OMRON

USER'S MANUAL

Programmable Cam Switch
Type **3F88L-130**
CAM POSITIONER

CONTENTS

1. OUTLINE

Angle detection by the resolver and angle setting and adjustment by the CAM POSITI-ONER. This eliminates that complicated mechanical type cam adjustment. In addition, functions including the variable programming during operation, teaching and zero point correction are available. The CAM POSITIONER can be used for applications of various rotational angle control systems.

Fully making use of the advantages of an electronic device, the unit is provided with an excellent performance, easy handling feature and high ability in a compact body. Ease of set-up and in-stallation is realized by utilizing the DIN rails.
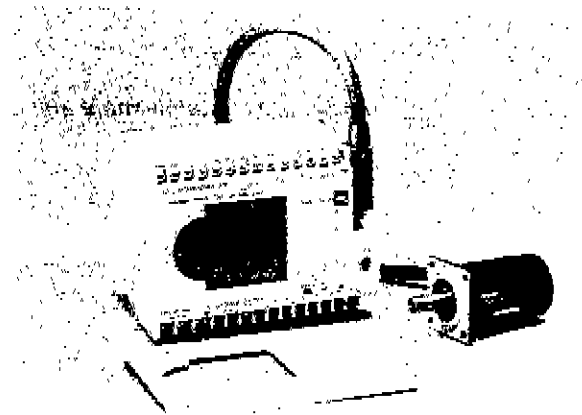
Variable programs during operation

With a machine in operation, the ON/OFF setting of revolutional angle can be changed. Most suitable for machines performing short-run multiple item production.

16 output points with 180/360 times max. ON/OFF control per output

Provided with 16 output points. Highly precise position control is available in maximum 180 times (resolution of 360 divisions per turn) and 360 times (resolution of 720 divisions per turn) per output point ON/OFF control.

Teaching funcition for ease of angle setting

With a machine in operation, the ON/OFF angle of the cam can be set in every output through the teaching function. The conventional complicated programming has been replaced with this easy and speedy setting work.

Ease of adjustment with zero point correction function

The zero point of a machine and that of the resolver may sometimes not be aligned when the resolver is installed. This can be immediately corrected using the zero point correction function provided.

Four kinds of programs can be stored

Programs can be stored in four kinds and they can be selected by the programable controller.

Switchable resolution

The sliding switch of the main unit selects the resolution of 360 and 720 divisions per turn.

EEPROM for operating memory

EEPROM has been adopted for the operating memory, which can be rewritten and used without the batteries for memory backed up.

Excellent resistance to the environment of resolver

The resolver of electro—magnetic type has an excellent resistance to the environment subjected to oil, dust, temperature, and shock. It can also be used over a wide ambi—enttemperature range of −10 to +80°C.

Absolute angle detection

The resolver can divide angles in absolute form and a high resolution of either 360 divisions or 720 divisions per turn is available.

Shaft load of 20 kg and shaft diameter of 10 mm

The shaft load is 20 kg for both of radial and axial directions and no other detector can achieve this figure.

Maximum cable length of 100 m

The resolver cable can be extended as long as 100 m. Using this cable remote control or operation can be per—formed at a place away from the resolver.

■Running example.

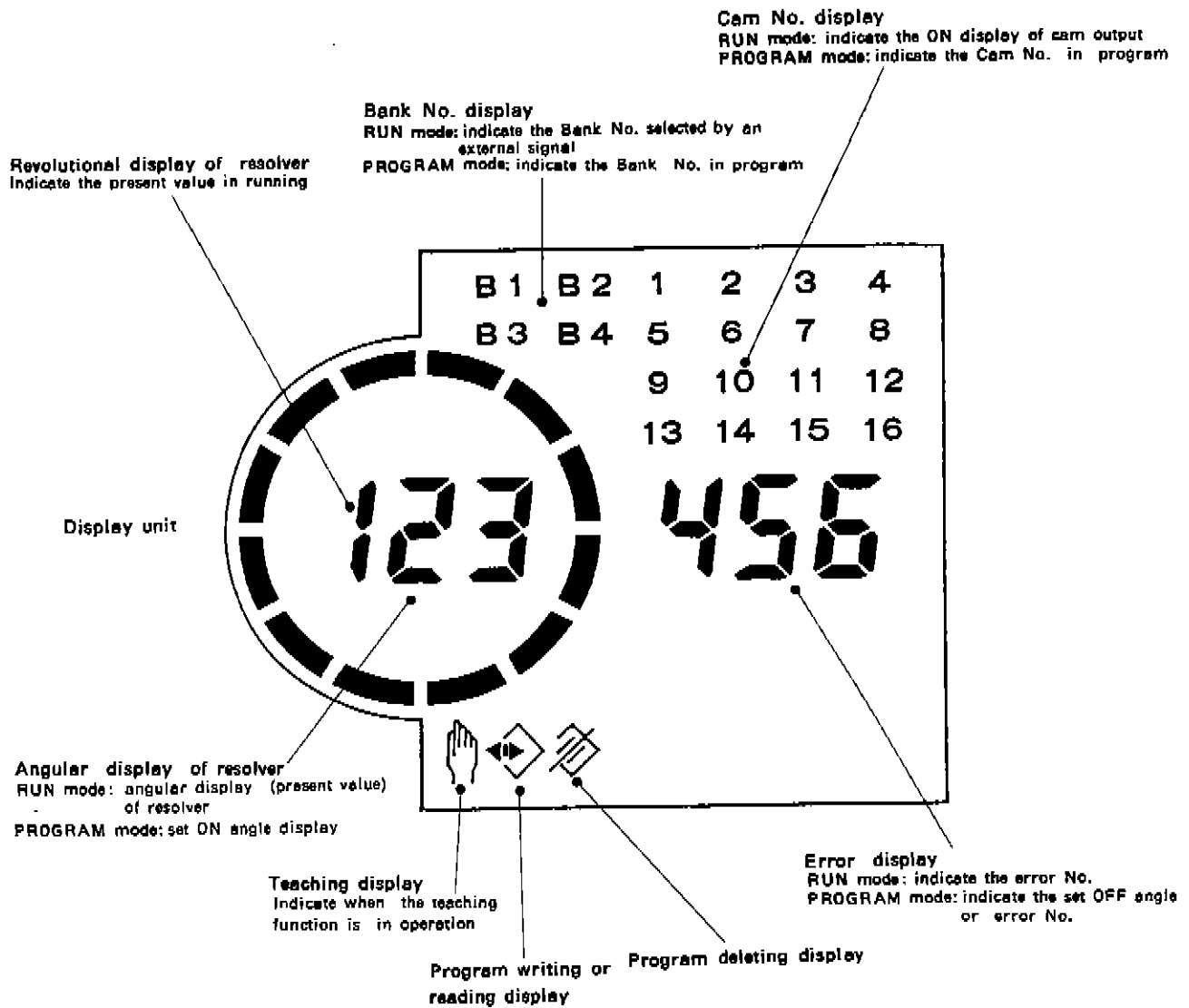| Cam output No·	ON setpoint	OFF setpoint
1 ＊	90	200
2	45	72
	110	180
	230	325
3	120	30

＊The cam output is OFF up to 89. ON at 90,
ON up to 189, and OFF at 200.

2. INTRODUCTION

2.1 Display

Cam No. display
RUN mode: indicate the ON display of cam output
PROGRAM mode: indicate the Cam No. in program

Bank No. display
RUN mode: indicate the Bank No. selected by an
external signal
PROGRAM mode: indicate the Bank No. in program

Revolutional display of resolver
Indicate the present value in running

```
B 1  B 2   1    2   3    4
B 3  B 4   5    6   7    8
           9   10  11   12
          13   14  15   16
```

Display unit

123 456

Angular display of resolver
RUN mode: angular display (present value)
of resolver
PROGRAM mode: set ON angle display

Teaching display
Indicate when the teaching
function is in operation

Program writing or reading display

Program deleting display

Error display
RUN mode: indicate the error No.
PROGRAM mode: indicate the set OFF angle
or error No.

2.2 Operating and terminal unit

When connected with COM terminal, the cam positioner comes into operation. If disconnected, no output will come out.

Cam output (1~8), open-collector output

When connected with COM terminal, BANK can be selected.

BANK selection key in PROGRAM mode

START and BANK common terminal

Teaching input or test running key

Program deleting key

ALARM output

Resolver signal input connector

Resolution selecting switch

Program input ten-key Programming is performed by entering digitals only.

Cam output (9~16)

Shall be grounded.

Apply DC 12 ~ 30 V power.

Free power source Apply AC 100 ~ 240 V power.

Selecting switch for rotational direction of resolver

Program clear switch When pushed to ON, the program of displayed BANK is cleared.

RETURN key (or ENTER key) Used for writing, reading and clearing operation of program.

Clear key Used for clearing the key operated just before pushing this key.

Zero point correction switch When placed to ON, the present position shows " 000 "

RUN/PRG mode selection key The key can be pulled out for preventing program from being changed accidentally.

3. INSTALLATION

3.1 External dimensions

(1) Main unit (Type 3F88L−130)

DIN rails to be mounted

Cable pull strength : 3 kg
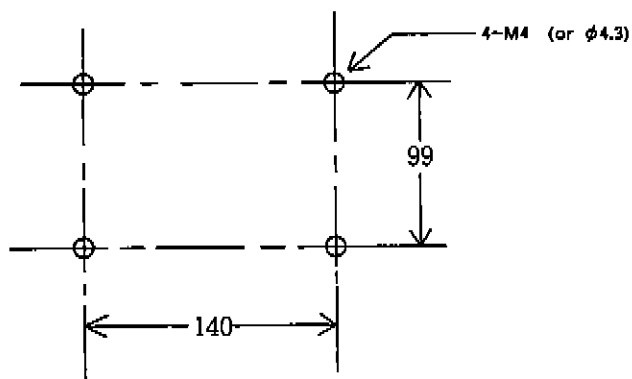
■ Installation method

• By way of DIN rails

When mounted using DIN rails, use the following items separately.

Supporting rail	Type PFP−100N, 50N
	Type PFP−100N2
End plate	Type PFP−M
Spacer	Type PFP−S

• Direct mounting (panel installation)

4−M4 (or φ4.3)

99

140

(2) Resolver (Type 3F88L-RS17)

Cable length: approx. 3 m
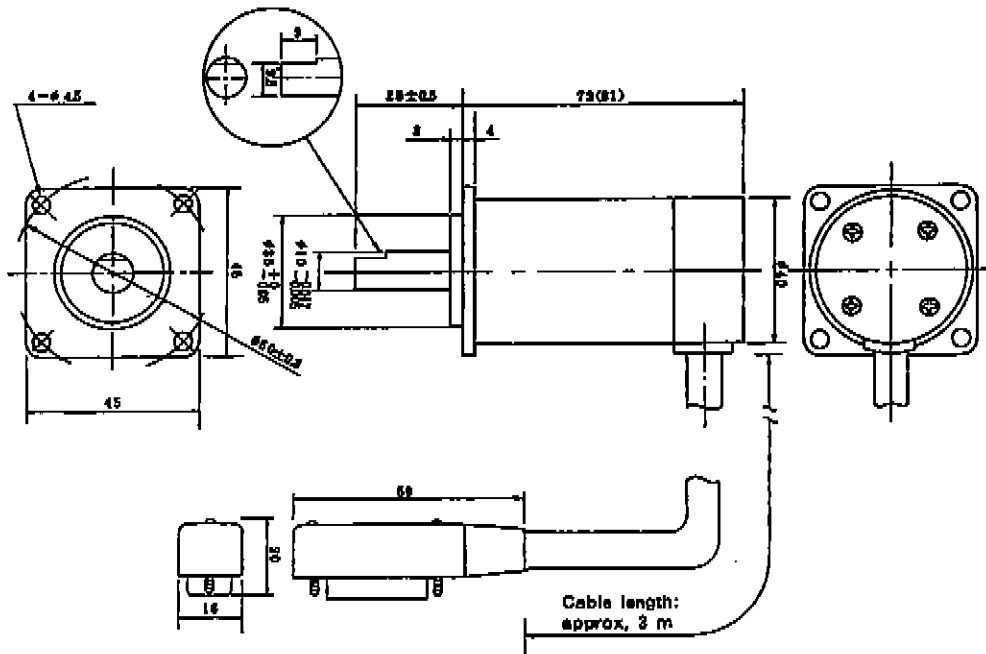
■ Mounting method

• Recommended mounting hole allocation

(recommended dimensions)

4-M4

• Mounting drawing

4-M4 screw

Sheet metal thickness : 3 mm or more
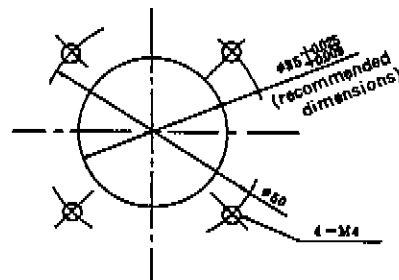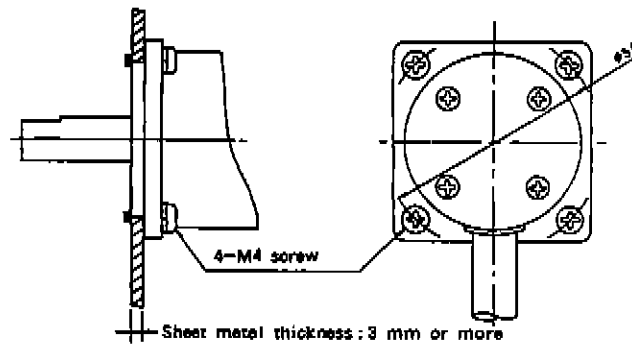
Note) Flange can withstand a static load up to 25 kg applied to the body of the resolver.
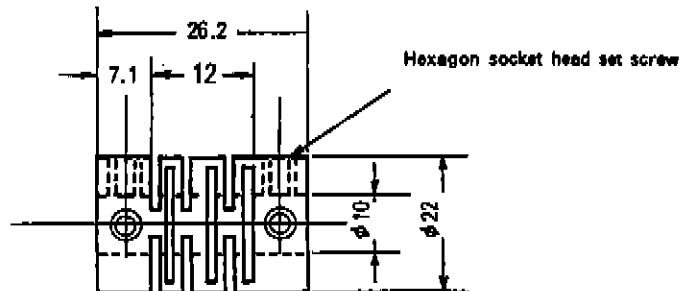
3.2 Connection with mechanical systems

Connect the resolver shaft with the shaft of a rotating machine system using the coupling (3F88L−RL10) supplied with the resolver.   Amount of alignment and bending angle shall be within the standard specified.

* External appearance of coupling

26.2
7.1 | 12
Hexagon socket head set screw
φ10 φ22

* Coupling specification

Max. bend-ing angle	Out of alignment	Allowable transfer torque		Set screw	
		20°C	80°C	Size	Tightening torque
10°	1.0 mm	30kg−cm	18kg−cm	M4×6	4.5kg−cm

Note)   When a torque of 1.7 ~ 2 times the allowable transfer torque is applied, the coupling will break at the flexible plate so as to prevent a loaded system from overloading.

* Connection of coupling

Shaft of a machine side   Shaft of the resolver side
C
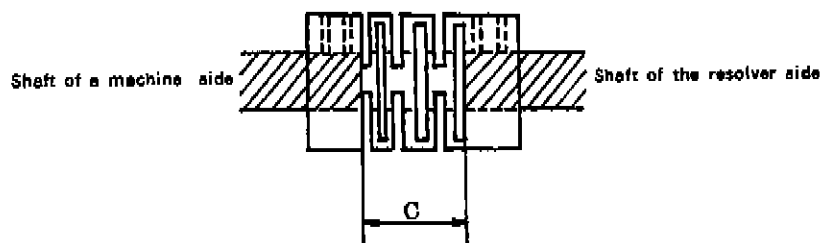
Note1) Connect both shaft without having them protruded into the area C shown above. Otherwise, the coupling will not perform its intended function to cause damage to the resolver.
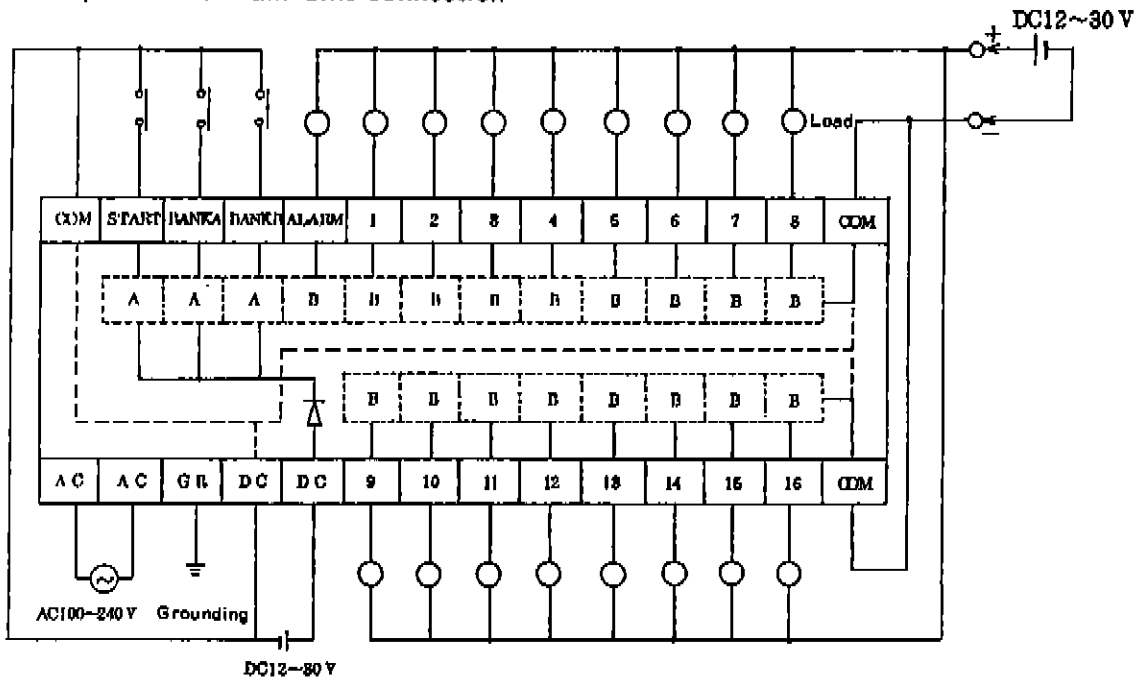
Note2) If the bending angle or amount of alignment of the shafts exceeds the specified value, not only the life of the coupling will be shorten but also the accuracy of resolver rotating angle will be adversely affected.

3.3 Connection

(1) Example of the main unit connection

Note) COM (common terminal) connection

1) As in the example shown above, use the COM terminal located on the upper left hand side of the board for START, BANK A, and BANK B in common connection.

2) As shown above, use the COM terminal located on the upper right hand side for output terminals (ALARM, 1 ~ 8) in common connection and use the COM terminal located on the lower right hand side for output terminals (9 ~ 16) in common connection.

■ Detailed section A

Performance		Circuit configuration
Max. voltage		
Max. current		
On current	5 mA or more	
OFF current	3 mA or less	

■ Detailed section B

Performance		Circuit configuration
Max. switching capacity		
Leakage current	100 μA or less	
Saturation voltage	2 V or less	
Transistor ON delay time		
Transistor OFF delay time		

(2) Power source connection
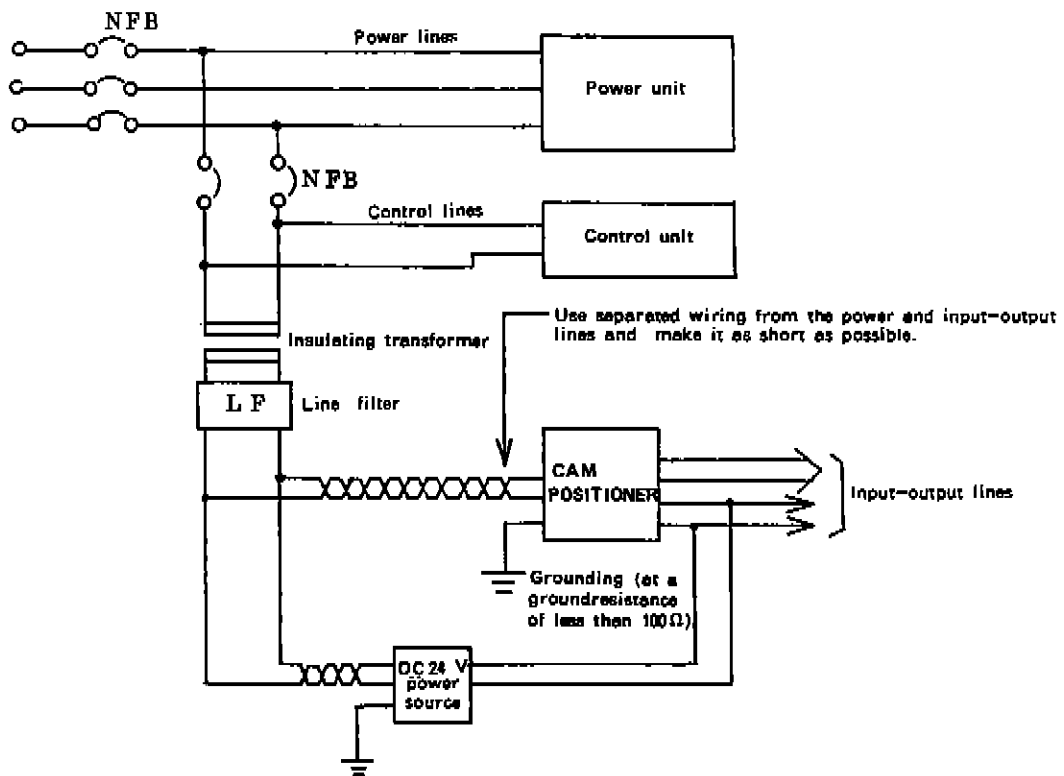
1) Use wires more than 2 mm² in size for the power lines to minimize the voltage drop.

2) The use of an insulating transformer and a line filter is recommended to atten-uate ground noise.

(3) External wiring

The positioner cable shall be located with respect to the control cable and power cable as shown below.

① Resolver circuit
② Positioner input-output circuit
③ Positioner power source circuit general control circuit
④ Power source circuit
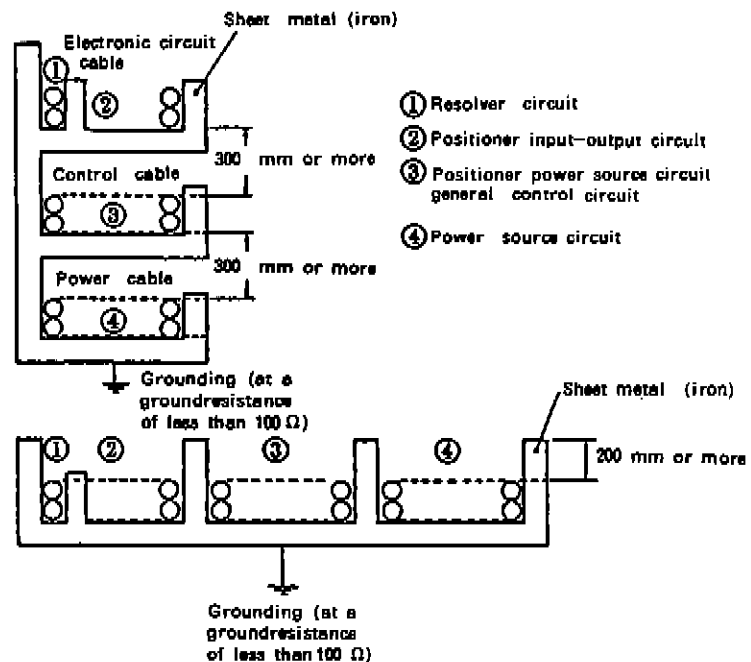
OPERATION

4. OPERATION

Title	Contents	Mode	Operating procedures
FORWARD/ REVERSE MODE SELECTION	Selection whether the present value will increase when the resolver rotates CW or when the resolver rotates CCW.	PWR OFF	
RESOLUTION SELECTION	Selection of resolution either 360 or 720	PWR OFF	
PROGRAM START	Program (PRG) mode selected.	RUN ↓ PRG	Note 3
ZERO POINT CORRECTION	Alignment of machine's zero point with resolvers zero point	PRG	Note 1
BANK SELECTION	Selection of BANK No. to be programmed, or cleared	PRG	
PROGRAM CLEAR	Program of the selected BANK completely cleared	PRG	Note 1
PROGRAM READ	Reading-out from user's program step required	PRG	Note 2
PROGRAM WRITE	Writing to user's program required.	PRG	Note 2
TEACHING INPUT	Direct entering of ON angle, OFF angle according to the actual operation of a machine.	PRG	Note 2
PROGRAM DELETE	Erasing of one step of user's program required	PRG	Note 2
TEST RUN	Adjustment of ON/OFF angle with a machine in operation. User's program can be modified with checking the operation.	PRG	Note 4
PROGRAM COMPLETION	Programming finished and RUN mode selected	PRG ↓ RUN	Note 5

Note 1) Push—button switches are pressed for P. CLR and ADJ.

2) Figures of 1 ~ 3 digits are entered into ⬜.

3) All Cam outputs are OFF while PGM mode.

4) Cam outputs are available while TEST RUN mode.

5) It takes 3 ~ 5.5sec to RUN mode selected.

5. TROUBLE SHOOTING

Error display

Mode		Error display	Contents		Corrective action
When PWR on		E 0 1	PWR interruption during program- ming	in program entering	Press ⒸC key to clear errors and check the contents of program.
		E 0 2		in EEPROM writing	
		E 0 3		in zero correction operation	
RUN mode	In running	E 1 0	Defective resolver		Replace resolver.
			Resolver cable disconnected		Check cable.
			Faulty resolver digital conversion circuit		Check or replace unit.
	In mode switching	E 1 2	Faulty memory (check when PWR on as well)		Replace unit.
PRG mode	In program entering	E 2 3	Duplication error of program (duplicated with ON output range of other step)		Press Ⓒ key and input data not duplicating other step.
		E 2 6	Cam No. input error (17 or more digital setting)		Press Ⓒ and input numbers between 1 ~ 16.
		E 2 7	Input error in ON or OFF value (larger digital value input)		Press Ⓒ and input digital value within specified range. (360 divisions : 0 ~ 359) 720 digisions : 0 ~ 719)
	In zero cor- rection op- eration	E 2 4	Data check error when zero correction performed		Press Ⓒ key and repeat operation. If errors appear again replace unit.
		E 2 5			
	In switching over to TEST RUN	E 1 1	BANK input error (on staritng TEST RUN, BANK setting on programming and BANK setting by external signal not coincide)		Press Ⓒ key and clear. Align external signal input with BANK setting on programming and repeat TEST RUN.
	In mode switching	E 2 8	Procedual error to proceed to RUN mode		Press Ⓒ key several times to make PRG initial state and switch to RUN mode

6. SPECIFICATION

6.1 Ratings and characteristics

■ 3F88L-130 CAM POSITIONER

Item	Contents
Number of output points	16
Output configuration	Transistor open collector Photo-isolation provided Switching capacity : DC 12 ~ 30 V, 300 mA External power source for output circuit:DC 12 ~ 30 V, 100 mA
Output display	LCD display at each point
Output terminal	Terminal board
Input detector (resolver)	1) 3F88L-RS17 2) 3F88L-RS15 3) 3F88L-RS15W
Response speed	800 rpm max. (in resolver rotation)
Memory	Electrically erasable PROM (EEPROM)
POSITION display	Resolver position displayed
Resolution unit	1/360, 1/720
Repeatability	±0.2°
Zero-point correction	1~359/1~719 (resolution 360/720)
Control input	START signal input (DC 24 V, 15 mA) BANK selection signal input (DC 24 V, 15 mA)
Abnormal output	When resolver signal interrupted or internal circuit faulty ALARM output becomes ON. (Open collector : DC 12 ~ 30 V, 300 mA)
Weight	1 kg or less
Supply voltage	AC 100 ~ 240 V 50/60 Hz
Allowable supply voltage	AC 85 ~ 264 V
Power consumption	15 VA or less
Insulation resistance	Between external terminal and case : 20 MΩ or more (using DC 500 V megger)
Dielectric strength	Between external terminal and case : AC 2000 V for 1 min.
Anti-vibration ability	• Vibration range 10 ~ 55 Hz • Full amplitude 0.75 mm • Test period X, Y, Z 3 directions in all 2-hour each
Anti-shock ability	30G X, Y, Z 6 directions each 3 times in all
Operating ambient temperature	-10 ~ +55°C
Operating ambient atmosphere	35 ~ 85%RH
Operating ambient atmosphere	Free from corrosive gas
Storage temperature	-25 ~ +65°C
Construction	Housed in control board

SPECIFICATION

■ 3F88L–RS17 Resolver

Item	Contents
Shaft diameter	φ10 mm
Shaft load	Radial : 20 kg, Axial : 20 kg (static allowable load)
Friction torque	120 g–cm or less
Anti–vibration ability	• Vibration range : 10 ～ 500 Hz • Full amplitude : 1.5 mm or 10G, which is greater • Test period : X, Y, Z 3 directions in all 2–hour each
Anti–shock ability	500G X, Y, Z 6 directions in all 3 times each
Protective construction	Drip–proof, oil–proof type IP52F (JEM)
Max. cable length	Can be extended as long as 100 m.
Frequency	5 kHz
Electrical error	10 min.
Max. speed of revolution	3000 rpm (mechanical)
Installation method	Flange mounting (flange strength 25 kg)
Coupling	3F88L–RL10 (supplid with the resolver)
Wiring lead–out method	Cable (3 m, connector attached at end)
Painted color	Munsell 5Y3/1
Operating ambient temperature	−10 ～ +80°C

6.2 Program specifications

1 step	Cam Number 2 digits ON setpoint 3 digits OFF setpoint 3 digits
Numeric value of the cam number	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Program BANK	Programing can be performed into four different banks.
Step input	For a one-step input of program, set Cam #. O N setpoint and OFF setpoint in numerals. For ON and OFF values, teaching input is possible.

The Max. number of registered
 	
steps :
	Max. number of ON/OFF cycles per cam
	
	          360-division 720-division
	
	       180 steps 360 steps

Program input	The sequence of input for each step is not specified. After input , the cam number and ON setpoint are arranged in numerical order.
Program read out	A program is read out using key. ⏎

PROGRAM SHEET

Cam#	Signal	ON	OFF	Time chart								
				0 0	60 120	90 180	120 240	180 360	240 480	270 540	300 600	(0) 360 720