FP-e Control Unit

New Born! Advanced PLC!

Timer, Counter, Hour meter, Temperature Controller and PLC in a Unit

■ Features

1. 5-character, 2-line, 3-color Display
Simple characters and numerical values can be displayed. Simple error messages as well as operation instructions and timer/counter set values can be displayed.

2. Front Operation Switch
Timer/Counter/Temperature set values can be changed using front operation switches. The switches can also be used as input switches (X30 to X3F), which save the need for installing external switches.

3. Equivalent to FP0-C14 Intelligence of Small PLCs
The FP-e has same functionality as FP0 such as pulse output and high-speed counter functions. Other than a tool port, a unit is equipped with COM. port (RS232C/RS485) for communication.

4. Easy Programming Using Wizard
Screen display program can be easily created using wizard on FPWIN GR software.

5. Smooth Debug
Monitoring the memory area data and I/O status facilitates debug using the R (register) and I (I/O monitor) display modes.

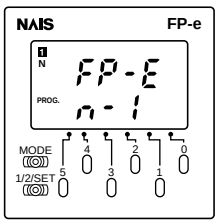
6. Panel Mounted Type
The front panel of the FP-e is water-proof IP66.

■ Type

Name	Type	Calendar timer	Thermocouple input	COM. port	Part number
FP-e control unit	Basic type (RS232C)	Not available	Not available	RS232C	AFPE224300
	Calendar timer type (RS232C)	Available	Not available	RS232C	AFPE224305
	Thermocouple input type (RS232C)	Available	Available	RS232C	AFPE214325
	Basic type (RS485)	Not available	Not available	RS485	AFPE224302
	Thermocouple input type (RS485)	Not available	Available	RS485	AFPE214322

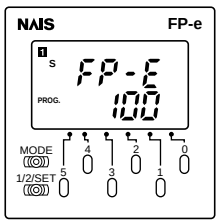
■ Display modes and functions

1 N mode
(Normal mode)



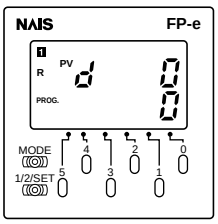
Displays some characters and numerical values, and numerical data can be changed.

2 S mode
(Switch mode)



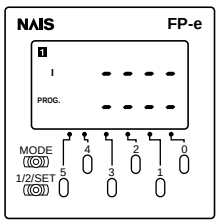
Displays characters and numerical values. Function switches can be used for input.

3 R mode
(Register mode)



Displays a value of a register in the FP-e.
The value can be changed from the front panel.

4 I mode
(I/O monitor mode)

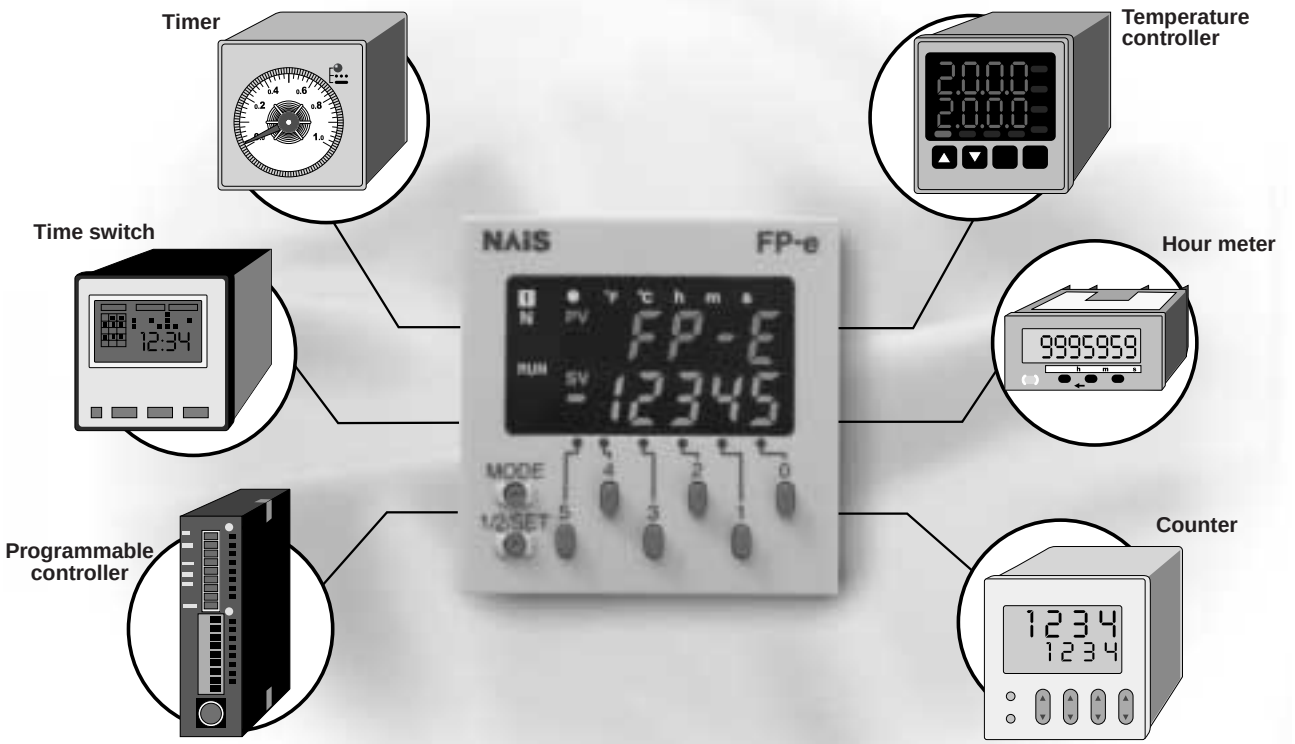


I/O status (X, Y) in the FP-e can be displayed.

FP-e Features

The panel mounted type PLC FP-e is ideal for the control of small machines and distributed control.

Do this, do that, do everything. **All in One!**



● 3-color Display

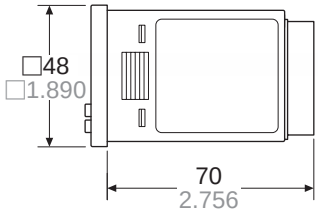
Simple characters and numerical values can be displayed. Simple messages as well as timer/counter/temperature settings and elapsed values can also be displayed.

● Built-in operation switch

Setting values can be changed. The operation switch can also be used for input.

● Compact and Space-saving

Panel mountable, little space is taken up on the control panel. The size is only 48 × 48 × 70 mm (depth).



● Matches FP0 intelligence (equivalent to FP0-C14)

● IP66 Panel mounting type

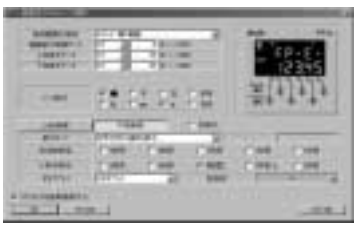
Based on your panel design, the color can be changed to black. (option)

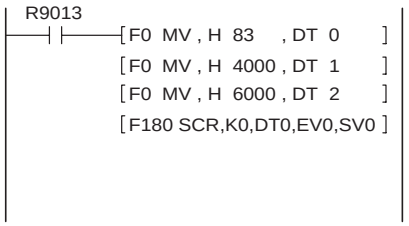
Same Programming software for all FP series PLC

Control FPWIN GR

Ladder programming software is the same as that used for the FP series.

An FP-e screen display program is generated by simply entering values in the wizard screen.

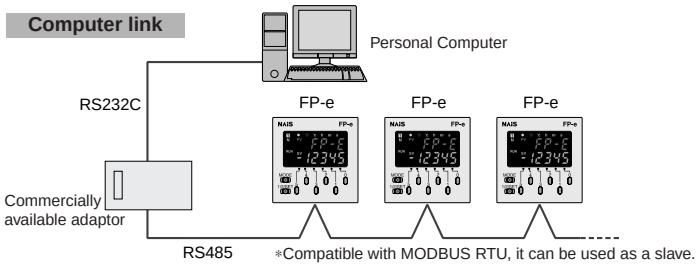




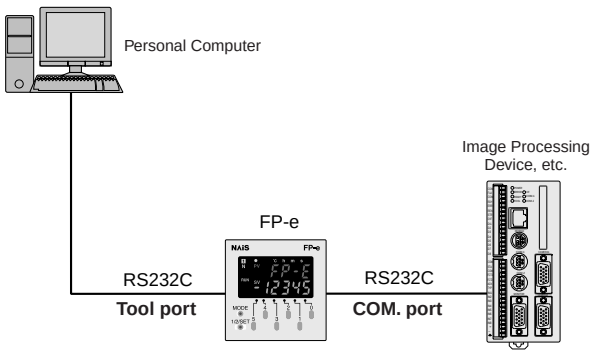
Built-in RS485 or RS232C COM port

● Up to 99 computer link stations can be connected to one network with RS485.

Up to 32 computer link stations are possible using a C-NET adaptor and up to 99 are possible using a commercially available adaptor. This makes it possible to monitor operation status or perform control.



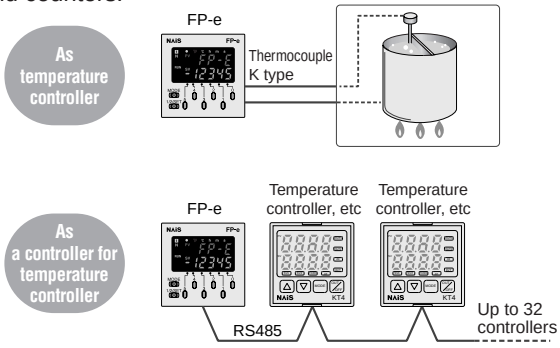
● Two RS232C Devices can be connected to one FP-e. (RS232C Type)



Temperature control

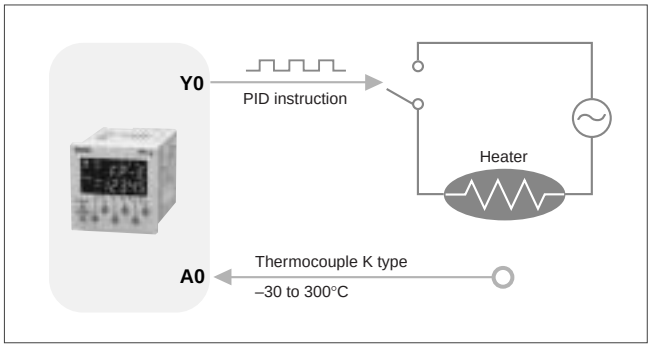
● Two-point K-type thermocouple (–30 to 300°C) connection is possible. (equipped with thermocouple input)

FP-e can combine temperature controllers, small PLC, timer and counters.



● PID instruction/Auto-Tuning

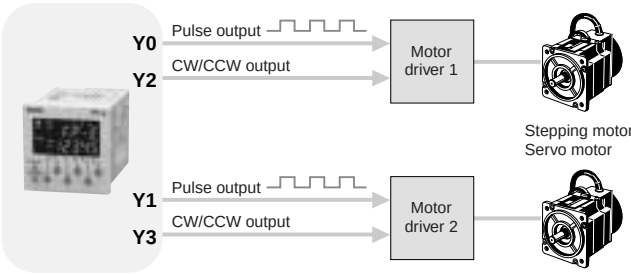
Accurate temperature control can be achieved with built-in PID instruction.



Built-in high-speed counters and 2-axis independent motion control.

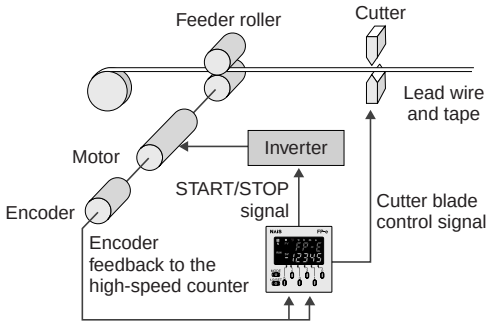
● Pulse output

The unit comes with 2 channels of built-in pulse output up to 10 kHz.
Since these two channels can be separately used, the FP-e is also suitable for 2-axis independent positioning.



● High-speed counter

The FP-e has 4 built-in high speed counters.
1 phase × 4ch Total 10 kHz (5 kHz*)
2 phase × 2ch Total 2 kHz (1 kHz*)
* Thermocouple input type.



FP-e Specifications List

■ Performance specifications

Item \ Model			AFPE224300 Basic type (RS232C)	AFPE224302 Basic type (RS485)	AFPE224305 Calendar timer type (RS232C)	AFPE214325 Thermocouple input type (RS232C)	AFPE214322 Thermocouple input type (RS485)
Programming method/Control method			Relay symbol/Cyclic operation				
Number of controllable I/O points		Control unit	14 points [Input: 8, Output: 6 (Tr. NPN: 5/Ry: 1)]			12 points [Input: 6, Output: 6 (Tr. NPN: 5/Ry: 1)]	
		Front switch input	8 points				
Program memory		Built-in memory	Built-in EEP-ROM				
Program capacity			2720 steps				
Number of instructions		Basic	83				
		High-level	117				
Operation speed			0.9 μs/step (for basic instruction)				
I/O update and Base time			2 ms			Typical 2 to 3 ms Max. 15 ms note 1)	
Operation memory points	Relays	Internal relay (R)	1008 points (R0 to R62F)				
		Special internal relay (R)	64 points (R9000 to R903F)				
		Timer/Counter (T/C)	144 points (for initial setting, Timer: 100 points (T0 to T99), Counter: 44 points (C100 to C143) note 2) Timer range (1 ms, 10ms, 100ms, 1 s): selected by instruction				
	Memory areas	Data register (DT)	1660 words (DT0 to DT1659)				
		Special data register (DT)	112 words (DT9000 to DT9111)				
		Index registers (IX. IY)	2 points				
Differential points			Unlimited				
Master control relay points (MCR)			32 points				
Number of labels (JP and LOOP)			64 labels				
Number of step ladders			128 stages				
Number of subroutines			16 subroutines				
Number of interrupt			7 (external: 6, internal: 1)				
Self-diagnostic function			Watchdog timer, program syntax check, etc.				
Clock/calendar function note 3)			—		Available (year, month, day, hour, minute, second and day of week) However, this can only be used when a battery has been installed.		—
Battery life			—		220 days or more (actual usage value: approx. 870 days (25°C) (Periodic replacement interval: 1 year) (Value applies when no power is supplied at all.)		—
Pulse catch input			6 points in total (X0 and X1: 50 μs, X2 to X5: 100 μs)				
Interrupt input							
COM. port note 4)			RS232C	RS485	RS232C	RS232C	RS485
Periodical interrupt			0.5 ms to 30 s (0.5ms increments)				
Constant scan			Available				
Password			Available				
Special functions	High-speed counter * The combination of 1-phase × 2 ch. and 2-phase × 1 ch. is also possible for the high-speed counter.		Counter mode: Addition/subtraction (1-phase) note 5) - Input points: 4 ch. (Max.)				
			- Max. speed: 10 kHz (total of 4 ch.)			: 5 kHz (total of 4ch.)	
			- Input contact: X0: count input (ch. 0), X1: count input (ch. 1), X2: reset input note 6) X3: count input (ch. 2), X4: count input (ch. 3), X5: reset input note 6)				
			- Min. input pulse width: X0 and X1: 50 μs (10 kHz)			X0 and X1: 100 μs (5 kHz)	
			X3 and X4: 100 μs (5kHz)				
			Counter mode: 2-phase/individual/direction decision (2-phase) - Input points: 2 ch (Max.)				
			- Max. speed: 2 kHz (total of 2 ch.)			: 1 kHz (total of 2ch.)	
			- Input contact: X0: count input (ch. 0), X1: count input (ch. 0), X2: reset input X3: count input (ch. 2), X4: count input (ch. 2), X5: reset input				
			- Min. input pulse width: X0 and X1: 50 μs (10 kHz)			X0 and X1: 100 μs (5 kHz)	
			X3 and X4: 100 μs (5 kHz)				
	Pulse output	Output points	2 independent points (Y0 and Y1) (No interpolation function)				
		Output frequency	40 Hz to 10 kHz (Y0/Y1: 1-point) note 7) 40 Hz to 5 kHz (Y0/Y1: 2-point)			40 Hz to 5 kHz (1-point) 40 Hz to 2.5 kHz (2-point)	
	PWM output	Output points	2 points (Y0 and Y1)				
		Output frequency	Frequency: 0. 15 Hz to 1 kHz Duty: 0.1 % to 99.9 % (0.1 % increments)				
Memory backup note 8)	Timer		Non-hold type: (all points)				
	Counter	Non-hold type	From set value to C139				
	Counter	Hold type	4 points (elapsed values) C140 to C143				
	Internal relay	Non-hold type	976 points (R0 to R60F) 61 words (WR0 to WR60)				
		Hold type	32 points (R610 to R62F) 2 words (WR61 to WR62)				
	Data register	Non-hold type	1652 words (DT0 to DT1651)				
		Hold type	8 words (DT1652 to DT1659) + 640 words note 10)				

Notes 1) The time takes longer every 250 ms.
2) The proportion of timer points to counter points can be changed using a system register.
3) Precision of calendar timer:
- At 0°C/32°F, less than 200 seconds error per month
- At 25°C/77°F, less than 70 seconds error per month
- At 55°C/131°F, less than 240 seconds error per month
4) When using the COM. port for communication, retransmission is recommended. The RS232C driver IC for the COM. port conforms completely to EIA/TIA-232E and CCITT V. 28 standards
5) The max counting speed (10 kHz) is the counting speed with a rated input voltage of 24 V DC and an ambient temperature of 25°C. The counting speed (frequency) will be derated depending on the voltage and temperature.
6) If the unit is equipped with both reset inputs X0 and X1, X2 serves as the reset input for X1. If X3 and X4 are used, X5 serves as the reset input for X4.
7) When the positioning control instruction "F168" is performed, the maximum output frequency is 9.5 kHz.
8) The program, system registers and the hold type area (internal relay, data register, and timer/counter) are backed up by the built-in EEP-ROM. When a battery is replaced with a new one in the FP-e unit with a calendar timer function, settings can be changed. The data cannot be stored even when the settings are changed using the system register without installing a battery.
9) F180 (SCR) and F181 (DSP) instructions are supported from Control FPWIN GR Ver.2.2.
10) Up to 640 words can be written into EEP-ROM by P13 (PICWT) and retreived back by F12 (ICRD).

■ General specifications

Item	Description	
Rated voltage	24 V DC	
Operating voltage range	21.6 to 26.4 V DC	
Allowed momentary power off time	10 ms	
Ambient temperature	0 to +55°C 32 to +131°F	
Storage temperature	–20 to +70°C –4 to +158°F	
Ambient humidity	30 to 85%RH (at 25°C, non-condensing)	
Storage humidity	30 to 85%RH (at 25°C, non-condensing)	
Breakdown voltage	Between the insulated circuits: 500 V AC for 1 min. Only between (3) Output terminal (Y5, COM) and other insulated circuit: 1500 V AC for 1 min.	Insulated circuits (1) Power supply terminal, function earth, input terminals (A0, A1) COM. (RS232C) terminal (2) Input terminals (COM. X0 to Xn) (3) Output terminals (+, –, Y0 to Y4) (4) Output terminals (Y5, COM.) (5) COM. (RS485) terminal
Insulation resistance	Between the insulated circuits: 100 MΩ or more (measured with 500 V DC)	
Vibration resistance	10 to 55 Hz, 1 sweep/min. Double amplitude of 0.75 mm 0.30 inch, 10 min. on 3 axes	
Shock resistance	98 m/s^2 or more, 4 times on 3 axes	
Noise immunity	1000V (p-p) with pulse widths 50 ns and 1 μs (using noise simulator)	
Operating condition	Free from corrosive gases and excessive dust	
Current consumption	200 mA or less (24 V DC)	
Protection	IP66-compliant front section (with rubber gasket.)	
Weight	Approx. 130 g	

■ Input specifications (X0 to X7)

Item		Description
Number of inputs		8 points (6 points for thermocouple input type)
Insulation method		Photocoupler
Rated input voltage		24 V DC
Operating voltage range		21.6 to 26.4 V DC
Rated input current		Approx. 4.3 mA
Input points per common		8 points/common (6 points/common for thermocouple input type) Either the positive or negative of the input power supply can be connected to common terminal.
Min. ON voltage/ON current		19.2 V or less/4 mA or less
Max. OFF voltage/OFF current		2.4 V or more/1 mA or more
Input impedance		Approx. 5.1 kΩ (X0, X1) Approx. 5.6 kΩ (X2 to X7)
Response time	OFF → ON	50 μs or less (X0, X1) note)
		100 μs or less (X2 to X5) note)
		2 ms or less (X6, X7)
	ON → OFF	50 μs or less (X0, X1) note)
		100 μs or less (X2 to X5) note)
		2 ms or less (X6, X7)
Operating indicator		LCD display (I/O monitor mode)

Note) X0 through X5 are inputs for the high-speed counter and have a fast response time. If used as normal inputs, you are recommend to insert a timer in the ladder program as chattering and noise may be interpreted as an input signal.
Also, the above specifications apply when the rated input voltage is 24V DC and the temperature is 25°C.

■ Thermocouple input specifications

Item	Description
Number of inputs	2 points (CH0: WX1, CH1: WX2)
Temperature sensor type	Thermocouple type K
Input range	–30.0 to 300.0°C note 1) (–22 to 572°F)
Accuracy	±0.5%FS±1.5°C (FS = –30 to 300°C)
Resolution	0.1°C
Conversion time	250 ms/2CH note 2)
Insulation method	Between internal circuit and thermocouple input circuit: noninsulated note 3) Between CH0 and CH1 of thermocouple input: PhotoMos insulation
Wire cut detection	Available

Notes 1) Temperature can be measured up to 330°C (626°F). When the measured temperature exceeds 330°C (626°F) or the thermocouple wiring is disconnected, "K20000" is written to the register.
2) Temperature conversion for thermocouple input is performed every 250 ms. The conversion data is updated on the internal data register after the scan is completed.
3) The internal circuit and thermocouple input circuit are not insulated. Therefore, use the nongrounding type thermocouples and sheath tubes.

■ Transistor NPN output specifications (For Y0 to Y4)

Item		Description
Insulation method		Photocoupler
Output type		Open collector
Rated load voltage		5 to 24 V DC
Operating load voltage range		4.75 to 26.4 V DC
Max. load current		0.5 A
Max. surge current		1 A
Output points per common		5 points/common
OFF state leakage current		100 μA or less
ON state voltage drop		1.5 V or less
Response time	OFF → ON	50 μs or less (For Y0 and Y1), 1 ms or less (For Y2,Y3 and Y4)
	ON → OFF	50 μs or less (For Y0 and Y1), 1 ms or less (For Y2,Y3 and Y4)
External power supply (for driving internal circuit)	Voltage	21.6 to 26.4 V DC
	Current	6 mA/point (For Y0 and Y1) 3 mA/point (For Y2, Y3, and Y4)
Surge absorber		Zener diode
Operating indicator		LCD display (I/O monitor mode)

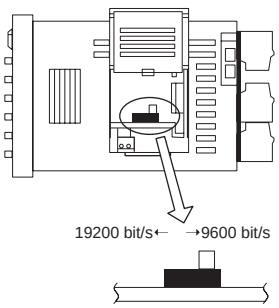
■ Relay output specifications (Y5)

Item		Description
Output type		1a (1 Form A, normally open)
Rated control capacity		2 A 250 V AC, 2 A 30 V DC
Output points per common		1 point/common
Response time	OFF → ON	Approx. 10 ms
	ON → OFF	Approx. 8 ms
Life time	Mechanical	Min. 2×10^7 operations
	Electrical	Min. 10^5 operations (resistive load)
Surge absorber		None
Operating indicator		LCD display (I/O monitor mode)

■ COM. port communication specifications note 1)

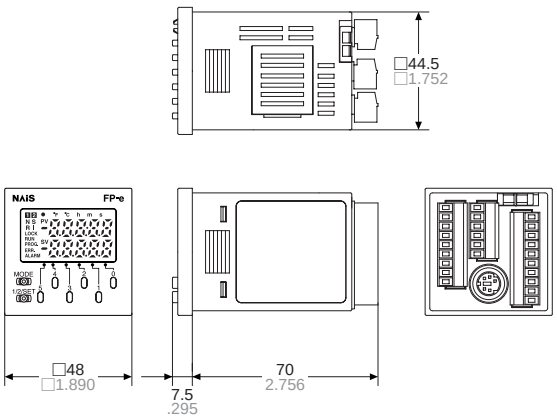
Item	Description	
COM. port type	RS232C note 2)	RS485
Isolation status with the internal circuit	Non-isolated	Isolated
Transmission distance	15 m	1200 m
Transmission speed note 3) (Baud rate)	300, 600, 1200, 2400, 4800, 9600, 19200 bit/s	9600,19200 bit/s note 4)
Communication method	Half-duplex	
Synchronous method	Asynchronous communication method	
Transmission format	Stop bit: 1 bit/2 bit	
	Parity: Not available/Available (Odd number/Even number)	
	Data length 7 bit/8 bit	
	Beginning code: STX available/STX not available	
	Ending code: CR/CR+LF/not available/ETX	
Data output order	Starting from 0 bit per character	
No. of connected units	—	99 note 5)
Communication mode	• General-purpose communication • Computer link • Modbus RTU slave (scheduled)	• General-purpose communication • Computer link • Modbus RTU slave

Notes
1) When communicating between FP-e and other device, it is recommneded to perform resend processing.
2) For RS232C wiring, be sure to use shield wires for higher noise immunity.
3) Set the baud rate of RS485 to both FP-e system register and FP-e internal switch. Set the baud rate of RS232C to FP-e system register.
4) When sending a command from the FP-e is completed in RS485 communication, send a response from the receive device to the FP-e after the following time has been elapsed:
9600 bit/s: 2 ms or longer 19200 bit/s: 1 ms or longer
It takes at least 1 scan time (at least 2 ms) for the FP-e to send back a response after receiveing the command.
5) When our C-NET Adapter or other RS485 device than recommended is connected in the system, the maximum connection number is limited to 32 units.



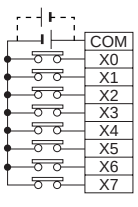
■ Dimensions

(mm inch)

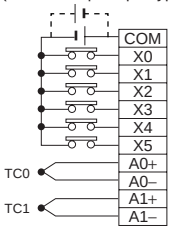


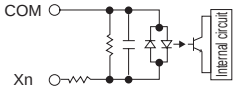
■ Wiring diagram

● Input connector
(Basic type)

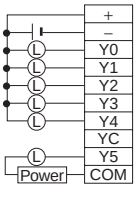


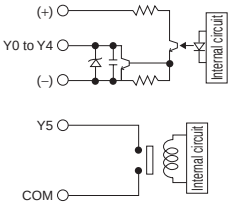
(Thermocouple input type)



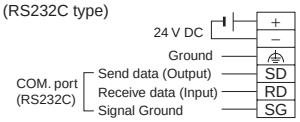


● Output connector

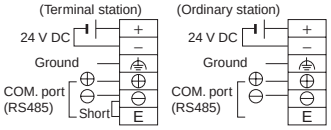




● Power supply/COM. port connector
(RS232C type)

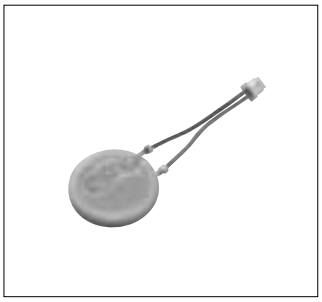


(RS485 type)

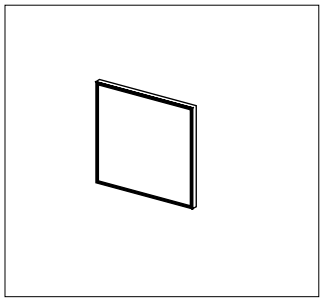


FP-e Options

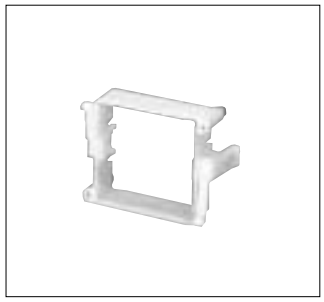
■ Options



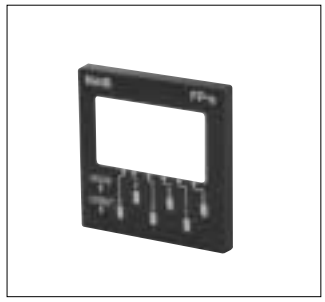
Backup battery
Included with calendar timer type
Part number: **AFPG804**



Rubber gasket
Comes with FP-e control unit
Part number: **ATC18002**

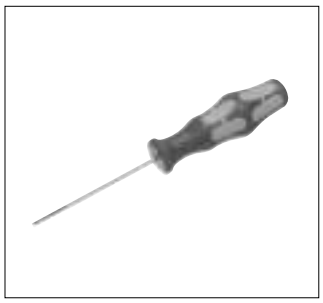


Mounting frame
Comes with FP-e control unit
Part number: **AT8-DA4**

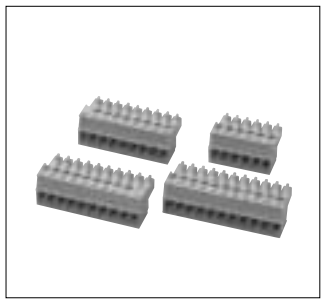


Panel cover
Color: Black (20 pcs)
Part number: **AFPE803**

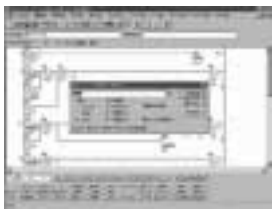
Protective cover
Part number: **AQM4803**



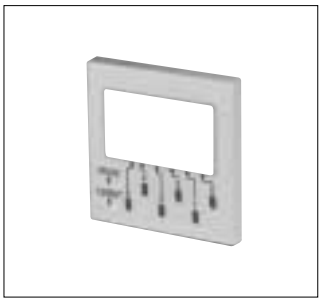
Terminal screwdriver
Using when wiring terminal block
Part number: **AFP0806**



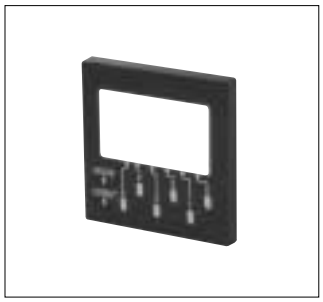
Terminal socket set
4 terminal blocks
Part number: **AFPE804**



Programming tool software Control FPWIN GR/FPWIN Pro
Part number: **FPWINGRF-EN2** (Full version)
FPWINGRS-EN2 (Small version)
FPWINPROF-EN4 (Full version)
FPWINPROS-EN4 (Small version)



Panel cover (No printing for NAiS/FP-e)
Color: Ash-gray
Part number: **AFPE805**



Panel cover (No printing for NAiS/FP-e)
Color: Black
Part number: **AFPE806**