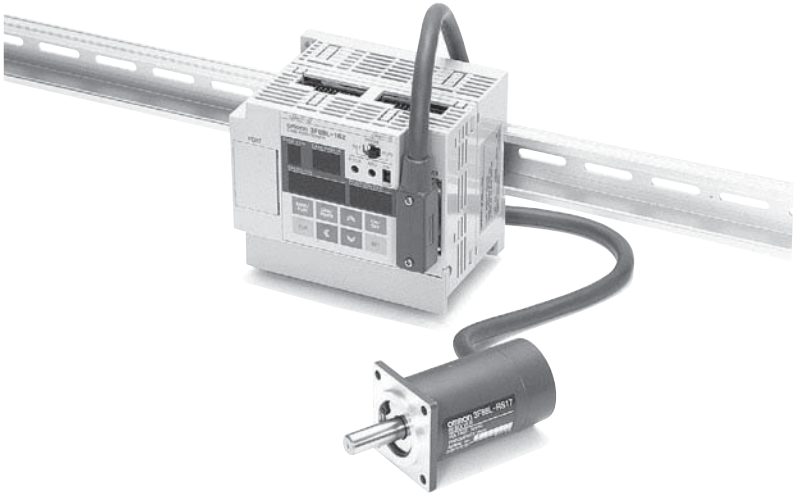
# Cam Positioner
# 3F88L-160/-162

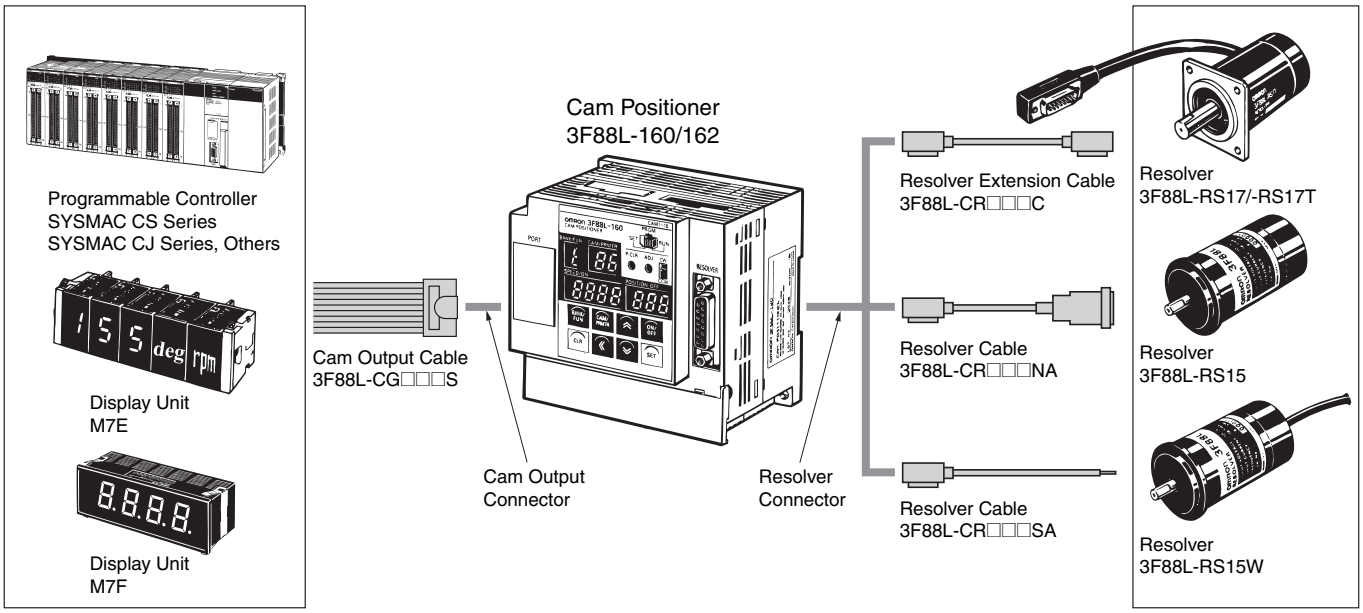
CSM_3F88L-160_-162_DS_E_2_1

## Faster, More Advanced Rotational Control for Greater Precision and Improved Productivity

- High speed and high precision double machine productivity.
- Compact design saves space.
- Simple operations and settings match cam outputs to the rotational angles.
- UL/CSA listing and EC Directive compliance ensure worldwide application.
- Many convenient onsite functions.



## System Configuration




## Ordering Information

| Name | | | Model |
|---|---|---|---|
| Cam Positioner | | 16 outputs | 3F88L-160 |
| | | 32 outputs | 3F88L-162 |
| Resolver | Shaft: 10 dia. | Standard model | 3F88L-RS17 |
| | | High-torque model | 3F88L-RS17T |
| | Shaft: 6 dia. | Connector type | 3F88L-RS15 |
| | | Lead-wire type | 3F88L-RS15W |
| Resolver Extension Cable with Connectors on Both Ends | | 2 m | 3F88L-CR002C |
| | | 5 m | 3F88L-CR005C |
| | | 10 m | 3F88L-CR010C |
| | | 20 m | 3F88L-CR020C |

| Name | | Model |
|---|---|---|
| RS15 Resolver Cable with Connectors on Both Ends | 3 m | 3F88L-CR003NA |
| | 5 m | 3F88L-CR005NA |
| | 10 m | 3F88L-CR010NA |
| | 15 m | 3F88L-CR015NA |
| | 20 m | 3F88L-CR020NA |
| RS15W Resolver Cable with Connector on One End | 3 m | 3F88L-CR003SA |
| | 5 m | 3F88L-CR005SA |
| | 10 m | 3F88L-CR010SA |
| Cam Output Cable with Connector on One End | 1 m | 3F88L-CG001S |
| | 3 m | 3F88L-CG003S |

# Specifications

## General Specifications

| Item / Model | 3F88L-160 | 3F88L-162 |
|---|---|---|
| **Supply voltage** | 100 to 240 VAC, 50/60 Hz | |
| **Allowable supply voltage** | 85 to 264 VAC | |
| **Power consumption** | 27 VA max. | |
| **Inrush current** | 40 A at 10 ms max. | |
| **I/O power supply** | 145 mA at 24 VDC | |
| **Allowable I/O supply voltage** | 20.4 to 26.4 VDC | |
| **Insulation resistance** | 20 MΩ min. between all external AC power supply terminals and the protective ground terminal (at 500 VDC) ✻ | |
| **Dielectric strength** | 2,300 VAC at 50/60 Hz for 1 min between all external AC power supply terminals and the protective ground terminal (leakage current: 10 mA max.) ✻ | |
| **Noise immunity** | IEC 61000-4-4: 2 kV power line | |
| **Vibration resistance** | Conforms to JIS C0911: 10 to 57 Hz with 0.075-mm single amplitude 80 min each in X, Y, and Z directions, 57 to 150 Hz at 9.8-m/s$^2$ acceleration (sweeps: 8 min × 10 sweeps = 80 min total) | |
| **Shock resistance** | Conforms to JIS C0912: 147 m/s$^2$ three times each in X, Y, and Z directions | |
| **Ambient operating temperature** | 0 to 55°C | |
| **Ambient operating humidity** | 10% to 90% (with no condensation) | |
| **Ambient operating atmosphere** | No corrosive gases | |
| **Ambient storage temperature** | –20 to 75°C | |
| **Terminals screw size** | Power supply input: M3.5, control I/O: M3 | |
| **Momentary power interruption detection time** | Does not detect momentary power interruptions lasting less than 15 ms. | |
| **Dimensions** | 110 × 100 × 82.5 mm (W × H × D) | |
| **Weight** | 1 kg max. | |
| **Structure** | Mounted inside panel | |
| **Mounting method** | Screw mounting (two M4 screws) or DIN Track mounting | |

✻ Disconnect the functional ground terminal from the protective ground terminal before performing insulation resistance or dielectric strength tests.

## Characteristics

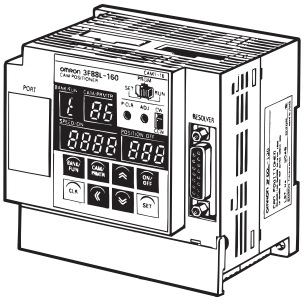
| Item / Model | 3F88L-160 | 3F88L-162 |
|---|---|---|
| **No. of outputs** | 16 | 32 |
| **Output performance** | Open-collector output, maximum switching capacity: 300 mA at 26.4 VDC (1.6 A max. per connector) | |
| **No. of banks** | 8 banks at 360 resolution, 4 banks at 720 resolution | |
| **Display** | 7-segment LED (current bank, speed, current angle) | |
| **Response speed** | 1,600 r/min at 360 resolution, 800 r/min at 720 resolution | |
| **Detection cycle** | 100 μs max. | |
| **Reproducibility** | 0.2° | |
| **Memory backup** | No. of non-volatile memory (EEPROM) writes: 100,000 times | |
| **Control unit** | 1/360 at 360 resolution, 1/720 at 720 resolution | |
| **Origin compensation** | 1 to 359 at 360 resolution, 1 to 719 at 720 resolution | |
| **Backlash compensation** | 1 to 179 at 360 resolution, 1 to 359 at 720 resolution | |
| **Advance angle compensation** | Advance angle compensation Range: 1 to 359 at 360 resolution, 1 to 719 at 720 resolution<br>Speed input range: 1 to 1,600 at 360 resolution, 1 to 800 at 720 resolution<br>**Note:** Only zero will be accepted for the angle advancement input when the speed input is zero. | |
| **Control inputs** | START, TRIG, BANK 1 to 3, and RESET<br>Photocoupler input impedance: 4.7 kΩ | |
| **Control outputs** | RUN, ERROR, and M·DET<br>Open-collector output, maximum switching capacity, 300 mA at 26.4 VDC | |
| **Speed detection accuracy** | 5 r/min max. | |

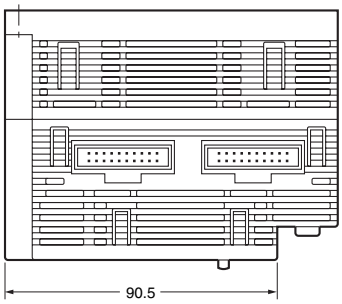
# Dimensions

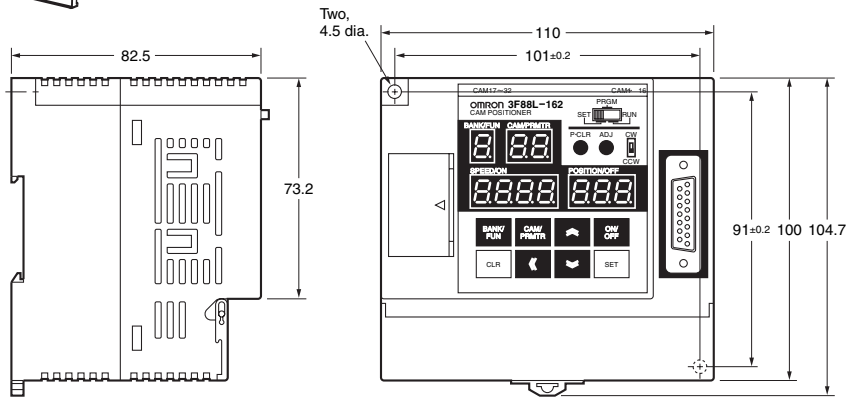
**Note:** All units are in millimeters unless otherwise indicated.

## 3F88L-160/-162

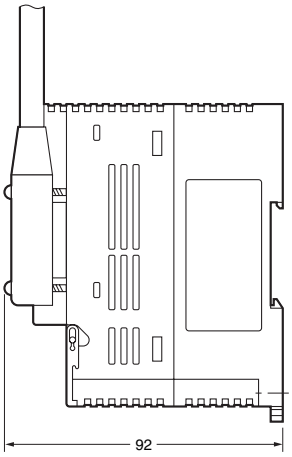
**3F88L-160**
**3F88L-162**





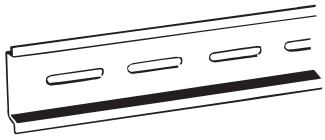



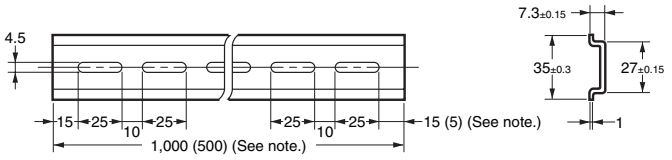

**Resolver Cable Wiring Diagram**




## Mounting Track

**PFP-100N**
**PFP-50N**



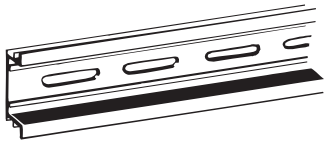


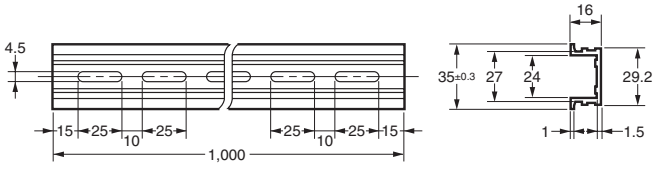

**Note:** The values shown in parentheses are for the PFP-50N.

| Model |
|---|
| PFP-100N |
| PFP-50N |

## Mounting Track

**PFP-100N2**



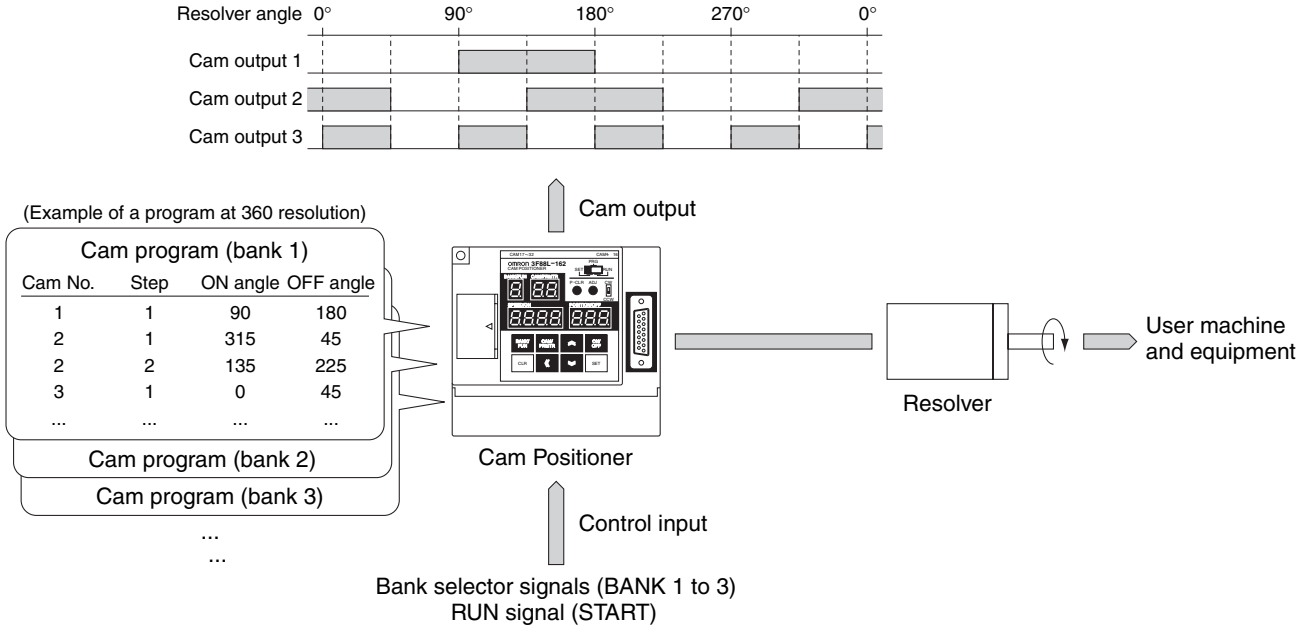



| Model |
|---|
| PFP-100N2 |

# Overview of Functions

## Basic Operating Procedure

Enter the cam program (i.e., the cam output ON/OFF pattern) into the Cam Positioner. Use the bank selector signals to select a bank and turn the RUN signal ON to start operation.




## Resolution

- The angle resolution can be set to 360 increments/rotation or 720 increments/rotation.
- The function and performance of the following items depend on the resolution.

| Item / Resolution | Resolution of 360 | Resolution of 720 |
|---|---|---|
| **Angle setting and display unit (See note.)** | 1° is set and displayed as "1". | 0.5° is set and displayed as "1". |
| **Allowable Resolver speed** | 1,600 r/min | 800 r/min |
| **No. of steps in the cam program** | 180 steps max. | 360 steps max. |
| **No. of banks** | 8 banks | 4 banks |

**Note:** If you want the ON angle to be 90°, for example, set 90 for a 360 resolution and 180 for a 720 resolution.

## Modes

The 3F88L-160/162 Cam Positioners have three modes that can be selected from the mode selector switch on the front of the Positioner. They are RUN, PRGM, and SET.
The following functions are supported in each mode.

RUN mode: Normal operation or adjustment operation
PRGM mode: Creating, editing, deleting, or testing a cam program
SET mode: Entering Cam Positioner parameters and compensation settings, teaching, or entering communications settings

| SET (Setting) Mode | Move between modes | PRGM (Programming) Mode | Move between modes | RUN (Operation) Mode |
|---|---|---|---|---|
| • Sets parameters for 3F88L-160/162 Cam Positioners.<br>• Sets various compensation values.<br>• Enables teaching.<br>• Sets communications.<br>• Adjusts the origin position. | ⟷ | • Creates, edits, and deletes cam programs.<br>• Tests operation. | ⟷ | • Normal operation<br>• Adjustment operation<br>• Cam output and control I/O monitoring<br>• Origin shift |

## Selecting Function Levels

The following function levels are supported by the Cam Positioner using the Function Level Selector setting.

**Function Level 0 (Monitor Only)**

- Enables cam output and monitoring. You cannot write cam programs or set parameters in this level.
- This level is used to prevent accidental changes to cam programs and parameters.
- Functions that have already been set will operate from this level.

**Function Level 1 (Basic Operation/Monitor Only)**

- You can write cam programs in addition to performing all level 0 functions from this level.
- This level is used for basic operation.

**Function Level 2 (All)**

- All Cam Positioner functions are enabled in this level.
- This level provides access to the application functions.

## Basic Functions

**Cam Program Write Function**

- A cam program is used to set the cam output ON/OFF angles. Up to 180 steps registered in 8 banks can be set per cam output at 360 resolution and up to 360 steps registered in 4 banks can be set per cam output at 720 resolution.
- Cam programs are generally input from the Operation Keys on the front of the Cam Positioner, but a computer using the CompoWay/F communications protocol can also be used to input them.

**Note: 1.** One step is one ON/OFF combination for a cam.

**2.** A bank is a program unit with cam outputs 1 to 32 constituting a set for the 3F88L-162, and cam outputs 1 to 16 constituting a set for the 3F88L-160. Switch banks to change the program that is used for operation.

**Cam Output Function**

The cam output function is used to turn the cam outputs ON and OFF according to the ON/OFF angle settings for each cam in the bank specified by the BANK inputs while the START input is ON.

**Monitor Function**

The monitor function is used to monitor cam outputs and control I/O status.

**Save Data**

The save data function stores parameters and cam programs in EEPROM memory. The memory is non-volatile, and does not require battery replacement or any other maintenance.

**No. of Programs Check**

The number of programs check is used to check the number of programs and the origin compensation angle.

## Initial Setting Function

**Encoder Resolution Setting**

The Encoder resolution per Resolver revolution can be set to 360 or 720.

**Rotation Direction Setting**

The direction in which the angle increases can be set to match the rotation direction of the Cam Positioner and the Encoder.

## Application Functions

**Origin Compensation**

Any angular position can be changed to 0° to align the Cam Positioner origin with the Encoder origin.

**Origin Shift**

If the TRIG input turns ON in RUN mode, the origin shift function changes any angular position to 0° to align the Cam Positioner origin with the Encoder origin.

**Backlash Compensation**

The detection angles can be offset in the clockwise and counterclockwise directions to absorb the play in the mechanical system.

**Advance Angle Compensation**

The advance angle compensation function advances the cam output angle proportional to Resolver speed.

**Cam Protection**

The cam protection function applies levels of protection per cam or per bank to prevent cam ON/OFF data from being accidentally changed or deleted.

**One-direction Function Setting**

The one-direction function setting can be used to enable a cam output in one direction only. It can be set for each cam.

**Output Hold Function**

The output hold function holds the previous cam output status when you switch to the program mode or when an error occurs.

**PV Output Function**

The PV output function uses the cam output signals to output signals to a Display Unit (M7E, M7F, etc.). It can be used to display the present angle and speed on the Display Unit.

**Pulse Output Function**

The pulse output function allows ON/OFF data set at regular intervals for any bank or cam to be automatically set in memory.

**Teaching**

The teaching function allows you to enter Resolver angle data directly as cam program settings while you manually operate the Encoder.

**Copy Function**

The copy function allows you to set a master Cam Positioner so you can copy cam programs, compensation values, and settings all at once to other Cam Positioners.

**Test Operation**

The test operation allows you to change the ON/OFF angles in real time and produce cam outputs in PRGM mode, ignoring the control input signal status, to adjust the ON/OFF angles to match those of the Encoder.

### Adjustment Operation

The adjustment operation allows you to change the ON/OFF angles in real time under normal operating conditions (i.e., while producing cam outputs) to adjust the ON/OFF angles to match those of the Encoder.

### Communications

The Cam Positioner has a communications port that conforms to CompoWay/F form B. Using communications allows you to read and write cam programs or monitor the present angle and speed via communications through this port.

**Note:** CompoWay/F is an integrated protocol used for OMRON general-purpose serial communications. It uses a uniform frame format and the factory interface network service (FINS) command structure widely used by OMRON products, such as Programmable Controllers, to facilitate communications between multiple components or between computers and components.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

In the interest of product improvement, specifications are subject to change without notice.

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