IDEC

Think Automation and beyond...

IDEC SmartRelay

FL1F

Easy relay/timer control and remote monitoring

Ver.UP!

New functions are applicable only to base module FS05 or later and WindLGC Ver. 8.2 or later.

Remote Monitoring

- Remote monitoring via PCs and smart devices
- FL1F WEB EDITOR enables easy design of web browser screen

FL1F Access Tool

- Microsoft Excel add-in-tool available
- Ideal for managing periodic performance such as real time status monitoring and daily reports

Reduces Development Time

- With 2 new additional function blocks (Float to integer conversion), a total of 46 types are available
- Supports user-defined function blocks

High Expandability

- Text display
- 6 types of I/O expansion modules
- Connects to peripheral equipment using Modbus TCP communication (server/client, 16 connections)
- Up to 16 connections are enabled with 1:n communication

High Maintainability

- Supports micro SD memory card
- Clock backup for 20 days
- New auto clock adjust function via NTP
- Simulation functions and online testing capabilities

Easy Operation

- Small LCD display and control switches

Easy-to-See LED Display

- Backlight in 3 colors (white, amber, red)
- Message display

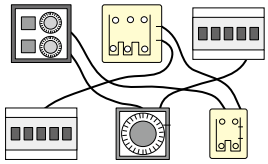
Multiple Variations

- 100 to 240V AC/DC, 24V DC
- 24V AC/DC, 12/24V DC
- Basic model without LCD display available

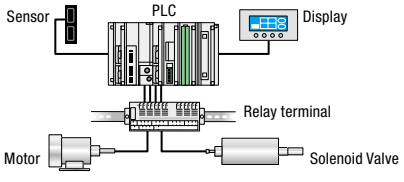
High environmental resistance

- Operating Temperature –25 to +55°C (no freezing)

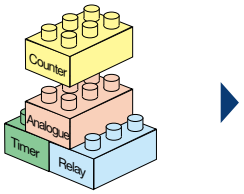
Versatile FL1F to simplify wiring, adjustments, and settings of systems.



Change your complicated system of multiple relays, timers, and counters to a single IDEC SmartRelay.



The IDEC SmartRelay replaces many functions of peripheral equipment of the programmable logic controller. Features 10A max. output contacts and up to 192 display characters.



46 different types of function blocks make it possible to perform various control operations easily.

IDEC SmartRelay is More Convenient Than Ever Before

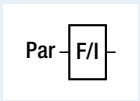
New functions are applicable only to base module FS05 or later and WindLGC Ver. 8.2 or later.

Operation Management NEW

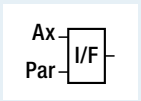
New add-in-tool available for Microsoft Excel. Easy operation control using accustomed Microsoft Excel functionality. Useful for managing technical documents using tables and graphs.

Capable of Handling Various Scenarios NEW

Analog values can be presented not only in integers but also floating points.



Float to integer conversion



Integer to float conversion

Remote Monitoring NEW

New FL1F WEB EDITOR enables easy design of an user-friendly web page.
The graphical display achieves intuitive operation and management.

Reports the Status by 3-color Backlight

Errors and alarms can be displayed with a choice of white, amber, and red backlighting, according to the status level.

Reports by Messages

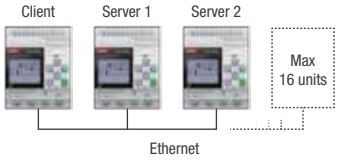
Using a scroll function, a maximum of 192 one-byte characters (6 lines, 16 characters) in the Base Module, and a maximum of 240 one-byte characters (6 lines, 20 characters) in the Text Display, can be displayed.

Settings can be Modified On-Site

Using the LCD display and control switches, parameters can be changed and programs can be added on-site.

FL1F Communication

Data communication systems between IDEC SmartRelays can be easily established without any communication programs. 1: n communication with a maximum of 16 connections is available.

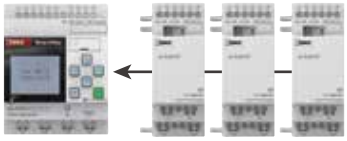


Batch Control through the Display

Settings of the base module of multiple units can be controlled and updated on a Text Display. Under the administrator mode, user programs can be easily modified.

Expandability for Easy Design Changes

I/O for a maximum of 60 points, 12 units can be expanded (maximum configurations are DI24 / DO20 / AI8 / AO8), enabling design changes easy to handle.



Reduces Development Time (1)

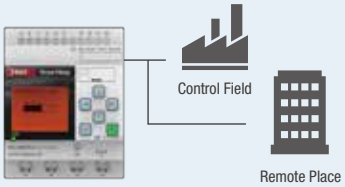
WindLGC, application software for IDEC SmartRelay, is capable of developing 3 programs at the same time.

Reduces Development Time (2)

Equipped with the user-defined function blocks, set control patterns can be made into blocks for repetitive uses.

Reduces Maintenance Time

Uploading and downloading of programs can be remotely controlled through Ethernet.



Product details, documents, and sample program available on website.

• Documents (CAD, Manuals) • Application Example • Sample Programs • FL1F Access Tool • FL1F WEB EDITOR

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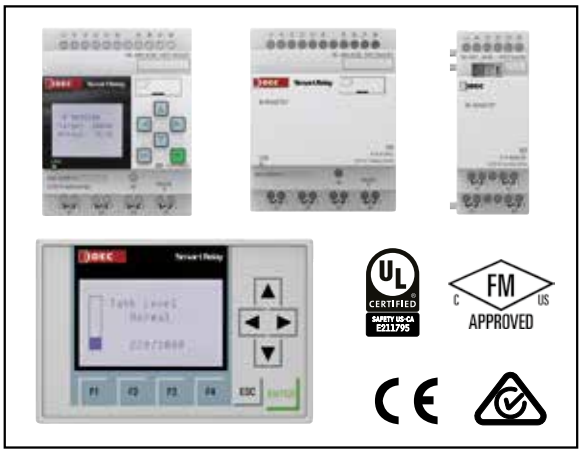
IDEC

FL1F IDEC SmartRelay

New IDEC SmartRelay FL1F enhances both high performance and easy control.

- Maximum I/O 60 points: (24DI + 20DO + 8AI + 8AO)
- Maximum programming capacity: 8,500 bytes (400 function blocks)
- Operating temperature: -20 to +50ºC (*1) (*2)
- For Base Modules with LCD display, not only program editing and monitoring of function blocks, but also addition and deletion of programs can be performed. The user interface enables intuitive operation. Programs can be modified quickly.
- For Base Modules with LCD display, a backlight display with 3 colors (white, amber, red), which can display 16 characters x 6 lines, is available (2-byte characters also available).
- Data is stored in a non-volatile memory, which provides no limit in backup time.
- With a built-in clock function, a maximum of 20-day backup is possible (at ambient temperature of 25°C.) Also, NTP function adjusts the clock automatically when connected to the internet.
- Equipped with a micro SD memory card slot, program downloading and data logging is possible using a commercially-available memory card.
- Ethernet communication port (RJ45). No cables required for downloading and uploading user programs. Also, Modbus TCP (server / client / 16 connection) for communicating with peripheral equipment is available. (*1)



- Web server function available. “FL1F WEB EDITOR” function in WindLGC enables easy and expressive design of web pages by drag and drop.
- With 1:n communication, a system with a maximum of 16 connections can be built.
- New function block available (float to integer, integer to float conversion function block.) (*1)
- “FL1F Access Tool” enables easy operation control using accustomed Microsoft Excel functionality. (*1) (*3)
- The Text Display for FL1F is a backlight LCD display (160 x 96 dots) available in 3 colors (white, amber, and red). Display of up to 20 characters x 6 lines. Scrolling, blinking, and bar graph available.
- Five new function blocks available (astronomical clock, analog filter, maximum and minimum, average, stop watch).

*1) When FS is 05 or later. WindLGC Ver. 8.2 or later is required for FS 05 or later. *2) When FS is 04 or earlier: 0 to +55ºC *3) Microsoft Excel Version 2010, 2013

Base Modules

Package Quantity: 1

Rated Power Voltage	Input Signal	Output Signal	Display	Clock	I/O Points	Weight (approx.)	Part No.
24V DC	DC (*1) I1, I2, I7 and I8 are used for digital/analog inputs	Transistor	Yes	Yes	8/4 points	195g	FL1F-H12SCD
12/24V DC		Relay	Yes	Yes	8/4 points	240g	FL1F-H12RCE
			—			200g	FL1F-B12RCE
24V AC/DC	AC/DC (*1)	Relay	Yes	Yes	8/4 points	240g	FL1F-H12RCA
			—			200g	FL1F-B12RCA
100 to 240V AC/DC	AC/DC	Relay	Yes	Yes	8/4 points	240g	FL1F-H12RCC
			—			200g	FL1F-B12RCC

*1) With NPN/PNP sensor input. For details, see “Input Internal Circuits” on page 5.

Expansion I/O Modules (*2) (*3)

Package Quantity: 1

Type	Rated Power Voltage	Input Signal	Output Signal	I/O Points	Weight (approx.)	Part No.
Input/Output	24V DC	DC	Transistor	4/4 points	95g	FL1F-M08B1S2
	12/24VDC	DC	Relay	4/4 points	130g	FL1F-M08B2R2
	24V AC/DC	AC/DC (*4)	Relay	4/4 points	130g	FL1F-M08D2R2
	100 to 240V AC/DC	AC/DC	Relay	4/4 points	130g	FL1F-M08C2R2
Analog Input	12/24V DC	Analog	—	2/0 points	95g	FL1F-J2B2
Analog Output	24V DC	—	Analog	0/2 points	95g	FL1F-K2BM2

*2) I/O points within the range of the maximum expansion I/O points can be used.
*3) When using modules of the same power voltage, supply power to the Base Module and Expansion I/O Modules using one power supply.
When power is supplied to the modules from different power supplies, the fast transient burst is 1 kV (IEC61000-4-4).
*4) With NPN/PNP sensor input. For details, see “Input Internal Circuits” on page 5.

Text Display for FL1F

Package Quantity: 1

Rated Power Voltage	Weight (approx.)	Part No.	Remarks
24V AC/DC 12V DC	220g	FL1F-RD1	Supplied with a mounting clip and gasket

Options

Name	Part No.	Ordering No.	Package Quantity	Remarks
Application Software: WindLGC (*5)	FL9Y-LP1CDW	FL9Y-LP1CDW	1	DVD-ROM (incl. online help manual)
Mounting Clip for Base Module (*6)	FL1F-PSP1	FL1F-PSP1PN05	5	Supplied with a module
Mounting Clip and Waterproof Gasket for Text Display (*7)	FL1F-KW1	FL1F-KW1	1	Supplied with Text Display
IDEC SmartRelay User’s Manual (English)	FL9Y-B1789	FL9Y-B1789	1	Downloadable from: http://www.idec.com/download

*5) DVD-ROM (Including online help manual)
*6) Supplied with a Base Module and an Expansion I/O Module.
*7) Supplied with a Text Display, it includes a gasket, four mounting clips, and a power supply connector.

Base Module Specifications

Base Module Type No.			FL1F-H12SCD	FL1F-H12RCE FL1F-B12RCE	FL1F-H12RCA FL1F-B12RCA	FL1F-H12RCC FL1F-B12RCC
Power Supply	Rated Power Voltage		24V DC	12/24V DC	24V AC/DC	100 to 240V AC/DC
	Allowable Voltage Range		20.4 to 28.8V DC	10.8 to 28.8V DC	20.4 to 26.4V AC 20.4 to 28.8V DC	85 to 265V AC 100 to 253V DC
	Rated Frequency		—	—	47 to 63 Hz	47 to 63 Hz
	Current Draw		25 to 50 mA (24V DC) 1.2A (with max. load on digital output)	50 to 165 mA (12V DC) 25 to 90 mA (24V DC)	60 to 185 mA (12V DC) 25 to 100 mA (24V DC)	23 to 46 mA (100V AC) 15 to 25 mA (240V AC) 12 to 23 mA (100V DC) 5 to 15 mA (240V DC)
	Allowable Momentary Power Interruption		—	2 ms Typ. (12V DC) 5 ms Typ. (24V DC)	5 ms Typ. (24V AC/DC)	10 ms Typ. (100V AC/DC) 20 ms Typ. (240V AC/DC)
	Power Consumption		1.2 W (24V DC)	2.0 W (12V DC) 2.2 W (24V DC)	4.4 W (24V AC) 3.2 W (24V DC)	4.6 W (100V AC) 6.0 W (240V AC) 2.3 W (100V DC) 3.6 W (240V DC)
	Reverse Polarity Protection		Yes	Yes	—	—
Clock	Backup Duration		20 days (+25° C Typ.)	20 days (+25° C Typ.)	20 days (+25° C Typ.)	20 days (+25° C Typ.)
	Clock Accuracy		±2 sec/day (Typ.)	±2 sec/day (Typ.)	±2 sec/day (Typ.)	±2 sec/day (Typ.)
Input	Input Signal		DC	DC	AC/DC	AC/DC
	Input Points		8 (I1 to I8)	8 (I1 to I8)	8 (I1 to I8)	8 (I1 to I8)
	High-speed Input*1		4 (I3, I4, I5, I6), 5 kHz maximum	4 (I3, I4, I5, I6), 5 kHz maximum	—	—
	Analog Input Points		4 (I1, I2, I7, I8)	4 (I1, I2, I7, I8)	—	—
	Analog Input Range		0 to 10V DC (max. rated input: 28.8V DC)	0 to 10V DC (max. rated input: 28.8V DC)	—	—
	Analog Input Error		±1.5% (of full scale)	±1.5% (of full scale)	—	—
	Analog Input Resolution		10 bits (0 to 1000)	10 bits (0 to 1000)	—	—
	Cycle time		300 ms	300 ms	300 ms	300 ms
	Allowable Voltage Range		0 to 28.8V DC	0 to 28.8V DC	0 to 26.4V AC 0 to 28.8V DC	0 to 265V AC 0 to 253V DC
	Input Impedance	Digital Input	5.8 kΩ	5.8 kΩ	4.8 kΩ	610 kΩ
		Analog Input	80 kΩ	80 kΩ	—	—
	Isolation		—	—	—	—
	Operating Range	OFF Voltage	< 5V DC	< 5V DC	< 5V AC/DC	< 40V AC < 30V DC
		ON Voltage	≥ 12V DC	≥ 8.5 V DC	≥ 12V AC/DC	≥ 79V AC ≥ 79V DC
		OFF Current	< 0.9 mA (I3 to I6) < 0.07 mA (I1, I2, I7, I8)	< 0.88 mA (I3 to I6) < 0.07 mA (I1, I2, I7, I8)	< 1.2 mA	< 0.05 mA (AC) < 0.06 mA (DC)
		ON Current	≥ 2.1 mA (I3 to I6) ≥ 0.18 mA (I1, I2, I7, I8)	≥ 1.5 mA (I3 to I6) ≥ 0.12 mA (I1, I2, I7, I8)	≥ 2.6 mA	≥ 0.08 mA (AC) ≥ 0.13 mA (DC)
	Turn ON Time		1.5 ms (Typ.) ≤ 1.0 ms (I3 to I6)	1.5 ms (Typ.) ≤ 1.0 ms (I3 to I6)	1.5 ms (Typ.)	100V AC: 40 ms (Typ.) 240V AC: 30 ms (Typ.) 100V DC: 25 ms (Typ.) 240V DC: 20 ms (Typ.)
	Turn OFF Time		1.5 ms (Typ.) ≤ 1.0 ms (I3 to I6)	1.5 ms (Typ.) ≤ 1.0 ms (I3 to I6)	15 ms (Typ.)	100V AC: 45 ms (Typ.) 240V AC: 70 ms (Typ.) 100V DC: 60 ms (Typ.) 240V DC: 75 ms (Typ.)
	Wire Length		100m maximum (*2)	100m maximum (*2)	100m maximum (*2)	100m maximum (*2)
Output	Output Signal		Transistor source output	Relay output	Relay output	Relay output
	Output Points/ Contact Configuration		4 points (separate)	4NO contacts	4NO contacts	4NO contacts
	Isolation		—	Isolated	Isolated	Isolated
	Dielectric Strength (between power/input terminals and output terminals)		—	2500V AC, 1 minute 500V DC, 1 minute	2500V AC, 1 minute 500V DC, 1 minute	2500V AC, 1 minute 500V DC, 1 minute
	Output Voltage		External power voltage	—	—	—
	Maximum Load Current		0.3A maximum	Resistive load 10A at 12/24V AC/DC 10A at 100/120V AC 10A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC	Resistive load 10A at 12/24V AC/DC 10A at 100/120V AC 10A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC	Resistive load 10A at 12/24V AC/DC 10A at 100/120V AC 10A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC
	Surge Current		—	30A maximum	30A maximum	30A maximum
	Short-circuit Protection		Built-in current limiting resistor: Approx. 1A	External fuse required: 16A maximum	External fuse required: 16A maximum	External fuse required: 16A maximum
	Minimum Switching Load		—	10 mA, 12V DC (reference value)	10 mA, 12V DC (reference value)	10 mA, 12V DC (reference value)
	Initial Contact Resistance		—	100 mΩ maximum (at 1A, 24V DC)	100 mΩ maximum (at 1A, 24V DC)	100 mΩ maximum (at 1A, 24V DC)
	Mechanical Life		—	10 million operations (no load, 10 Hz)	10 million operations (no load, 10 Hz)	10 million operations (no load, 10 Hz)
	Electrical Life		—	100,000 operations (rated resistive load) 1800 operations/hour	100,000 operations (rated resistive load) 1800 operations/hour	100,000 operations (rated resistive load) 1800 operations/hour

After power-up, the FL1F takes a maximum of 1.2 seconds (when using a micro SD card) to RUN mode.
*1) When selecting frequency trigger function.
*2) 10m when connected to analog input (twisted pair cable)

Expansion I/O Module Specifications

Expansion I/O Module Type No.			FL1F-M08B1S2	FL1F-M08B2R2	FL1F-M08D2R2	FL1F-M08C2R2	FL1F-J2B2	FL1F-K2BM2
Power Supply	Rated Power Voltage		24V DC	12/24V DC	24V AC/DC	100 to 240V AC/DC	12/24V DC	24V DC
	Allowable Voltage Range		20.4 to 28.8V DC	10.8 to 28.8V DC	20.4 to 26.4V AC 20.4 to 28.8V DC	85 to 265V AC 100 to 253V DC	10.8 to 28.8V DC	20.4 to 28.8V DC
	Rated Frequency		—	—	50/60Hz (47 to 63Hz)	50/60Hz (47 to 63Hz)	—	—
	Current Draw		25 to 40 mA	20 to 90 mA (12V DC) 15 to 50 mA (24V DC)	40 to 100 mA (24V AC) 15 to 50 mA (24V DC)	23 to 46 mA (100V AC) 15 to 30 mA (240V AC) 12 to 29 mA (100V DC) 5 to 15 mA (240V DC)	25 to 30 mA	30 to 82 mA
	Allowable Momentary Power Interruption		—	2 ms (typ.) (12V DC) 5 ms (typ.) (24V DC)	5 ms (typ.) (24V AC/DC)	10 ms (typ) (100V AC/DC) 20 ms (typ.) (240V AC/DC)	10 ms (typ.) (12/24V DC)	10 ms (typ.)
	Power Consumption		1.0W	1.1W (12V DC) 1.2W (24V DC)	2.6W (24V AC) 1.2W (24V DC)	4.6W (100V AC) 7.2W (240V AC) 2.9W (100V DC) 3.6W (240V DC)	0.4W (12V DC) 0.7W (24V DC)	2.0W
	Reverse Polarity Protection		Yes	Yes	—	—	Yes	Yes
Input	Input Signal		DC input	DC input	AC/DC input	AC/DC input	Analog input	—
	Input Points		4	4	4	4	—	—
	Isolation		—	—	—	—	—	—
	Allowable Voltage Range		20.4 to 28.8V DC	10.8 to 28.8V DC	20.4 to 26.4V AC 20.4 to 28.8V DC	85 to 265V AC 100 to 253V DC	—	—
	Operating Range	OFF Voltage	< 5V DC	< 5V DC	< 5V AC/DC	< 40V AC < 30V DC	—	—
		ON Voltage	≥ 12V DC	≥ 8.5V DC	≥ 12V AC/DC	≥ 79V AC ≥ 79V DC	—	—
		OFF Current	< 0.88 mA	< 0.88 mA	< 1.1 mA	< 0.05 mA (AC) < 0.06 mA (DC)	—	—
		ON Current	≥ 2.1 mA	≥ 1.5 mA	≥ 2.63 mA	≥ 0.08 mA (AC) ≥ 0.13 mA (DC)	—	—
	Turn ON Time		1.5 ms (Typ.)	1.5 ms (typ.)	1.5 ms (typ.)	100V AC: 40 ms (typ.) 240V AC: 30 ms (typ.) 100V DC: 25 ms (typ.) 240V DC: 20 ms (typ.)	—	—
	Turn OFF Time		1.5 ms (Typ.)	1.5 ms (typ.)	15 ms (typ.)	100V AC: 45 ms (typ.) 240V AC: 70 ms (typ.) 100V DC: 60 ms (typ.) 240V DC: 75 ms (typ.)	—	—
	Analog Input Points		—	—	—	—	2	—
	Analog Input Range		—	—	—	—	0 to 10V (max. rated input: 28.8V) 0 to 20 mA (max. rated input: 40 mA)	—
	Digital Resolution		—	—	—	—	10 bits (0 to 1000)	—
	Input Error		—	—	—	—	±1.5% (of full scale)	—
	Input Impedance		—	—	—	—	76 kΩ (0 to 10V) 250Ω (0 to 20mA)	—
	Sampling Cycle		—	—	—	—	50ms	—
Output	Wire Length		100m maximum	100m maximum	100m maximum	100m maximum	10m (twisted-pair shielded cable)	—
	Output Signal		Transistor source output	Relay output	Relay output	Relay output	—	—
	Output Points/ Contact Configuration		4 points (separate)	4NO contacts	4NO contacts	4NO contacts	—	—
	Isolation		—	Isolated	Isolated	Isolated	—	—
	Dielectric Strength (between power/input terminals and output terminals)		—	2500V AC, 1 minute 500V DC, 1 minute	2500V AC, 1 minute 500V DC, 1 minute	2500V AC, 1 minute 500V DC, 1 minute	—	—
	Output Voltage		External power voltage (20.4 to 28.8V DC)	—	—	—	—	—
	Maximum Load Current		0.3A maximum	Resistive load 5A at 12/24V AC/DC 5A at 100/120V AC 5A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC	Resistive load 5A at 12/24V AC/DC 5A at 100/120V AC 5A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC	Resistive load 5A at 12/24V AC/DC 5A at 100/120V AC 5A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC Inductive load 2A at 12/24V AC/DC 3A at 100/120V AC 3A at 230/240V AC 0.2 A at 120V DC 0.1 A at 240V DC	—	—
	Short-circuit Protection		Built-in current limiting resistor: Approx. 1A	External fuse required: 16A maximum	External fuse required: 16A maximum	External fuse required: 16A maximum	—	Yes
	Minimum Switching Load		—	10 mA, 12V DC (reference value)	10 mA, 12V DC (reference value)	10 mA, 12V DC (reference value)	—	—
	Initial Contact Resistance		—	100 mΩ maximum (at 1A, 24V DC)	100 mΩ maximum (at 1A, 24V DC)	100 mΩ maximum (at 1A, 24V DC)	—	—
	Mechanical Life		—	10 million operations (no load, 10 Hz)	10 million operations (no load, 10 Hz)	10 million operations (no load, 10 Hz)	—	—
	Electrical Life		—	100,000 operations (rated resistive load) 1800 operations/hour	100,000 operations (rated resistive load) 1800 operations/hour	100,000 operations (rated resistive load) 1800 operations/hour	—	—
	Analog Output Points		—	—	—	—	—	2
	Analog Output Range		—	—	—	—	—	Voltage: 0-10V DC Current: 0-20, 4-20 mA
	Digital Resolution		—	—	—	—	—	10 bits (0 to 1000)
	Output Error (of full scale)		—	—	—	—	—	±2.5%
	Output Impedance		—	—	—	—	—	Voltage: 5 kΩ minimum Current: 250Ω maximum
	Analog Value Conversion Interval		—	—	—	—	—	50 ms (typ.)
	Wire Length		—	—	—	—	—	10m (twisted-pair shielded cable)

Text Display Specifications

Power Voltage	24V AC/DC 12V DC
Allowable Voltage Range	20.4 to 26.4V AC 10.2 to 28.8V DC
Allowable Voltage Frequency	47 to 63Hz
Power Consumption	12V DC: 150 mA (Typ.) 24V DC: 75 mA (Typ.) 24V AC: 145 mA (Typ.) (*1)
Data Transmission Rate	10/100 M full/half duplex data transmission rate
Display	FSTN graphic display (W × H: 160 × 96 dots) LED backlight (White, Amber, Red)
Font type	English, Spanish, Russian, Chinese, Italian, Turkish, German, Dutch, French, Japanese
Displayable string	1 screen 6 lines × 20 columns
Keyboard	Membrane keypad
Installation	Panel cut-out using mounting clips
Dimensions (W × H × D)	128.2 × 86 × 38.7 mm

*1) 75 mA when FS is 03

LCD Display / Backlight

Backlight Durability (*1)	20,000 hours
LCD Display Durability (*2)	50,000 hours

*1) Backlight durability is the number of hours taken for the light to become 50% of the original brightness.
*2) Display durability is calculated under ordinary operating and storage conditions: room temperature, normal humidity below 65% RH, and not subjected to direct sunlight.

General Specifications

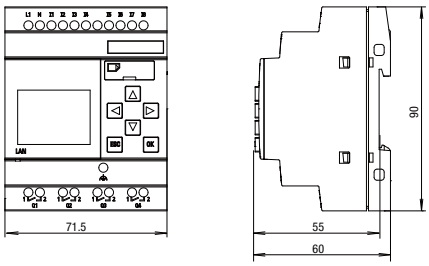
Item		Specifications	Standard
Operating Temperature	Horizontal Mounting	–20 to +55°C (no freezing) (*1)	Cold: IEC60068-2-1 Hot: IEC60068-2-2
	Vertical Mounting	–20 to +55°C (no freezing) (*1)	
Storage/ Transportation Temperature		–40 to +70°C (no freezing)	—
Relative Humidity		10 to 95% (no condensation)	IEC60068-2-30
Atmospheric Pressure		795 to 1080 hPa	—
Operating Condition		No corrosive gas	—
Degree of Protection		IP20	—
Vibration Resistance		5 to 8.4 Hz, amplitude 3.5 mm 8.4 to 150 Hz, acceleration 9.8 m/s^2	IEC60068-2-6
Shock Resistance		147 m/s^2	IEC60068-2-27
Drop Test (packaged)		0.3m	IEC60068-2-32
Emissions		Limit class B Group 1 Conducted: 0.15 to 30MHz	EN55011/A EN55022/B EN50081-1
Electrostatic Discharge Immunity		8 kV air discharge 6 kV contact discharge	IEC61000-4-2
Radiation Field Immunity		Field Strength: 1 V/m and 10 V/m	IEC61000-4-3
Fast Transient Burst		2 kV (power line) 2 kV (I/O signal line)	IEC61000-4-4
Surge Immunity (*2) (FL1F-H12RCC, FL1F-B12RCC only)		1 kV (power line) normal 2 kV (power line) common	IEC61000-4-5
Communication Cable		2.5 mm^2 (one wire) 1.5 mm^2 (two wires)	—
Terminal Style		Finger-safe type (*3)	—

*1) Base module: 0 to 55°C when FS is 04 or earlier
Text display: 0 to 55°C when FS is 03 or earlier
*2) For protection against surge noise on DC power supply types (FL1F-H12RCE/B12RCE, FL1F-H12SCD, FL1F-H12RCA/B12RCA), use surge absorbers, noise cut transformers, or noise filters. Use of a surge protection device (DEHN + SÖHNE GmbH + Co, BVT AD 24 Part No. 918 402) is recommended.
*3) Tightening torque 0.5 to 0.6 N·m

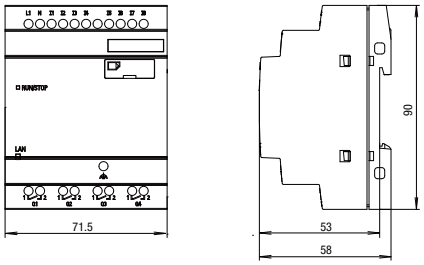
Dimensions

All dimensions in mm.

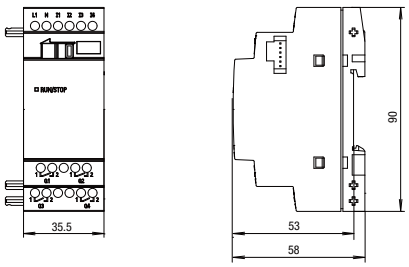
Base Module (with Display)



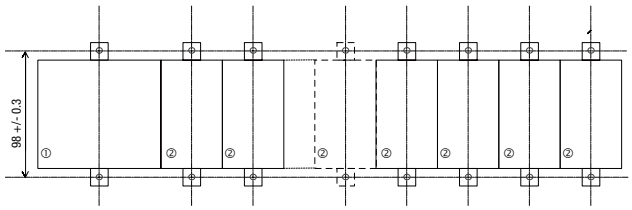
Base Module (without Display)



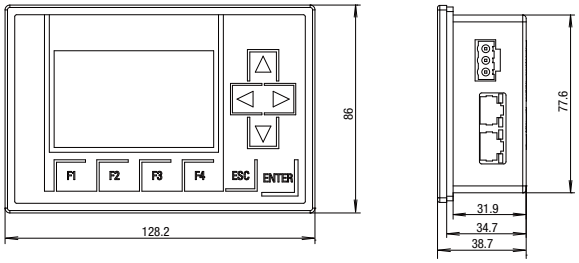
Expansion I/O Module



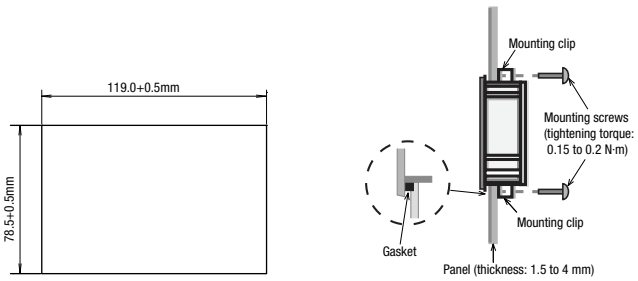
Mounting Hole Layout (Using Mounting Slides)



Text Display



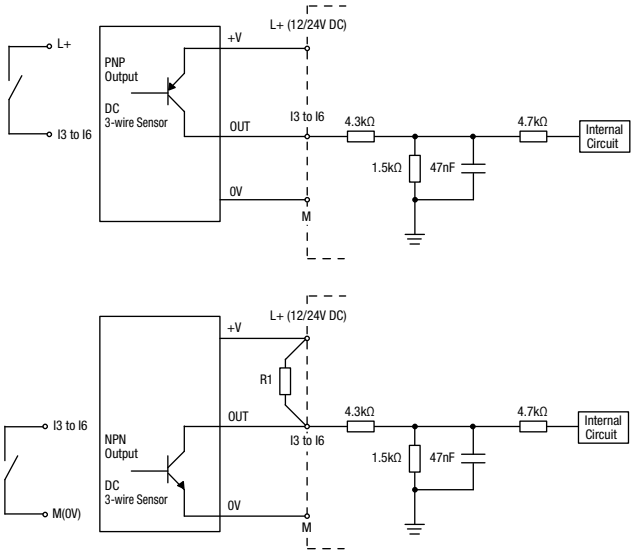
(Panel Cutout)



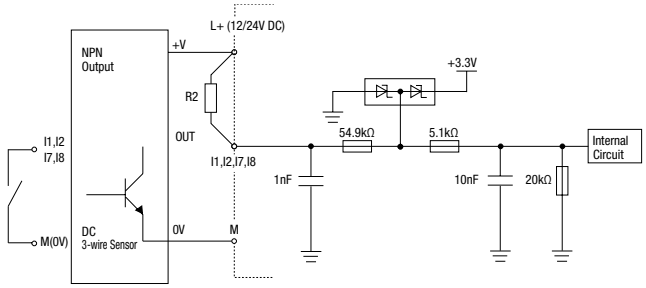
Input Internal Circuits

DC Input

FL1F-H12SCD/-H12RCE /-B12RCE
FL1F-M08B1S2/-M08B2R2



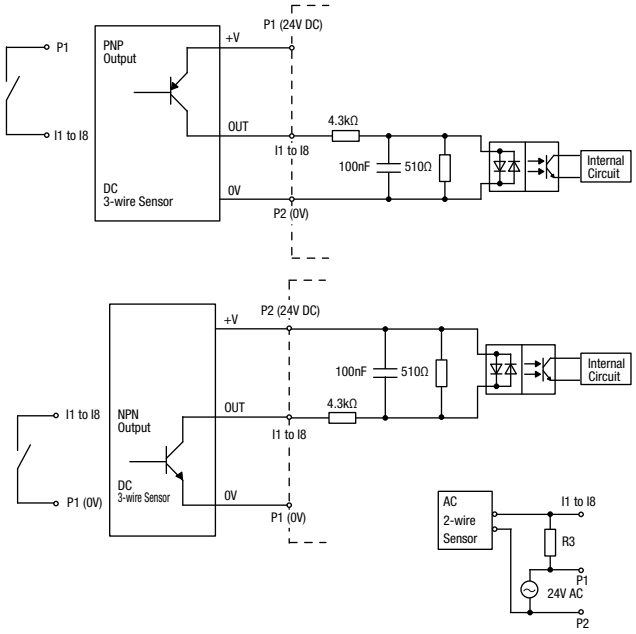
When using a NPN output sensor, connect an external resistor (I3 to I6):
FL1F-H12SCD:
For power voltage 24V DC: R1≤ 4kΩ, 1/4W
FL1F-H12RCE, -B12RCE
For power voltage 24V DC: R1≤ 8.1kΩ, 1/4W
For power voltage 12V DC: R1≤ 1.5 kΩ, 1/4W



I1,I2,I7 and I8 accept both digital and analog inputs.
The diagram above is for using I1,I2,I7, and I8 as digital inputs.
When using a NPN output sensor, connect an external resistor (I1,I2,I7,I8):
FL1F-H12SCD:
For power voltage 24V DC: R2≤ 50kΩ, 1/8W
FL1F-H12RCE, -B12RCE
For power voltage 24V DC: R2≤ 100kΩ, 1/8W
For power voltage 12V DC: R2≤ 19kΩ, 1/8W

24V AC/DC Input

FL1F-H12RCA /-B12RCA
FL1F-M08D2R2



Bleeder resistance (R3) calculation
R3 must satisfy the following three conditions.

$$\text{Condition 1: R3 } (\Omega) \leq \frac{\text{Maximum input OFF voltage (= 5VAC)}}{\text{Maximum sensor leakage corrent (A)}}$$

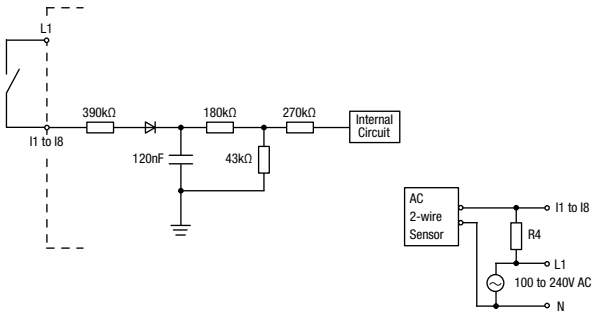
$$\text{Condition 2: R3 } (\Omega) \leq \frac{\text{Sensor power voltage (V)}}{\text{Maximum sensor load corrent (A)}}$$

The voltage drop across the load (R3) must be less than 5V while the sensor is turned off.

$$\text{Condition 3: } P_{R3}\text{ (W)} \leq \frac{\{\text{Sensor power voltage (V)}\}^2}{\text{R3 resistance } (\Omega)} \times 3 \text{ (3: recommended allowance)}$$

100 to 240V AC/DC

FL1F-H12RCC /-B12RCC
FL1F-M08C2R2



Bleeder resistance (R4) calculation
R4 must satisfy the following three conditions.

$$\text{Condition 1: R4 } (\Omega) \leq \frac{\text{Maximum input OFF voltage (= 40VAC)}}{\text{Maximum sensor leakage corrent (A)}}$$

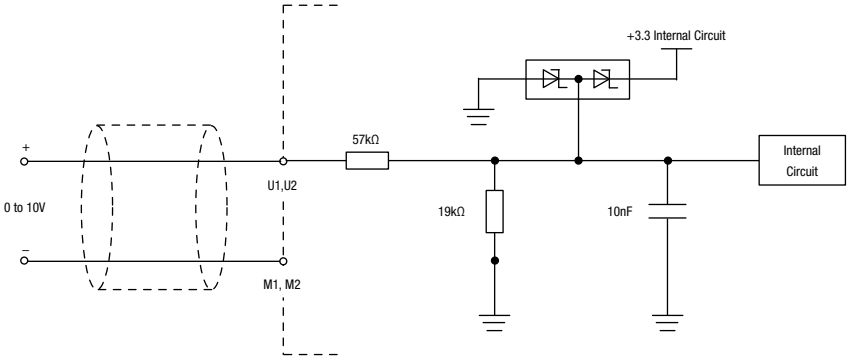
$$\text{Condition 2: R4 } (\Omega) \leq \frac{\text{Sensor power voltage (V)}}{\text{Maximum sensor load corrent (A)}}$$

The voltage drop across the load (R4) must be less than 40V while the sensor is turned off.

$$\text{Condition 3: } P_{R4}\text{ (W)} \leq \frac{\{\text{Sensor power voltage (V)}\}^2}{\text{R4 resistance } (\Omega)} \times 3 \text{ (3: recommended allowance)}$$

Analog Voltage Input

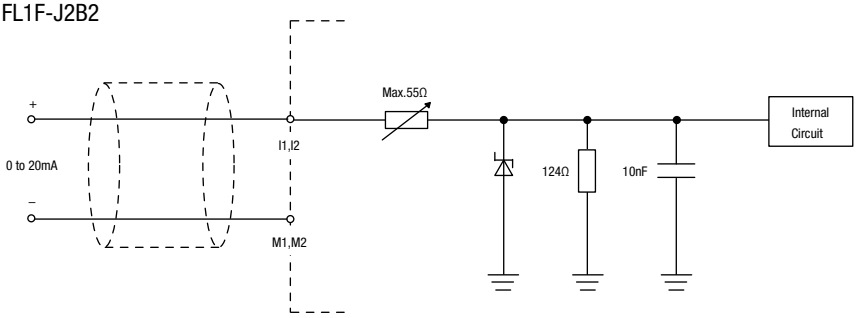
FL1F-J2B2



Use a twisted pair cable, and keep the cable as short as possible.

Analog Current Input

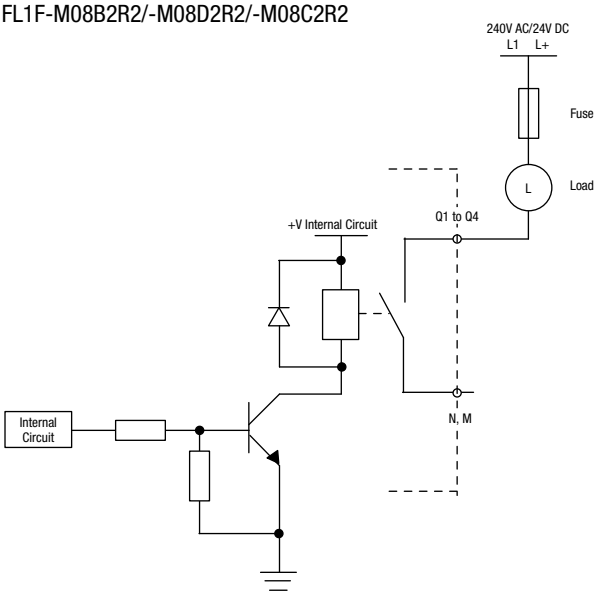
FL1F-J2B2



Output Internal Circuits

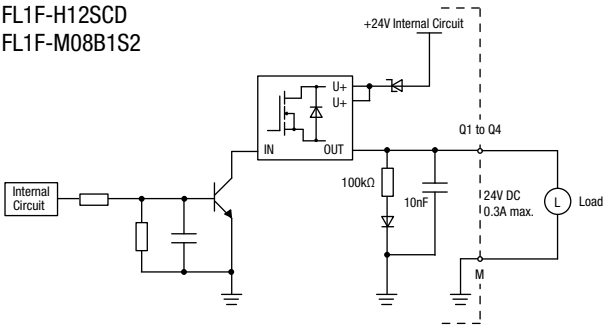
Relay Output

FL1F-H12RCE/-B12RCE/-H12RCA/-B12RCA/-H12RCC/-B12RCC
FL1F-M08B2R2/-M08D2R2/-M08C2R2



DC Output (Transistor Source Output)

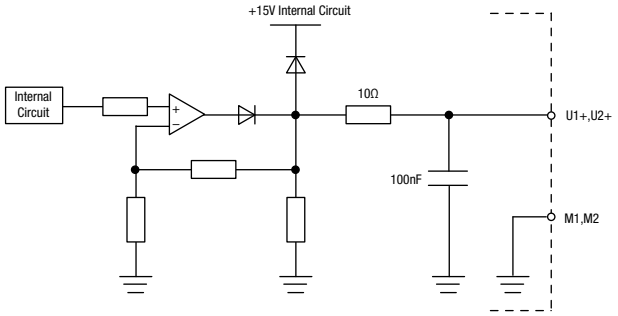
FL1F-H12SCD
FL1F-M08B1S2



When connecting to a DC input type PLC, use a negative common sink input type.

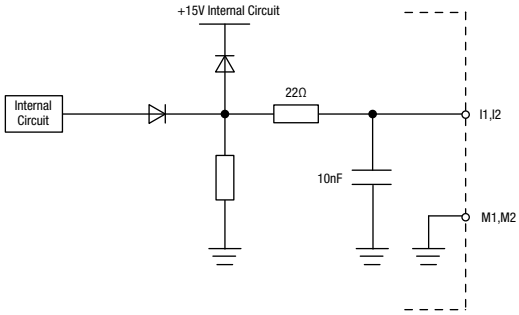
Analog Voltage Output

FL1F-K2BM2
(0-10V DC)



Analog Current Output

(0-20, 4-20 mA)



General Function Blocks

AND	Series connection of normally open contacts
AND (Edge)	Edge detection with edge evaluation (pos. edge)
NAND	Parallel connection of normally closed contacts
NAND (Edge)	Edge detection with edge evaluation (pos. edge)
OR	Parallel connection of normally open contacts
NOR	Series connection of normally closed contacts
XOR	Double changeover contact
NOT	Connection of closed contact

Special Function Blocks

On-delay
Off-delay
On-/Off-delay
Retentive on-delay
Latching Relay
Current impulse relay
Interval time-delay relay/Pulse output
Edge-triggered interval time-delay relay
Seven-day time switch
Twelve-month time switch
Up/down counter
Analog filter
Astronomical clock
Analog differential trigger
Analog value monitor
Operating hours counter
Asynchronous pulse generator
Random generator
Frequency trigger
Analog trigger
Analog comparator
Stairwell light switch
Dual-function switch
Max/Min
Stopwatch
Message texts
Softkey
Analog amplifier
Enhanced Shift register
PI control
Analog ramp control
Analog multiplexer
Pulse width modulator (PWM)
Analog math
Analog math error detection
Average value
NEW Float to integer conversion
NEW Integer to float conversion

Instructions

Module Expansion

Base Module connects up to 12 Expansion I/O Modules and maximum 60 I/Os can be used according to the combinations shown below.

1. For the terminal arrangement and wiring of the module, please be sure to read FL1F user's manual.
2. Before connecting and disconnecting modules, turn power off.
3. A maximum of 24 digital inputs, 8 analog inputs, 20 digital outputs, 8 analog outputs can be used by using a combination of a Base Module and Expansion I/O Modules.
4 When using modules of the same power voltage, supply power to the Base Module and Expansion I/O Modules using one power supply. When suplying power to the modules using different power supplies, supply power to the Base Module and Expansion I/O Module at the same time. Or, supply power to the Expansion I/O Module before the Base Module. Expansion I/O module may not be recognized if power is supplied to the Expansion I/O Module after the Base Module. When power is supplied to the modules from different power supplies, the fast transient burst is 1 kV (IEC61000-4-4).
5. A 100 to 240V AC/DC module cannot be connected to the right side of a 12/24V DC, 24V DC, or 24V AC/DC module.
6. For optimal and high-speed communication performance between Base Module and Expansion I/O Modules, install the input/output modules first, then the analog modules.
7. Approvals are as follows:
   ABS: American Bureau of Shipping (USA)
   BV: Bureau Verites (France)
   DNV GL: (Norway)
   LR: Lloyd's Register of Shipping (UK)
   NK: (Japan)
8. The following are the conditions of marine standards approval.
   - Modules of rated power voltage 12/24V AC/DC: Use at 24V DC
   - Modules of 12/24V DC and 24V DC: Use a surge protection device Part no. 918 402/918 422 made by DEHN+SÖHNE or equivalent.
   - For applications on a bridge or decks, a noise filter Part no. B84113-C-B-30 (made by TDKEPCOS) or equivalent is used (FL1F-RD1 cannot be used on a bridge or deck).
   - Contact IDEC regarding the environment where FL1F can be used.

Wiring

Base Module and Expansion I/O Module

- Connect an IEC60127 approved fuse to the power supply for protection against overload and short circuit.
- Do not connect input wire and communication cable in parallel or near the power line, output line, or motor line. Also make sure that any noise source is not present nearby.

Power-up

- After power-up, FL1F takes a maximum of 1.2 seconds (when using a micro SD card) to RUN mode. During power-up, a timer appears on models with a display. When using the FL1F without display, the red LED flashes, then the green LED flashes when RUN mode starts.
- Time taken to change to RUN mode
  1.2 seconds maximum

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