil-resistant construction.

Arm Lever
The arm lever is mounted upwards in the center position before shipping. To change the position, loosen the arm lever mounting screw, dismount the arm lever, and mount the arm lever in the left or right position.

The joint between the shaft and arm lever is formed with form-lock construction which remains secure even when the screw becomes loose.



Head
The head can be mounted in four directions.

Conduit
A wide variety of conduits is available.

Size	1-conduit	2-conduit
Pg13.5	Yes	Yes
G1/2	Yes	Yes
1/2-14NPT	Yes	Yes
M20	Yes	Yes
M12 Connector	Yes	---

Note: M12 connector types are not available for Switches with three contacts.

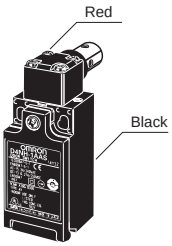
Dimensions

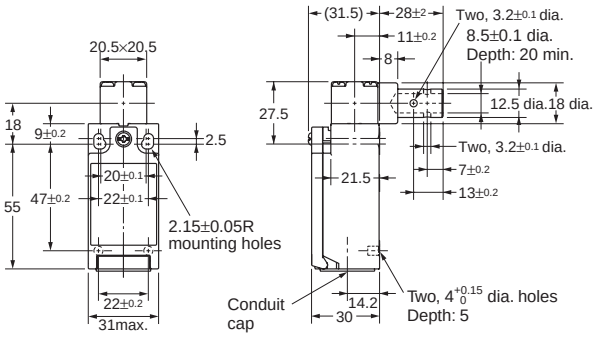
■ Switches

Note: All units are in millimeters unless otherwise indicated.

Shaft Type with 1 Conduit

D4NH-1□AS D4NH-2□AS
D4NH-3□AS D4NH-4□AS
D4NH-9□AS (See note 3.)

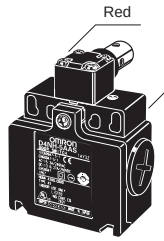


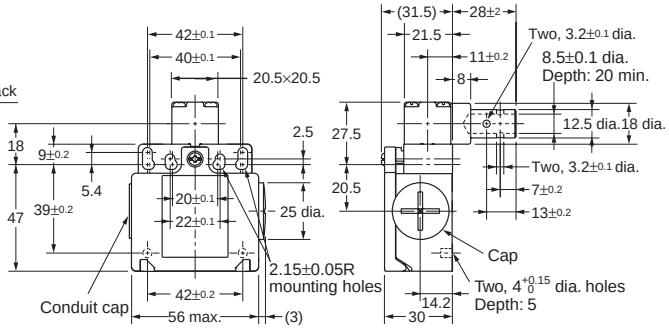


OF max.	0.15 N·m
PT 1 (NC) **PT 2 (NO)**	(7°) (MBB: 10°) (19°) (MBB: 5°)
DOT min. **DOF min.**	18° 1 N·m

Shaft Type with 2 Conduits

D4NH-5□AS D4NH-6□AS
D4NH-7□AS D4NH-8□AS



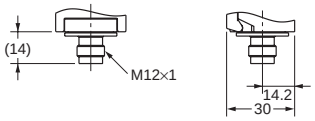


OF max.	0.15 N·m
PT 1 (NC) **PT 2 (NO)**	(7°) (MBB: 10°) (19°) (MBB: 5°)
DOT min. **DOF min.**	18° 1 N·m

Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
3. Refer to the following diagram for details on M12 connectors.

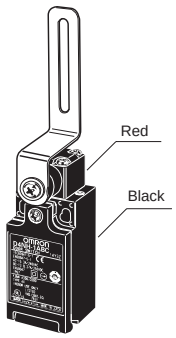
1-conduit M12 Connector

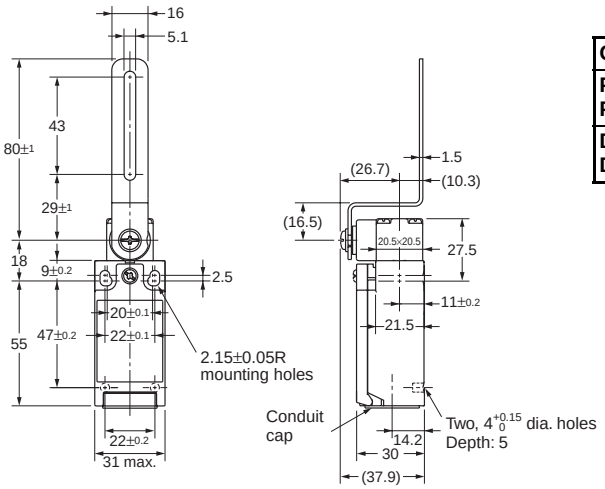
D4NH-9□□□



Arm Lever Type with 1 Conduit

D4NH-1□BC D4NH-2□BC
D4NH-3□BC D4NH-4□BC
D4NH-9□BC (See note 3.)

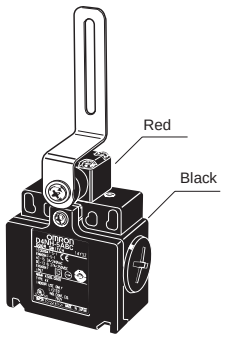


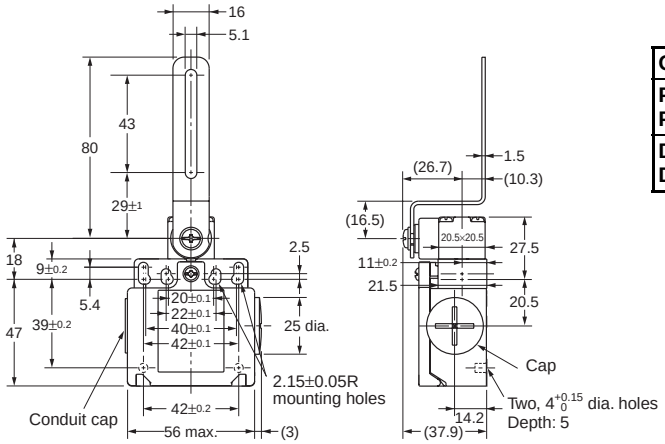


OF max.	0.15 N·m
PT 1 (NC) **PT 2 (NO)**	(7°) (MBB: 10°) (19°) (MBB: 5°)
DOT min. **DOF min.**	18° 1 N·m

Arm Lever Type with 2 Conduits

D4NH-5□BC D4NH-6□BC
D4NH-7□BC D4NH-8□BC



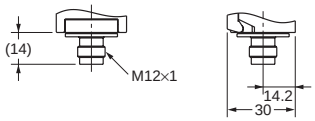


OF max.	0.15 N·m
PT 1 (NC) **PT 2 (NO)**	(7°) (MBB: 10°) (19°) (MBB: 5°)
DOT min. **DOF min.**	18° 1 N·m

Note: 1. Unless otherwise specified, a tolerance of ±0.4 mm applies to all dimensions.
2. Variation occurs in the simultaneity of contact opening/closing operations of 2NC, 2NC/1NO, and 3NC contacts. Check contact operation.
3. Refer to the following diagram for details on M12 connectors.

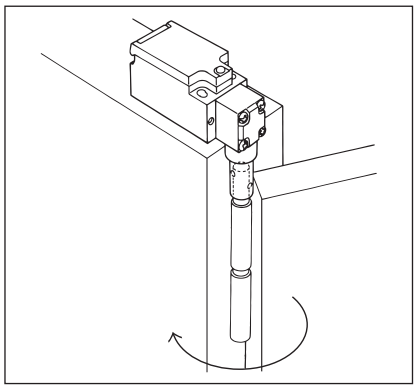
1-conduit M12 Connector

D4NH-9□□□

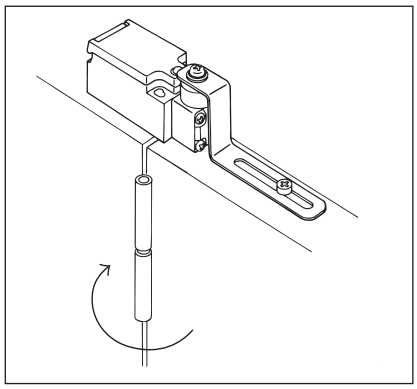


Application Examples (Protective Door Safety Measures)

Shaft Actuator



Arm Lever Actuator

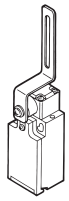


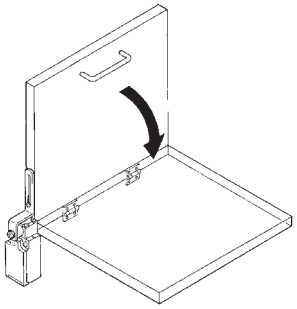
Application Examples of Arm Lever Use

Note: Be sure to evaluate the Switch under actual working conditions after installation.

When Installing at the Center

The arm lever is set for center installation at the time of shipment.

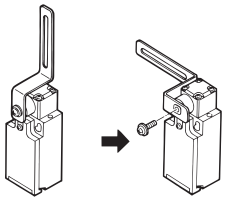


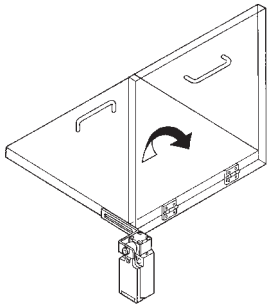


Note: Install the arm lever so that it will not rotate more than 90°.

When Installing to the Left

Remove the screw and arm lever, position the arm lever to the left, and then secure it with the screw.

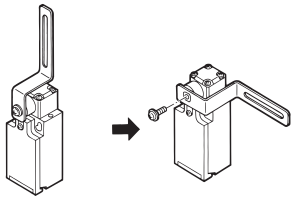


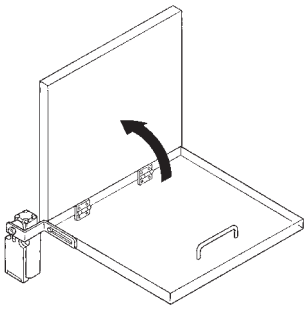


Note: Install the arm lever so that it will not rotate more than 180°.

When Installing to the Right

Remove the screw and arm lever, position the arm lever to the right, and then secure it with the screw.





Note: Install the arm lever so that it will not rotate more than 180°.

Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

⚠ CAUTION

Do not use metal connectors or conduits. If the Switch is made of resin, damage at the conduit section may cause electric shock.

■ Precautions for Safe Use

- Do not drop the Switch. Doing so may result in the Switch not performing to its full capability.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- Do not use the Switch where explosive gas or flammable gas may be present.
- Install the Switch in a location away from close body contact. Not doing so may result in malfunction.
- Do not use the Switch submerged in oil or water, or in locations continuously subject to splashes of oil or water. Doing so may result in oil or water entering the Switch interior. (The IP67 degree of protection specification for the Switch refers to water penetration while the Switch is submersed in water for a specified period of time.)
- Protect the head from foreign material. Subjecting the head to foreign material may result in premature wear or damage to the Switch. Although the Switch body is protected from penetration by dust or water, the head is not protected from penetration by minute particles or water.
- Turn the power OFF before wiring. Doing so may result in electric shock.
- Install a cover after wiring. Not doing so may result in electric shock.
- Connect a fuse to the Switch in series to protect the Switch from short-circuit damage. Use a fuse with a breaking current 1.5 to 2 times larger than the rated current. To conform to EN ratings, use an IEC60269-compliant 10-A fuse type gI or gG.
- Do not switch circuits for two or more standard loads (250 VAC, 3 A) at the same time. Doing so may adversely affect insulation performance.
- The durability of the Switch is greatly affected by operating conditions. Evaluate the Switch under actual working conditions before permanent installation and use within a number of switching operations that will not adversely affect the Switch's performance.
- Be sure to indicate in the machine manufacturer's instruction manual that the user must not attempt to repair or maintain the Switch and must contact the machine manufacturer for any repairs or maintenance.
- If the Switch is to be used in an emergency stop circuit or in a safety circuit for preventing accidents resulting in injuries or deaths, use a model that has an NC contact equipped with a direct opening mechanism and make sure that the Switch operates in the direct opening mode.

■ Precautions for Correct Use

Environment

- The Switch is intended for indoor use only.
- Do not use the Switch outdoors. Doing so may cause the Switch to malfunction.
- Do not use the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, CI_2) are present or in locations subject to high temperature and humidity. Doing so may result in damage to the Switch caused by contact failure or corrosion.
- Do not use the Switch under any of the following conditions.
  - Locations subject to extreme temperature changes.
  - Locations where high humidity or condensation may occur.
  - Locations subject to excessive vibration.
  - Locations where metal dust, processing waste, oil, or chemicals may enter through the protective door.
  - Locations subject to detergents, thinner, or other solvents.

Mounting Method

Mounting Screw Tightening Torque

Loose screws may result in malfunction. Tighten the screws to the specified torques.

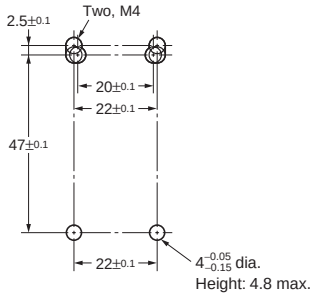
Terminal screw	0.6 to 0.8 N·m
Cover clamping screw	0.5 to 0.7 N·m
Head clamping screw	0.5 to 0.6 N·m
Arm lever clamping screw	1.6 to 1.8 N·m
Body clamping screw	0.5 to 0.7 N·m
Conduit mounting connection, M12 adaptor	1.8 to 2.2 N·m
	1.4 to 1.8 N·m (1/2-14NPT)
Cap screw	1.3 to 1.7 N·m

Switch Mounting

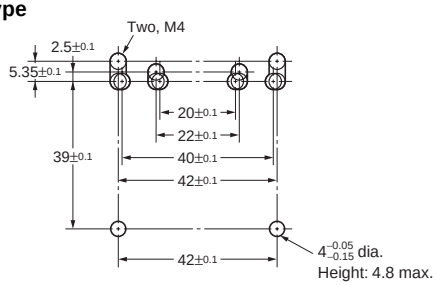
- Mount the Switch using M4 screws and washers and tighten the screws to the specified torque.
- For safety, use screws that cannot be easily removed, or use an equivalent measure to ensure that the Switch is secure.
- Secure the Switch with two M4 bolts and washers. Provide studs with a diameter of $4^{-0.05}_{-0.15}$ and a height of 4.8 mm max. at two places, inserting into the holes at the bottom of the Switch as shown below so that the Switch is firmly fixed at four points.

Switch Mounting Holes

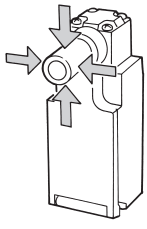
One-conduit Type



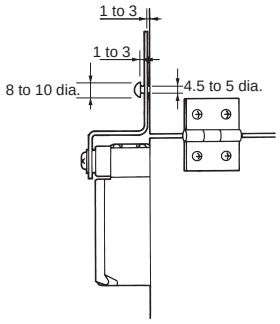
Two-conduit Type



- Mount the shaft or arm lever securely with a one-way screw, or an equivalent so that the shaft or arm lever cannot be easily removed.
- Align the rotational center of the shaft with the door, so that the Switch shaft and head will not be subjected to mechanical stress when the door opens or closes.
  Do not impose a force of 50 N or more on the shaft.



Be sure that the arm lever and door are mounted as shown in the following diagram so that the arm lever and head are not subjected to mechanical stress when the door opens or closes.



Changing the Head Direction

By removing the four screws of the head, the mounting direction of the head can be changed. The head can be mounted in four directions. Be sure that no foreign material will enter the head during a change in direction.

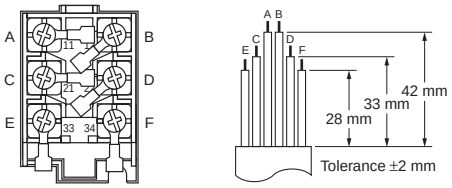
Arm Lever Mounting Position

The arm lever is mounted upwards in the center position before shipping. To change the position, loosen the arm lever mounting screw, dismount the arm lever, and mount the arm lever in the left or right position.

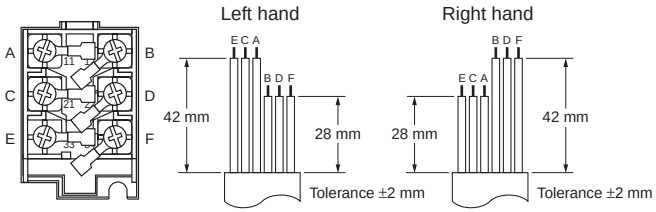
Wiring

- When connecting to the terminals via insulating tube and M3.5 crimp terminals, arrange the crimp terminals as shown below so that they do not rise up onto the case or the cover. Applicable lead wire size: AWG20 to AWG18 (0.5 to 0.75 mm^2).
  Use lead wires of an appropriate length, as shown below. Not doing so may result in excess length causing the cover to rise and not fit properly.

One-conduit Type (3 Poles)



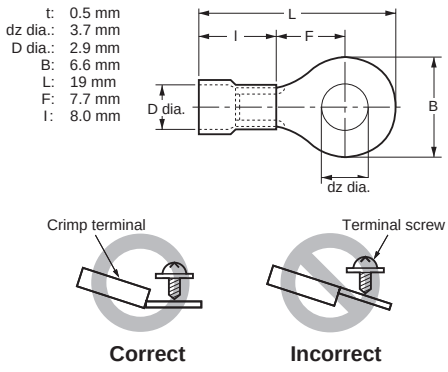
Two-conduit Type (3 Poles)



- Do not push crimp terminals into gaps in the case interior. Doing so may cause damage or deformation of the case.
- Use crimp terminals not more than 0.5 mm in thickness. Otherwise, they will interfere with other components inside the case. The crimp terminals shown below are not more than 0.5 mm thick.

Manufacture	Type
J.S.T. Mfg Co.	FV0.5-3.7 (F type) V0.5-3.7 (straight type)

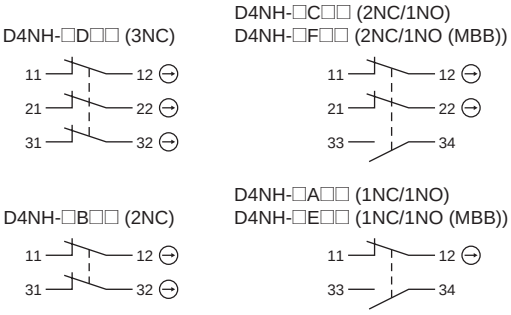
J.S.T is a Japanese manufacturer.



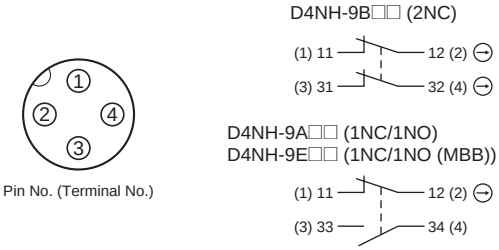
Contact Arrangement

- The following diagrams show the contact arrangements used for screw terminal types and connector types.

Screw Terminal Type



Connector Type



- Applicable socket: XS2F (OMRON).
- Refer to the *Connector Catalog* for details on socket pin numbers and lead wire colors.

Socket Tightening (Connector Type)

- Turn the socket connector screws by hand and tighten until no space remains between the socket and the plug.
- Make sure that the socket connector is tightened securely. Otherwise, the rated degree of protection (IP67) may not be maintained and vibration may loosen the socket connector.

Conduit Opening

- Connect a recommended connector to the opening of the conduit and tighten the connector to the specified torque. The case may be damaged if an excessive tightening torque is applied.
- When using 1/2-14NPT conduits, apply sealing tape between the connector and conduit opening to maintain the degree of protection (IP67) of the Switch.
- Use a cable with a suitable diameter for the connector.
- Attach and tighten a conduit cap to the unused conduit opening when wiring. Tighten the conduit cap to the specified torque. The conduit cap is provided with the Switch (2-conduit types).

Recommended Connectors

Use connectors with screws not exceeding 9 mm, otherwise the screws will protrude into the case interior, interfering with other components in the case. The connectors listed in the following table have connectors with thread sections not exceeding 9 mm. Use the recommended connectors to ensure conformance to IP67.

Size	Manufacturer	Model	Applicable cable diameter
G1/2	LAPP	ST-PF1/2 5380-1002	6.0 to 12.0 mm
Pg13.5	LAPP	ST-13.5 5301-5030	6.0 to 12.0 mm
M20	LAPP	ST-M20 × 1.5 5311-1020	7.0 to 13.0 mm
1/2-14NPT	LAPP	ST-NPT1/2 5301-6030	6.0 to 12.0 mm

Use LAPP connectors together with Seal Packing (JPK-16, GP-13.5, GPM20, or GPM12), and tighten to the specified tightening torque. Seal Packing is sold separately.

LAPP is a German manufacturer.

Before using a 2-conduit 1/2-14NPT type, attach the provided changing adaptor to the Switch and then connect the recommended connector.

Storage

Do not store the Switch in locations where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, Cl_2) or dust is present, or in locations subject to high temperatures and humidity.

Others

- Do not allow the load current to exceed the rated value.
- Confirm that the seal rubber has no defects before use. If the seal rubber is displaced or raised, or has foreign particles adhered to it, the sealing capability of the seal rubber will be adversely affected.
- Use the correct cover mounting screws only, or the sealing capability of the seal rubber will deteriorate.
- Inspect the Switch regularly.
- Use the following recommended countermeasures to prevent telegraphing when using adjustable or long levers.

1. Make the rear edge of the dog smooth with an angle of 15° to 30° or make it in the shape of a quadratic curve.
2. Design the circuit so that no error signal will be generated.
3. Use or set a Switch that is operated in one direction only.

Production Discontinuation

Following the release of the D4NH, production of the D4DH will be discontinued.

Date of Production Discontinuation

Production of the D4DH Series will be discontinued as of the end of March 2006.

Recommended Substitute Products

Use the D4NH-series Switches, which have been available since January 2004.

Product Substitution

1. Dimensions

   The D4DH and D4NH use the same mounting method, and mounting hole. The multi-contact structure and the extra 4 mm in length, however, are different.
2. Terminal Numbers

   For the 2-contact model, the terminals 21, 22, 23, and 24 on the D4DH are 31, 32, 33, and 34 on the D4NH.
3. Recommended Terminals

   If the recommended terminals are not used, the Switch may not be compatible. Make sure that the Switch is compatible with the terminals.

Comparison of the D4DH and Substitute Products

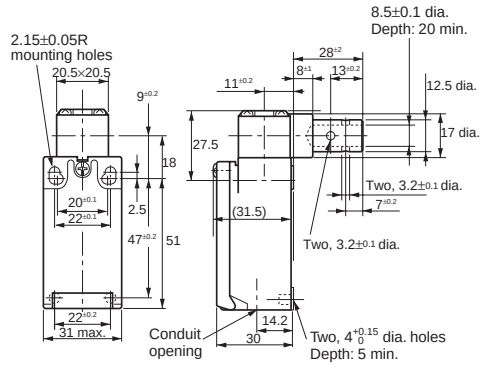
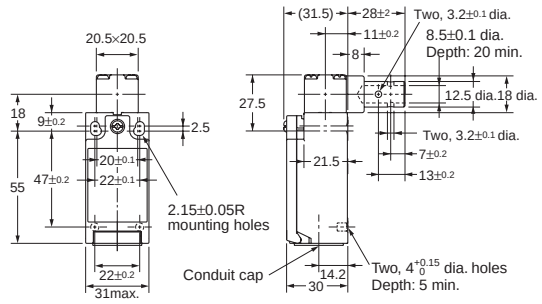
Model	D4NH
Switch color	Very similar
Dimensions	Very similar
Wiring/connection	Significantly different
Mounting method	Completely compatible
Ratings/performance	Very similar
Operating characteristics	Very similar
Operating method	Completely compatible

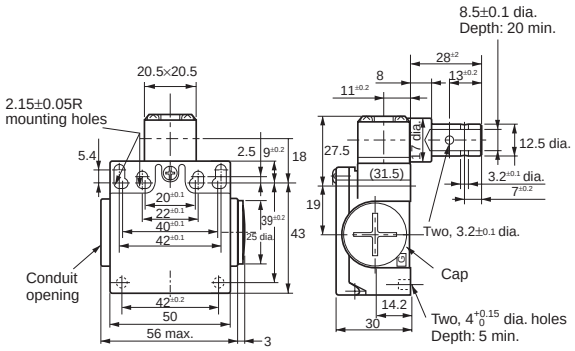
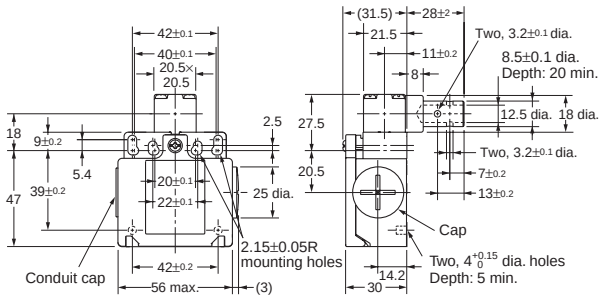
List of Recommended Substitute Products

Using M screws is recommended to comply with European standards. Therefore, the M20 conduit model is recommended for use in new designs.

D4DH product to be discontinued	Recommended substitute product	D4DH product to be discontinued	Recommended substitute product
D4DH-15AS	D4NH-1AAS	D4DH-1AAS	D4NH-1BAS
D4DH-25AS	D4NH-2AAS	D4DH-2AAS	D4NH-2BAS
D4DH-35AS	D4NH-3AAS	D4DH-3AAS	D4NH-3BAS
D4DH-55AS	D4NH-5AAS	D4DH-5AAS	D4NH-5BAS
D4DH-65AS	D4NH-6AAS	D4DH-6AAS	D4NH-6BAS
D4DH-15BC	D4NH-1ABC	D4DH-1ABC	D4NH-1BBC
D4DH-25BC	D4NH-2ABC	D4DH-2ABC	D4NH-2BBC
D4DH-35BC	D4NH-3ABC	D4DH-3ABC	D4NH-3BBC
D4DH-55BC	D4NH-5ABC	D4DH-5ABC	D4NH-5BBC
D4DH-65BC	D4NH-6ABC	D4DH-6ABC	D4NH-6BBC

Dimensions (Unit: mm)

Discontinued Models (1-conduit D4DH)	Replacement Products (1-conduit D4NH)
	

Discontinued Models (2-conduit D4DH)	Replacement Products (2-conduit D4NH)
	

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C131-E1-04

D4NS/D4JL-mounting Slide Keys

D4NS-SK/D4JL-SK

- Safety-door Switch attachments fit doors on aluminum frames as small as 20-mm^2 and frames that are large enough to enclose robotics.
- Shortens the lead time for Safety-door Switch mounting design.
- Enables applications in compliance with ANSI/RIA U.S. robot standards. (Excluding the D4NS-SK01.)

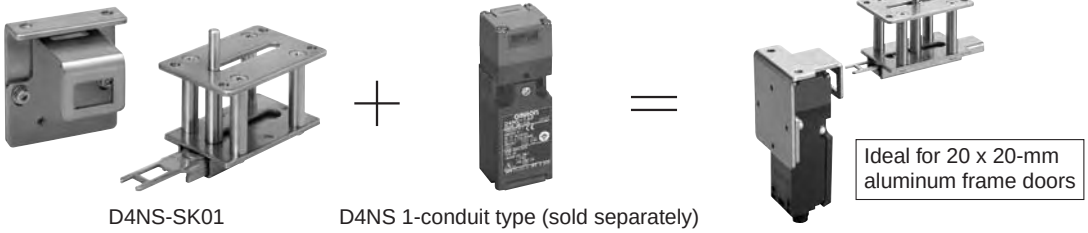
Note: Be sure to read the *"Safety Precautions"* on page 440 and the *"Precautions for All Safety Door Switches"* on page 317.

Note: Safety-door Switches are sold separately.

NEW

D4NS-SK01

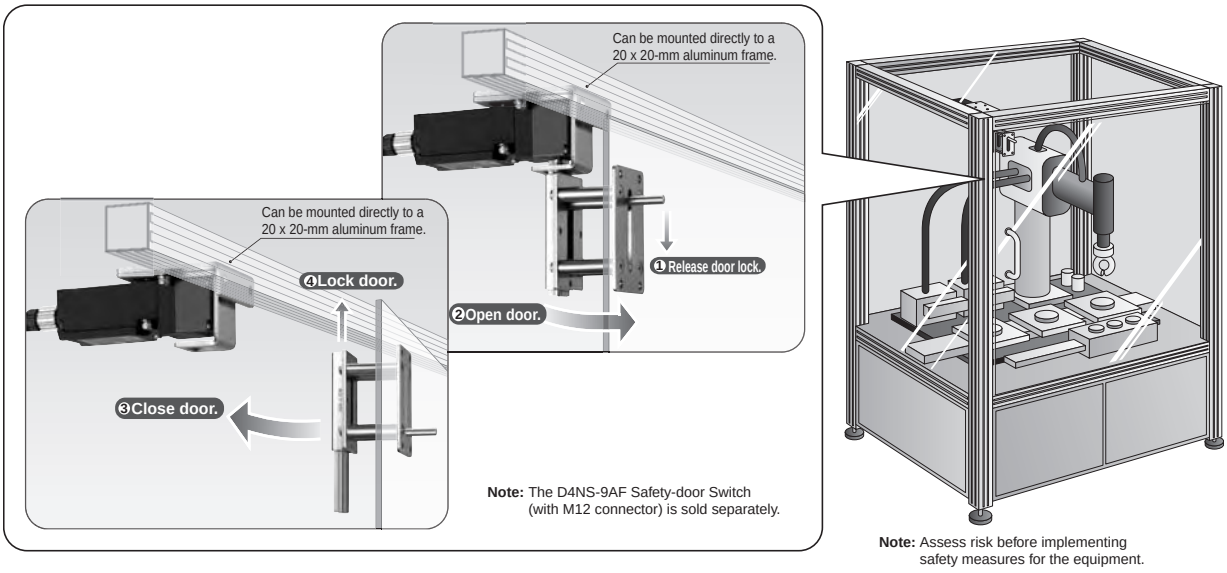
Configuration



D4NS-SK01 D4NS 1-conduit type (sold separately)

Features

Mounts directly to 20 x 20-mm aluminum frames.

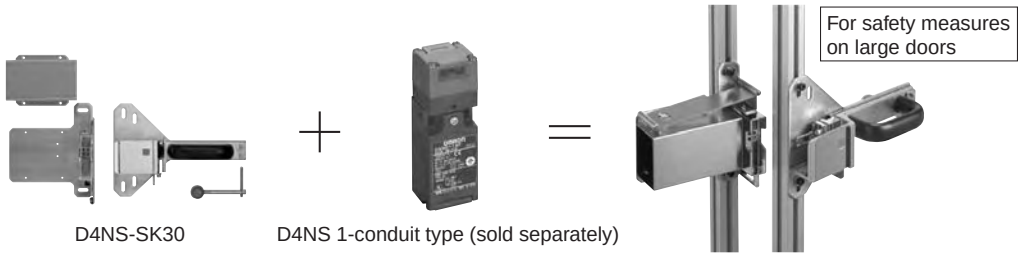


Note: The D4NS-9AF Safety-door Switch (with M12 connector) is sold separately.

Note: Assess risk before implementing safety measures for the equipment.

D4NS-SK30

Configuration



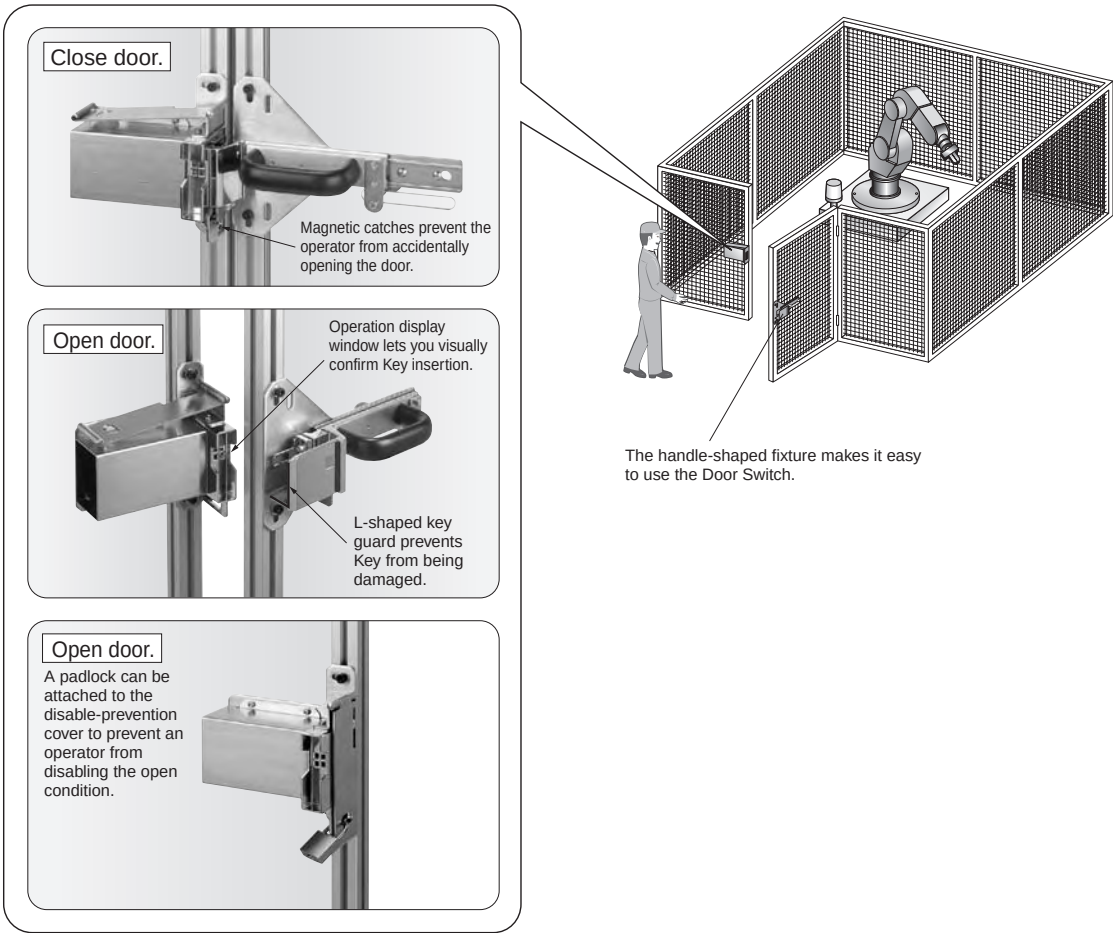
D4NS-SK30 D4NS 1-conduit type (sold separately)

Features

- **The L-shaped key guard prevents the Key from being damaged, and helps to guide the Key in smoothly.**
- **When the door is opened, the key hole can be covered by the disable-prevention cover, and a padlock can be attached.**
- **The operator's safety is then assured because the door cannot be closed until the padlock is removed.**

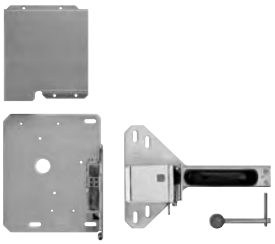
ANSI/RIA R15.06-1999 8.4 Protection of personnel within the safeguarded space
Personnel required to perform tasks within the safeguarded space shall be protected by:
a) Preventing the re-initiation of any motion or hazardous process while personnel are within the safeguarded space, for example locking a gate open;

- **The operation display window lets you visually confirm that the Key has been inserted.**
- **Magnetic catches prevent the door from opening if the operator accidentally bumps into it.**



D4JL-SK30

Configuration



D4JL-SK30

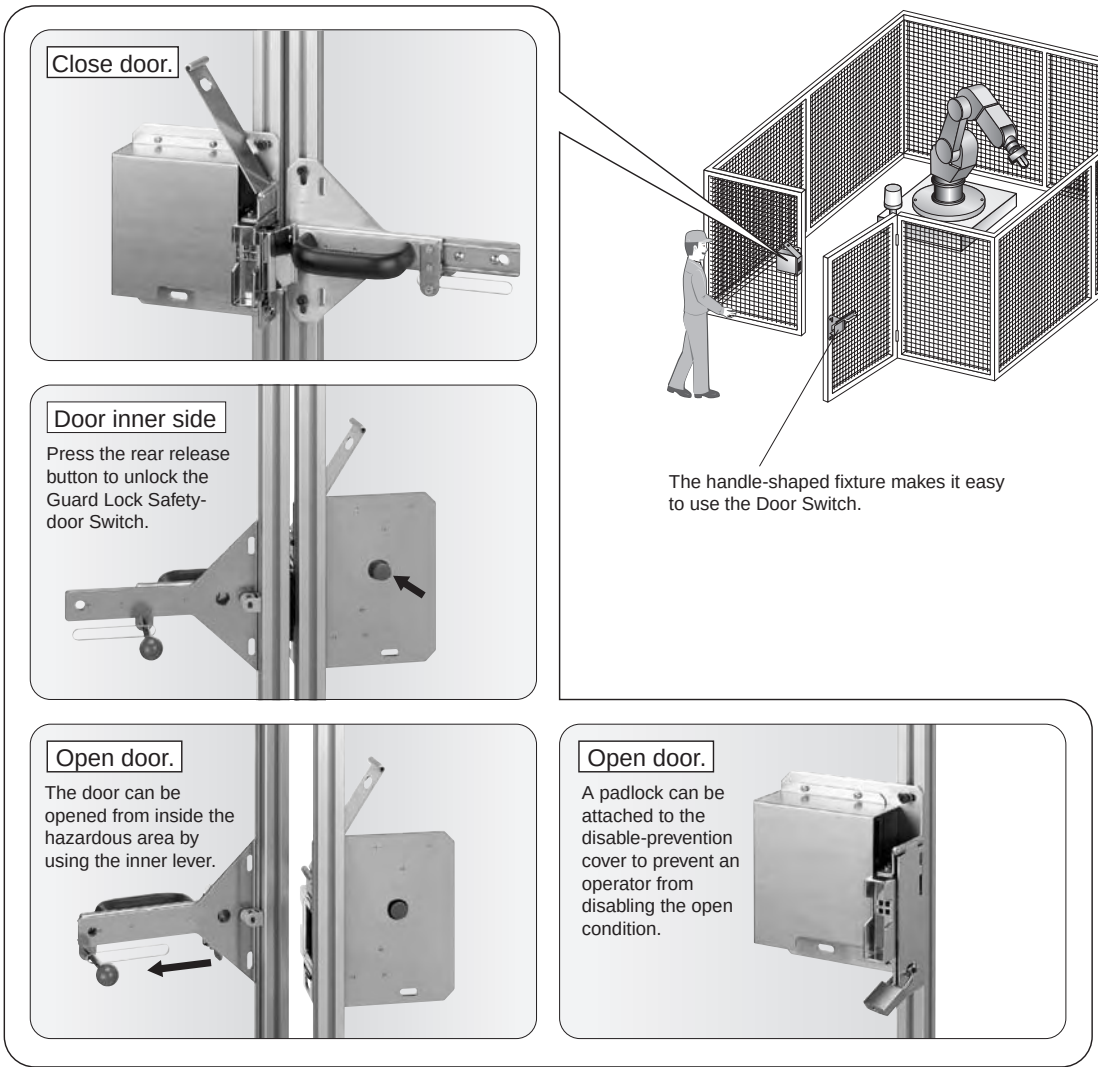
D4JL model
with rear release button (sold separately)

For safety measures on large doors that are potentially dangerous because their movement cannot be immediately stopped.

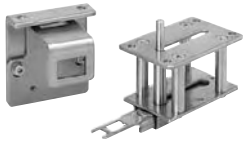
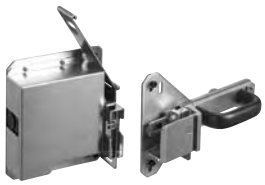
Features

- **Can be combined with the D4JL Guard Lock Safety-door Switch to prevent locked doors from being too easily opened.**
- **Even if an operator were to be trapped inside a hazardous area, the D4JL model with rear release button would allow the operator to unlock the door from the inside with the lever.**

ANSI/RIA R15.06-1999 11.2.2 Interlocking portion
b) The interlocking portion of the interlocked barrier shall be installed, applied, and maintained so that:
8) be capable of being easily unlocked from the inside of the safeguarded space with or without power available, when the possibility of full body access exists;



Ordering Information

Appearance	Specifications	Contents	Model	Applicable Door Switch
	Weight: 422 g Mechanical durability: 20,000 operations min.	Slide Key: 1 Auxiliary mounting bracket: 1 Receptacle bracket: 1	**D4NS-SK01**	D4NS 1-conduit type
	Weight: 2,800 g Mechanical durability: 20,000 operations min.	Slide Key: 1 D4NS mounting tool: 1 Inner lever: 1 Inner lever mounting screws: 2 Door Switch mounting one-way screws: 2 Switch protective cover: 1 Switch protective cover screws: 4 Disable-prevention cover (already mounted on Slide Key): 1	**D4NS-SK30**	D4NS 1-conduit type
	Weight: 3,400 g Mechanical durability: 20,000 operations min.	Slide Key: 1 D4JL mounting tool: 1 Inner lever: 1 Inner lever mounting screws: 2 Door Switch mounting one-way screws: 3 Switch protective cover: 1 Switch protective cover screws: 4 Disable-prevention cover (already mounted on Slide Key): 1	**D4JL-SK30**	D4JL-□□F□-□6 rear release button type

Note: 1. The Door Switch is not included. Select the Door Switch depending on the necessary number of contacts and the conduit size.

2. Perform risk assessment for the equipment in question, configure relay units and other safety circuits, and use properly.

Applicable Door Switches

Guard Lock Safety-door Switch
D4JL

- Two safety circuits and two monitor contacts provide an array of monitoring patterns.
- Standard gold-clad contacts enable use with ordinary loads and microloads.
- Models with rear release buttons allow people to unlock the Switch and escape if they are locked into hazardous areas.
- IP67 degree of protection

■ List of Models

Models with Rear Release Buttons

Release key type	Indicator	Lock and release types	Contact configuration (door open/closed detection switch and lock monitor switch contacts)	Conduit opening	Model
Special release key	Green	Mechanical lock Solenoid release	2NC/1NO+2NC/1NO	PG13.5	**D4JL-1NFA-C6**
				G1/2	**D4JL-2NFA-C6**
				1/2-14NPT	**D4JL-3NFA-C6**
				M20	**D4JL-4NFA-C6**
			2NC/1NO+3NC	PG13.5	**D4JL-1PFA-C6**
				G1/2	**D4JL-2PFA-C6**
				1/2-14NPT	**D4JL-3PFA-C6**
				M20	**D4JL-4PFA-C6**
			3NC+2NC/1NO	PG13.5	**D4JL-1QFA-C6**
				G1/2	**D4JL-2QFA-C6**
				1/2-14NPT	**D4JL-3QFA-C6**
				M20	**D4JL-4QFA-C6**
			3NC+3NC	PG13.5	**D4JL-1RFA-C6**
				G1/2	**D4JL-2RFA-C6**
				1/2-14NPT	**D4JL-3RFA-C6**
				M20	**D4JL-4RFA-C6**

Note: 1. To order models with an orange indicator, replace the "C6" at the end of the model number D4JL-□□FA-C6 with "D6".
2. For details on the D4JL, refer to the D4JL Datasheet (Cat. No. C135).
3. Ordinary D4JL types can also be mounted. However, because persons trapped inside the hazardous area cannot unlock the Switch from the inside, ordinary D4JL types do not satisfy ANSI requirements.

Safety-door Switch
D4NS

- Lineup includes MBB models and three contact models with 2NC/1NO and 3NC contact forms in addition to the previous contact forms 1NC/1NO, and 2NC.
- M12-connector models are available, saving on labor and simplifying replacement.
- Standard gold-clad contacts provide high contact reliability.
- Applicable to both standard loads and microloads.
- Free of lead, cadmium, and hexavalent chrome, reducing the burden on the environment.

■ List of Models

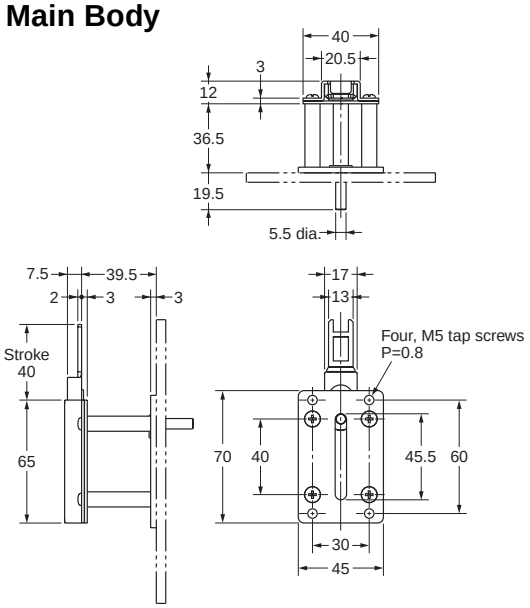
Type	Contact configuration		Conduit opening/Connector	Model
1-conduit	Slow-action	1NC/1NO	Pg13.5	**D4NS-1AF**
			G1/2	**D4NS-2AF**
			1/2-14NPT	**D4NS-3AF**
			M20	**D4NS-4AF**
		2NC	Pg13.5	**D4NS-1BF**
			G1/2	**D4NS-2BF**
			1/2-14NPT	**D4NS-3BF**
			M20	**D4NS-4BF**
		2NC/1NO	Pg13.5	**D4NS-1CF**
			G1/2	**D4NS-2CF**
			1/2-14NPT	**D4NS-3CF**
			M20	**D4NS-4CF**
		3NC	Pg13.5	**D4NS-1DF**
			G1/2	**D4NS-2DF**
			1/2-14NPT	**D4NS-3DF**
			M20	**D4NS-4DF**
	Slow-action MBB contact	1NC/1NO	Pg13.5	**D4NS-1EF**
			G1/2	**D4NS-2EF**
			1/2-14NPT	**D4NS-3EF**
			M20	**D4NS-4EF**
		2NC/1NO	Pg13.5	**D4NS-1FF**
			G1/2	**D4NS-2FF**
			1/2-14NPT	**D4NS-3FF**
			M20	**D4NS-4FF**
1-conduit connector	Slow-action	1NC/1NO	M12 connector	**D4NS-9AF**
		2NC		**D4NS-9BF**
	Slow-action MBB contact	1NC/1NO		**D4NS-9EF**

Dimensions

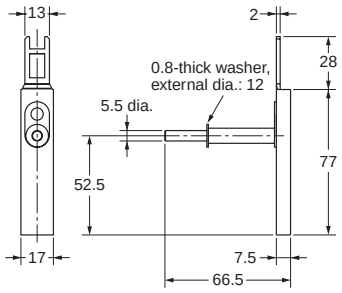
Note: All units are in millimeters unless otherwise indicated.

■ D4NS-SK01

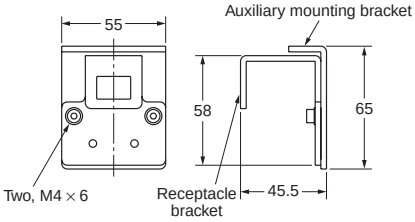
Main Body



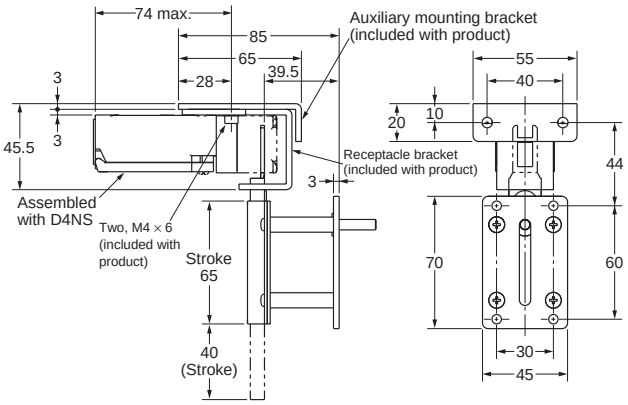
Slide Key Component



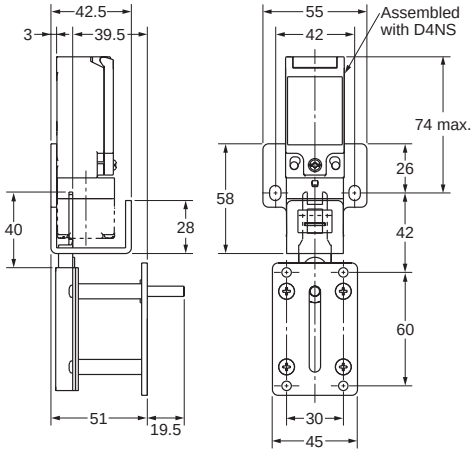
Auxiliary Mounting Bracket and Receptacle Bracket



Switch Mounting Pattern 1

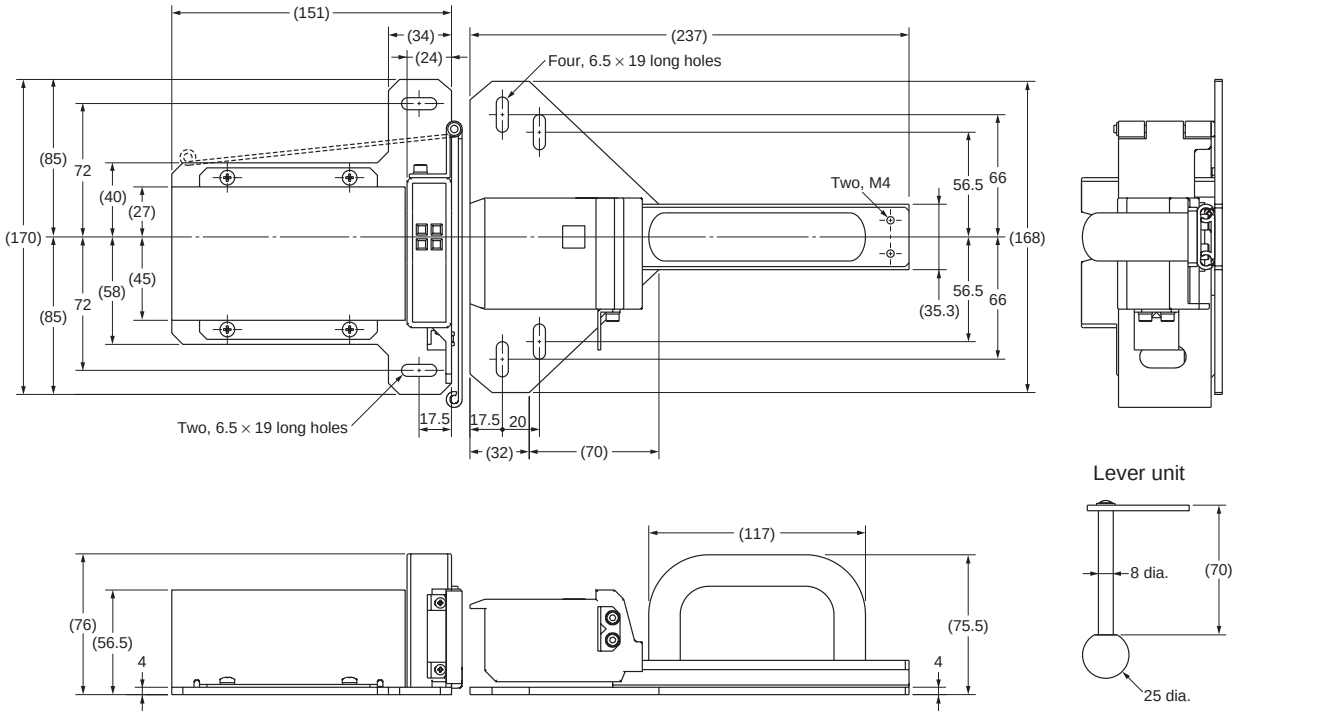


Switch Mounting Pattern 2

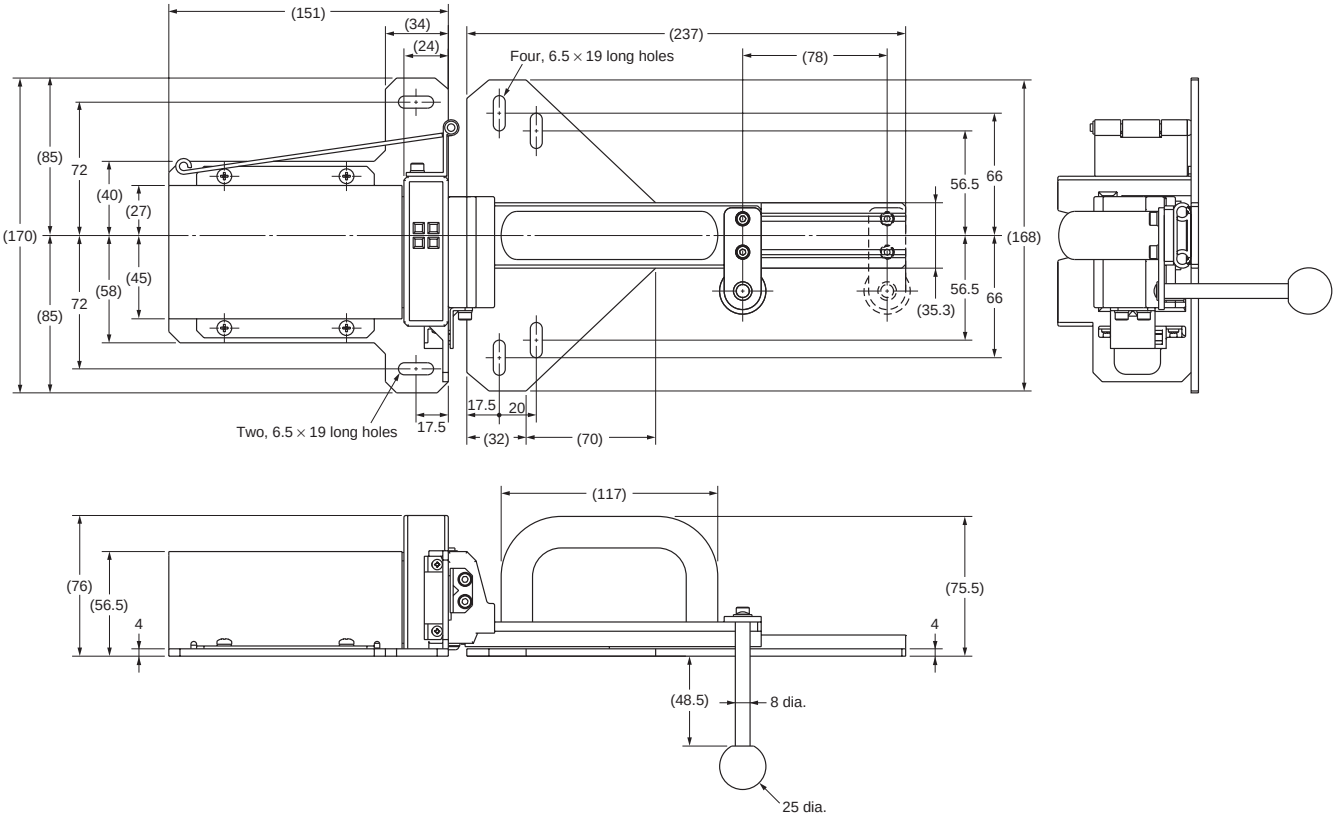


■ D4NS-SK30

Open Door

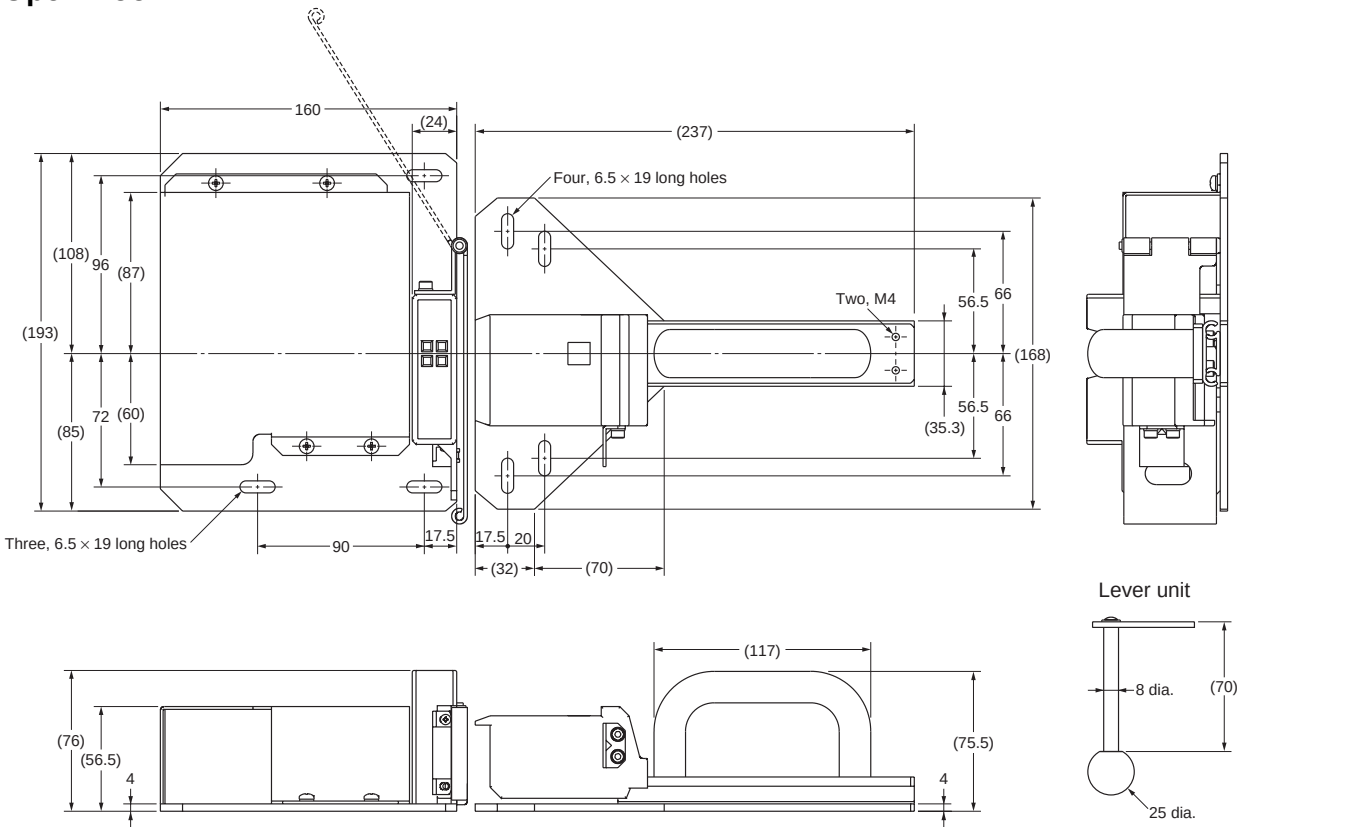


Closed Door

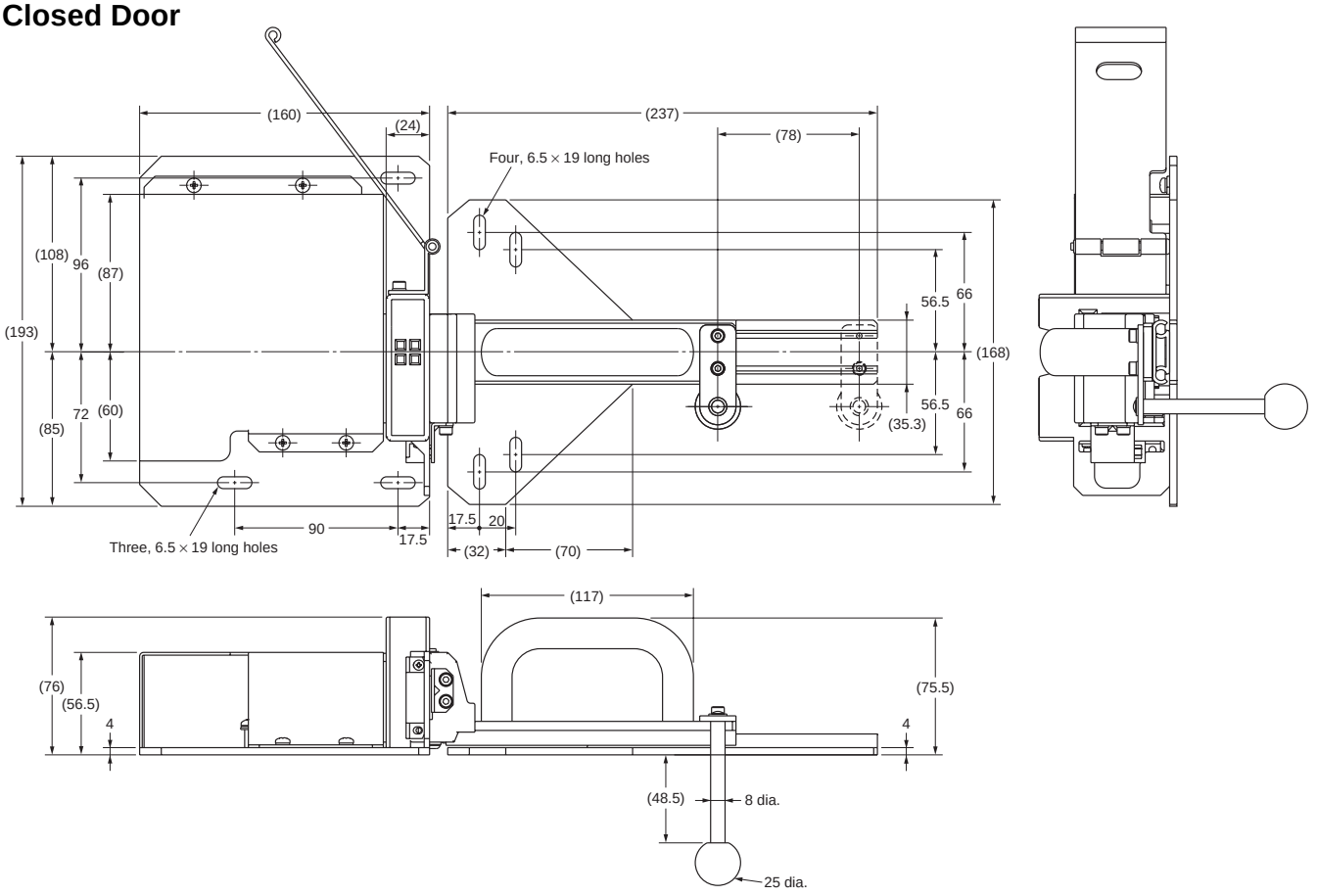


■ D4JL-SK30

Open Door



Closed Door



Safety Precautions

Refer to the *"Precautions for All Safety Switches"* on page 240 and *"Precautions for All Safety Door Switches"* on page 317.

⚠ CAUTION

Incorrect operation may cause injury. Also, the product is designed to be mounted so that it slides horizontally. Do not mount the product in a vertically sliding configuration.

■ Precautions for Safe Use

- Do not drop the Switch. Doing so may prevent the Switch from functioning to full capacity.
- Mount the Switch securely to prevent it from falling. Otherwise, injuries may occur.
- Do not attempt to disassemble or modify the Switch. Doing so may cause the Switch to malfunction.
- Make sure that the gap between the short bolt and guide is (±3 mm. Otherwise, excessive wear or damage may cause malfunction.
- To ensure safety, do not operate the Switch with anything other than a Slide Key.
- Be careful to avoid pinching your hand when operating the Switch.
- Be sure to mount the Switch protective cover. Otherwise, your hand may be injured by being pinched between the short bolt and Switch when closing the door with your hand on the Switch.
- When opening the door, be sure to lower the disable-prevention cover into position, attach a padlock, or take other steps to prevent other people from operating the Switch.
- The durability of the Switch is greatly influenced by the switching conditions. Always test the Switch under actual working conditions before application and use it in a switching circuit for which there are no problems with performance.
- The user must not maintain or repair equipment incorporating the Switch. Contact the manufacturer of the equipment for any maintenance or repairs required.
- Refer to the D4JL Guard Lock Safety-door Switch, D4NS Safety-door Switch Datasheet, Instruction Sheet for details and handling information on the Switch.

■ Precautions for Correct Use

- Insert the slide handle until the red operation indicator is completely displayed in the operation display window.

Normal Insufficient insertion

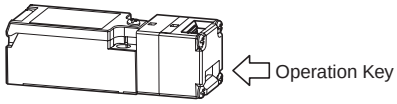
Operation display window

- Loose screws may result in malfunction. Use washers and tighten the screws to the specified torques. Also, when mounting the Switch to a door for disable-prevention purposes, purchase and use tamper-resistant screws.

Tightening Torque

Slide Key mounting screw (M6)		6.0 to 7.0 N·m
Switch mounting screw (included with product)	**For D4JL**	3.2 to 3.8 N·m
	For D4NS	0.5 to 0.7 N·m
Switch protective cover mounting screw (included with product)		1.2 to 1.4 N·m
Lever mounting screw (included with product)		1.2 to 1.4 N·m

- Use the D4NS-SK30 only with the D4NS Safety-door Switch head in the direction shown below.



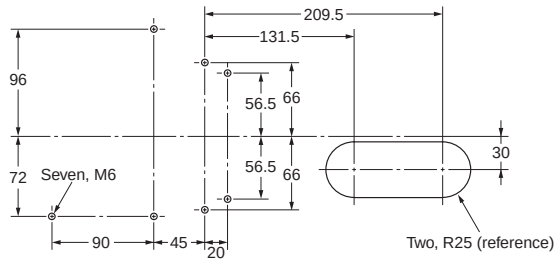
Technical Specifications

	D4JL-SK30	D4NS-SK30
Ambient operating temperature	–10 to 55°C (with no icing)	
Ambient operating humidity	95% max.	
Mechanical durability	20,000 operations min.	
Weight	Approx. 3.4 kg (not including D4JL Guard Lock Safety-door Switch)	Approx. 2.8 kg (not including D4NS Safety-door Switch)

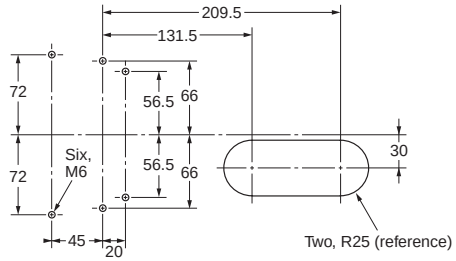
- Do not store the Switch where corrosive gases (e.g., H_2S, SO_2, NH_3, HNO_3, or CL_2) or dust are present, or in locations subject to high temperature or humidity.
- Perform maintenance inspections periodically.
- This product is for use only with OMRON Safety-door Switches. Do not use it with door switches made by other manufacturers.

■ Mounting Holes (Unit: mm)

D4JL-SK30



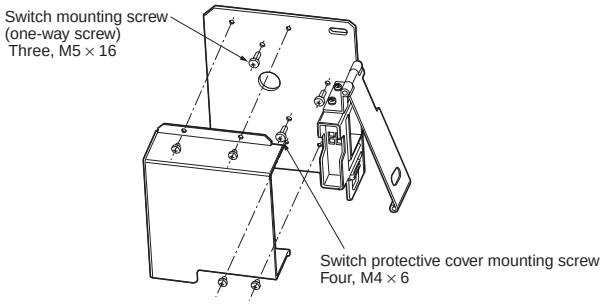
D4NS-SK30



■ Assembly

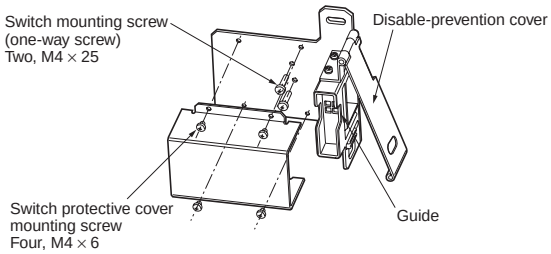
Switch part

D4JL-SK30



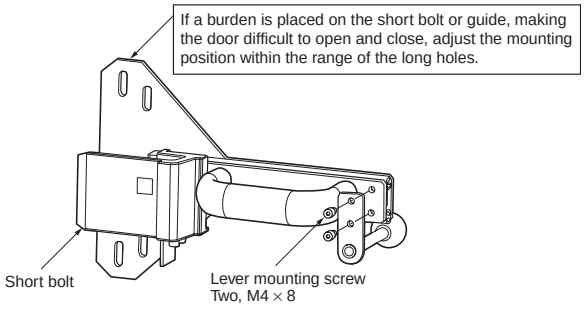
Switch part

D4NS-SK30



Handle part

D4JL-SK30/D4NS-SK30



ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. C136-E1-03