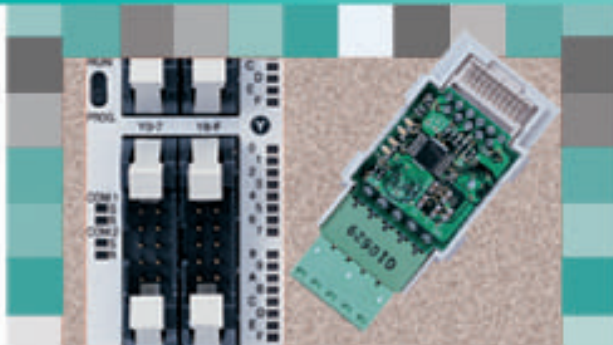


New:
32k Instructions



FPΣ (Sigma) Programmable Controller

FPΣ (Sigma)

The next generation compact PLC

Highlights

State-of-the-art PLC technology in the most compact size plus the ability to communicate via all important modern media characterize the FPΣ (Sigma). With its two 100kHz pulse outputs, four hardware counters that function at up to 50kHz for positioning applications, a programming memory capable of storing 32,000 steps, a real-time clock, and communication interfaces for RS232C and RS485, FPΣ (Sigma) is one of the most flexible PLCs on the market. Remarkably, it is also one of the smallest!

Communication

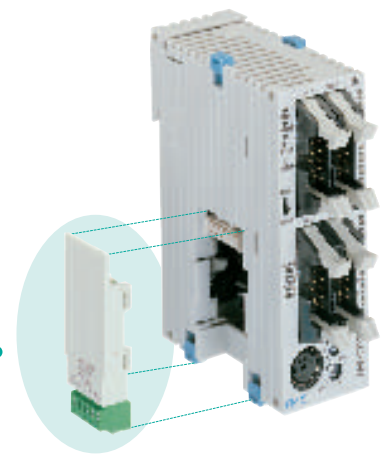
Four quick and easy snap-on cassettes are available to add different serial ports to the FPΣ (Sigma). All ports are capable of communicating at speeds of up to 115.2Kbps.

1-channel RS232C type.

2-channel RS232C type.

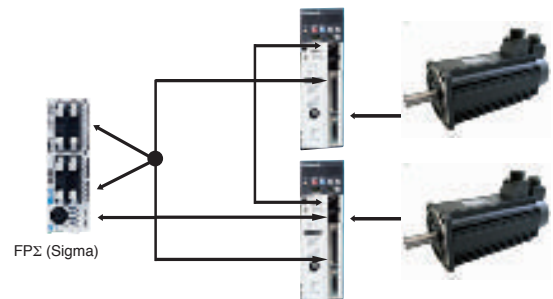
1-channel RS485 type.

1-channel RS232C + 1-channel RS485 type.



Positioning

In addition to a host of handy Panasonic functions, the FPΣ (Sigma) also offers circular and linear interpolation. Circular interpolation can be used for applications that apply glue, linear interpolation for pick & place applications, for example. By combining the FPΣ (Sigma) with servo motors, you can perform real 2-axis motion control.



Driver Minus A series Motor Minus A series

Temperature Control

With the thermocouple input units and our accurate unique PID and IPD algorithms, temperature can be controlled more easily and accurately than ever.



Other Highlights

- High expansion capability with up to 384 I/Os
- Short circuit protected transistor outputs
- Fastest processing time, 0.32μsec/basic command
- Built-in analogue volume with two points
- Compact design (W 30 x H 90 x D 60mm)
- Backup battery

FPΣ (Sigma) CPUs

Outstanding performance in a compact design

FPΣ (Sigma) – Transistor output type



28 points	
Input 16 points	Output (PNP) 12 points
Connector type	
FPG-C28P2H	



32 points	
Input 16 points	Output (NPN) 16 points
Connector type	
FPG-C32T2H	

FPΣ (Sigma) Relay output type



24 points	
Input 16 points	Output 8 points
Terminal type	
FPG-C24R2H	

FPΣ (Sigma) – Transistor output type with thermistor input



28 points	
Input 16 points	Output 12 points
2 Thermistor inputs	
FPG-C28P2HTM	



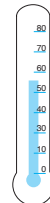
32 points	
Input 16 points	Output 16 points
2 Thermistor inputs	
FPG-C32T2HTM	

FPΣ (Sigma) – Relay output type with thermistor input



24 points	
Input 16 points	Output 8 points
2 Thermistor inputs	
FPG-C24R2HTM	

Temperature Control



High Expansion Capability

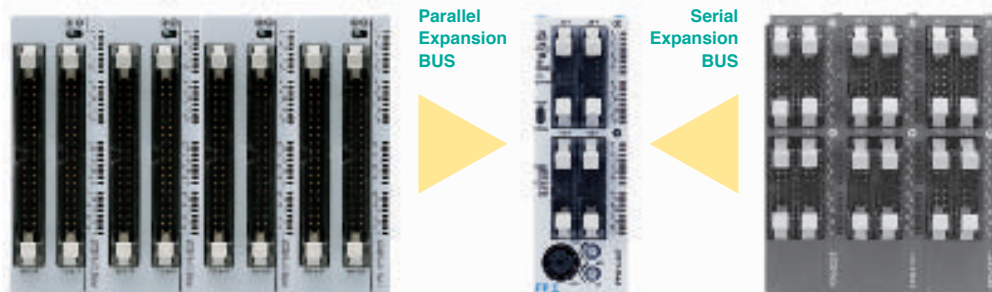
FPΣ (Sigma) can use the expansion units of the FP0 on the right-hand side. New FPΣ (Sigma) units can be added to the left-hand side.

Max. 4 Expansion Units
each 64 I/Os = 256 I/Os

...up to 384 I/O!

CPU
max. 32 I/Os

Max. 3 Expansion Units
each 32 I/Os = 96 I/Os



FPΣ (Sigma) Expansion Units – Left Side Expansion

Wide variety of expansion units

**FPΣ (Sigma)
I/O Expansion Unit**



64 points
Input 32 points Output (PNP) 32 points
MIL Connector type
FPG-XY64D2P

**FPΣ (Sigma)
I/O Expansion Unit**



64 points
Input 32 points Output (NPN) 32 points
MIL Connector type
FPG-XY64D2T

**FPΣ (Sigma)
Memory Expansion Unit**



FPG-EM1
Memory: 256k words
FPG-EM1

**FPΣ (Sigma)
S-Link Expansion Unit**



S-Link Master
128 Inputs or outputs
FPG-SL

FPΣ (Sigma) Positioning Expansion Units



1-axis
Transistor output
FPG-PP11



1-axis
Line driver output
FPG-PP12



2-axis
Transistor output
FPG-PP21



2-axis
Line driver output
FPG-PP22

Communication Cassettes



1-channel
RS232C type
FPG-COM1



2-channel
RS232C type
FPG-COM2



1-channel
RS485 type
FPG-COM3



2-channel
RS232C & RS485 type
FPG-COM4

FP Memory Loader

- Read or write programs from or to a PLC
- Personal computer is not required
- Applicable with FP0, FPΣ (Sigma), FP-M, FP2 and FP2SH



AFP8670

FPΣ (Sigma) Expansion Units – Right Side Expansion

Wide variety of expansion units

A maximum of 3 FP0 expansion units can be added to the CPU unit.

Digital I/O Units

Relay output type



8 points
Input 2 points
Output 4 points
FP0-E8RSA



16 points
Input 8 points
Output 8 points
FP0-E16RSA



32 points
Input 16 points
Output 16 points
FP0-E32RSA

Input only type



8 points
Input 8 points
FP0-E8XA



16 points
Input 16 points
FP0-E16XA

Transistor output type



8 points
Output 8 points
FP0-E8YPA (PNP)
FP0-E8YTA (NPN)



16 points
Input 8 points
Output 8 points
FP0-E16YPA (PNP)
FP0-E16YTA (NPN)



16 points
Output 16 points
FP0-E16YPA (PNP)
FP0-E16YTA (NPN)



32 points
Input 16 points
Output 16 points
FP0-E32YPA (PNP)
FP0-E32YTA (NPN)

Option:

Output 8 points
FP0-E8YRSA

Analogue I/O Units



3 points
Input 2 points
Output 1 point
FP0-A21A



4 points
Output 4 points
FP0-A04I



4 points
Output 4 points
FP0-A04V



8 points
Input 8 points
FP0-A80A



4 points
Input 4 points
FP0-TC4



8 points
Input 8 points
FP0-TC8



6 points
Input 6 points
FP0-RTD6

• Input (12 bit):
± 10V, 0 – 5V,
0 – 20mA
• Output (12 bit):
± 10V, 0 – 20mA

–
–
4 – 20mA

–
–
± 10V

± 10V, ± 100mV
0 – 5V, 0 – 20mA

• K, J, T, R type thermocouples
can be used
• Resolution: 0.1°C
• Accuracy: 0.8°C (R type: 3°C)
• Temperature range:
-100 to 1500°C

• Pt100, Pt1000,
Ni1000
• Temperature range:
-200 to 500°C

AC Power Supply

FP0-PSA2



Input 85 to 265VAC
Output 24VDC/0.7A
Terminal type

Networking Units



**MEWNET-F
FP0-IOL**
(MEWNET-F Slave)



**PROFIBUS
FP0-DPS2**
(DP Slave)



**Ethernet
FPWEB**
(Web-Server Unit)

FPΣ (Sigma)

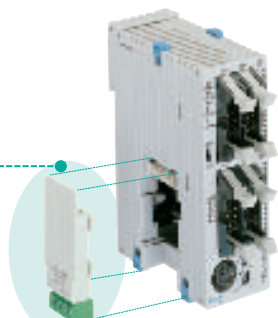
Optimised communication functions

1-channel RS232C type.

2-channel RS232C type.

1-channel RS485 type.

1-channel RS232C + 1-channel RS485 type.



Four types of communication cassettes enable:

- efficient connection to serial devices
- transmission speeds of up to 115.2kbits/s
- long transmission distance of up to 1200m

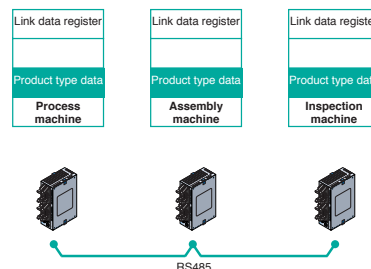
In addition, the green screw terminal is removable for easy wiring.

With the RS485 type communication cassette...

Despite being compact you can create powerful PLC links!

More links than you imagined a compact PLC could achieve
(2,048 link relays / 256-word link data registers)

- Can be used to share product type between different machines.
- Can be used for interlocking between different machines.
- Easy wiring between PLCs with twin-core cabling.



Masterless communication method

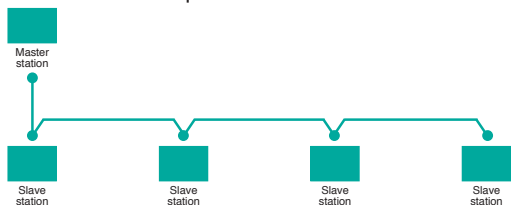
(when PLC linkage is achieved with link relays and link data registers)

The masterless communication method means that even if a connected device (station) goes into power off, operations to automatically switch the master station continue. Start up is smooth and the recovery from malfunctions is also potentially faster.

Previous models

Usual master-slave communication

- If the master station is not on, communication cannot take place.
- Errors occur when devices are not turned on in sequence.



With the FPΣ (Sigma)

Masterless communication using the FPΣ (Sigma)

- Even if a station goes into a power-off state, communications between the other stations continue.



Use of insulated RS485

Uses the insulated RS485, which is highly reliable and largely impervious to noise. High-speed communication over long distances are enabled.

■ Transmission speed: Max. 115.2kbits/s

■ Transmission distance: Max. 1.200m

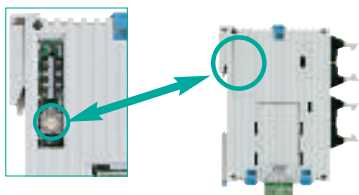
FP Σ (Sigma)

Optimised communication functions

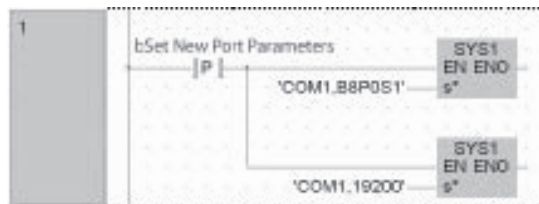
Convenient station no. setting function enables flexible use, even when there are product type changes.

- Station no. switchability allows the use of unified programming and program switching.
- Because even the communications parameters can be changed in the program, connection is enabled with external devices that have different communication parameters.

FP Σ (Sigma) Station No. setting switch



Communication parameters changed by instructions



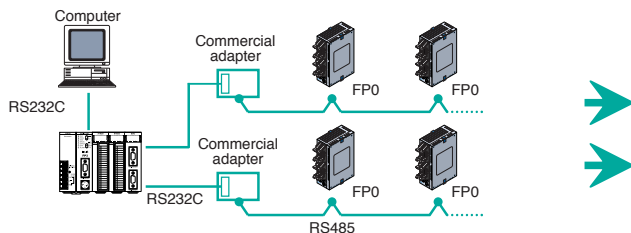
Great for these applications, too...

Computer linkage with up to 99 stations enabled (max. 32 stations when using C-NET adapter).

- Ability to gather data from multiple stations means greater design freedom.

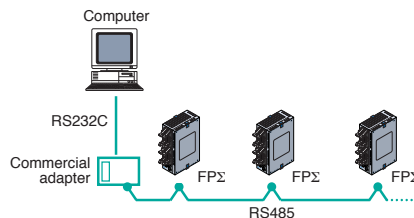
Previous models

Relay stations required for linking medium-scale PLCs



With the FP Σ (Sigma)

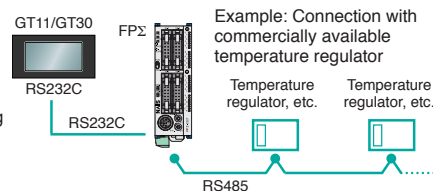
Computer linkage with up to 99 stations



Can also be connected to external devices that are equipped with RS485 interface

- Enables connection to external devices, such as temperature regulators, that are equipped with RS485 interface.
- Applicable with data gathering or setting adjustment.

- Control is possible using commercially available RS485 devices.

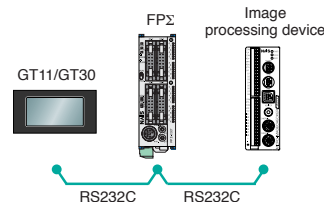


With the RS232C type communications cassette

Efficient connection with other control devices helps to save space!

- Enables connection to devices with RS232C interface, such as a programmable display panel, image processing device and other devices.
- When used as a tool port, up to 3 external devices can be connected.

- A 2-channel type communication cassette is used.



FP Σ (Sigma) Positioning

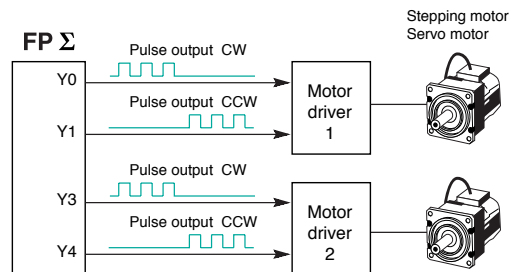
Specially designed for positioning applications

Max. 100kHz pulse output performance is now standard.
Powerful device capable of linear interpolation and circular interpolation.

Pulse output max. 100kHz

Because command processing at speeds up to 100kHz is available, high-speed, high-precision positioning is enabled. Along with stepping motor control, the specs also ensure plenty of scope for controlling servomotors.

Possible to combine with pulse-train input drivers
 Single unit enables two-axis control

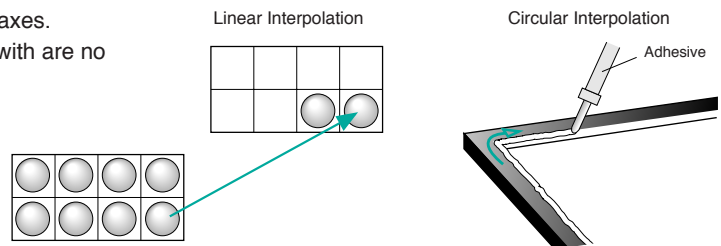


Rapid 0.02ms start (when JOG operation controls are executed)

The time taken to execute the JOG operation, from the instant the trigger (execution condition) goes on to the time of pulse output, is 0.02ms and 0.2ms even with trapezoidal control. Control time is reduced even for machines that quickly and repeatedly restart.

Linear interpolation and circular interpolation are built in (FPG-C32T2H and FPG-C28P2H)

Interpolation functions enable simultaneous control of two axes. Applications that a compact PLC couldn't previously cope with are no longer a challenge.

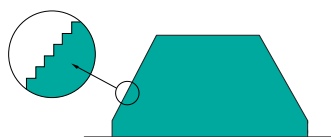


And there's more...

Smooth acceleration/deceleration

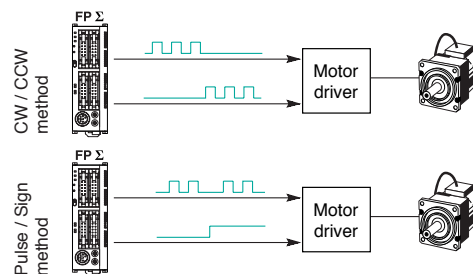
You can choose to set either 30 or 60 steps of acceleration/deceleration. This feature means you can achieve smoother movement during long acceleration/ deceleration periods of stepping motors.

The settings are there for a maximum 60 acceleration/deceleration steps.



Support for CW/CCW method

Reduce overall costs by designing systems that combine with servomotors and small stepping motors without support for Pulse and Sign method.



FP Σ (Sigma) Positioning

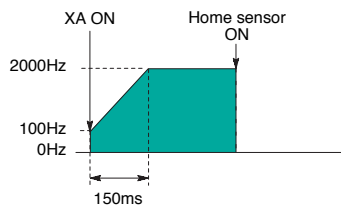
High-speed, high precision positioning

Programming with convenient and easy-to-understand instructions

- Uses a preset value table for starting speed, target speed, acceleration/ deceleration time, and other factors. Easy-to-understand programming is possible since numbers can be specified intuitively.
- Comes with dedicated instructions for each mode: trapezoidal control, home return, JOG operation, free table operation, linear interpolation, and circular interpolation.

Home position return

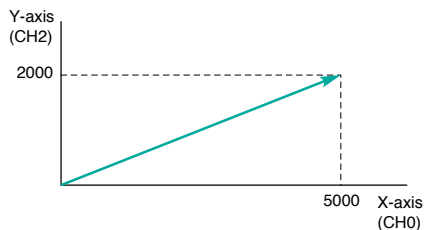
- Pulse output diagram (when the home position proximity input is not used).



Home search automatically reverses the motor rotation when Over limit input(+) or Over limit input (-) is input and their searches for the home position or near home position in order to return to it automatically.

Linear interpolation

- Positioning locus.



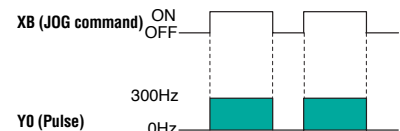
A control function that automatically defines the continuum of points in a straight line based on only two co-ordinate positions.

Selectable home return mode

- The home return method may be specified even in situations such as when only a single sensor is being used, depending on the design.
- When the home position return is completed, a deviation counter clear signal can also be output.

JOG operation

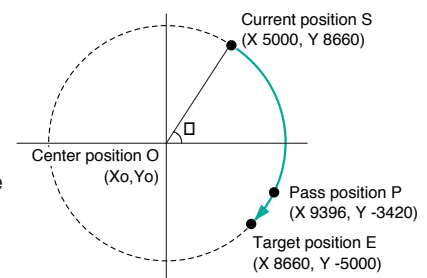
- Pulse output diagram



This refers to an operation in which the motor is rotated only while operation commands are being input. This is used to forcibly rotate the motor using input from an external switch, for instance when making adjustments. Depending on the circumstances, unlimited feeding can be accomplished with the JOG operation in some cases.

Circular interpolation

- Positioning locus.



- Center-radial setting methods are also available.

Allows points to be smoothly traversed by arced paths for which the user specifies the orientation plane, the radius of curvature, motion path profile, and direction of motion.

FPΣ (Sigma) Positioning Expansion Units

Precise positioning

Features

- Fast startup of 0.02 or 0.005ms makes cycle time reduction possible.
- Feedback pulse count function makes output pulse counting from external encoders possible.
- JOG positioning control supports a wide range of applications.
- 4 types of S-curve acceleration/ deceleration control makes smooth startup and stopping possible:
Sine curve, quadratic curve, cycloid curve and cubic curve.



FPG-PP11



FPG-PP12



FPG-PP21



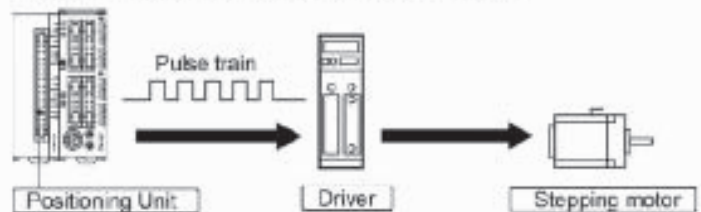
FPG-PP22

- The FPΣ (Sigma) positioning unit can handle simultaneous startup of multiple axes, enabling simultaneous control of linear interpolation and other elements through user programs.
- Transistor output type (open collector) and line driver output type are available.

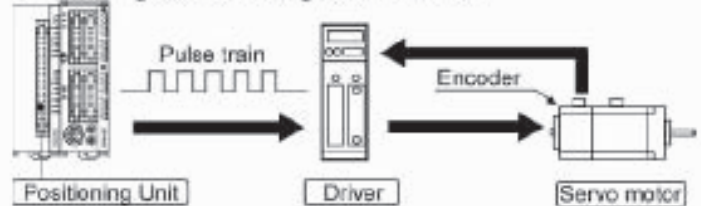
Unit type and product number

Type	Output type	Part number
1 - axis type	Transistor output type	FPG-PP11
2 - axis type	Transistor output type	FPG-PP21
1 - axis type	Line driver output type	FPG-PP12
2 - axis type	Line driver output type	FPG-PP22

Positioning control using a stepping motor



Positioning control using a servo motor



1 - axis and 2 - axis types are available.

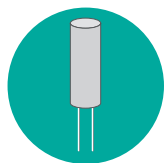
Multiple axes (up to 2 axes) can be controlled with a single unit.

Optimised Temperature Control

Functions convenient for temperature control are built in

The control unit with thermistor inputs enables temperature control at low cost

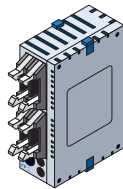
Two thermistor inputs, which cost less than thermocouples, can be connected to the FPΣ (Sigma) unit via thermistor inputs (FPG-C28P2HTM, FPG-C32T2HTM and FPG-C24R2HTM).



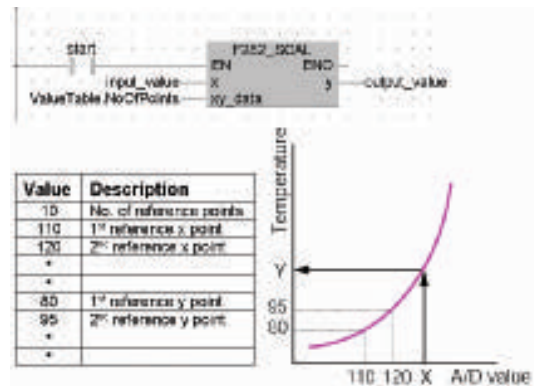
Thermistor



FPΣ (Sigma) control unit that accepts thermistors



Using a simple linearization command, measuring the temperature by the thermistor can be programmed easily.

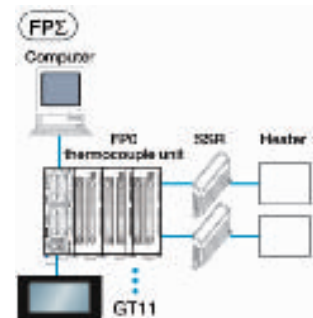


Four- and eight-channel type thermocouple input expansion unit

Up to three units can be added to each control unit, enabling temperature control of up to 24 channels.

Advantages over multiple temperature controllers:

- Information collection and computer-based storage.
- On-site error monitoring using programmable display.
- Significant reduction in total costs.
- Power supply stabilisation by protecting synchronisation between heater ON and OFF states.
- Temperature settings can be easily changed using batch function.

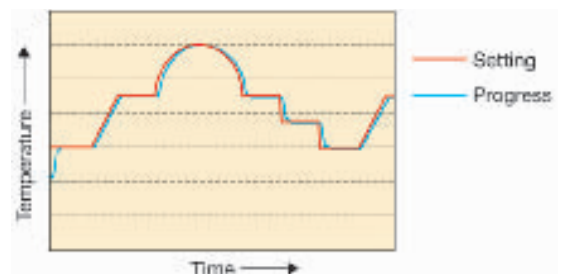


Optimised temperature control with PID and PWM instruction

You can easily set multi-stage temperature control and time control usually available only in high performance type temperature controllers.

With the built-in PID and IPD algorithms, temperature can be controlled more accurate than ever.

Example of temperature control with the auto-tuning function only



FPΣ (Sigma)

Supports the enhancement of your equipment's performance

Network enhancement

■ Modbus-compatible

FPΣ (Sigma) is compatible with the world's de facto standard Modbus* and can serve as both Modbus RTU master and slave, making it ideal for air conditioning or temperature control etc.

* Protocol developed by Modicon Inc., an American company

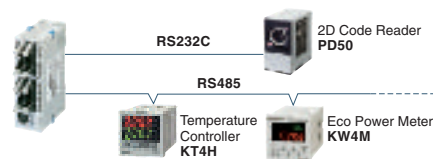
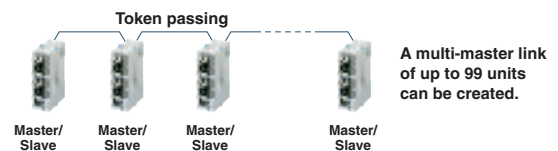
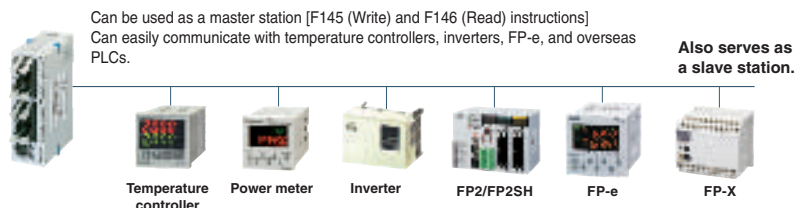
■ These applications are also available.

When 17 or more FPΣ (Sigma) units need to be linked, you can use the Modbus function instead of MEWNET-W0 to link up to 99 units. Since each FPΣ (Sigma) unit can be either a master or a slave, a multi-master link can be created by passing a token from a user program.

■ New "MEWTOCOL Master" function is available.

The MEWTOCOL master function automatically creates and transmits commands using the Panasonic open protocol MEWTOCOL. This function significantly facilitates serial communications with MEWTOCOL-compatible equipment, such as PD50, KT4H and KW4M.

FPΣ (Sigma) can serve as Modbus Master or Slave



Security enhancement

Programs are copy-protected by the upload restriction setting and an eight-character password.

- The setting to inhibit the uploading of PLC programs to PCs protects your programs from unauthorized copying. (If this setting is released, programs in the PLC are forcibly cleared.)
- An eight-character password has been adopted. (The conventional four-character password is also available.) Approx. 218 trillion passwords can be set by combining eight alphanumeric characters, making it nearly impossible to crack the password set.

Debugging performance enhancement

Up to 512 steps can be rewritten simultaneously in RUN mode.
This improvement allows efficient program debugging without stopping the operation.

FPΣ (Sigma) Data Memory Expansion Unit

Data capacity expandable up to 256k words

Features

- Able to store 256k words, this memory unit is well-suited for storing remote monitoring logs.
- Take advantage of FPΣ's (Sigma) memory for manufacturing systems that produce more than one model. With FPΣ's (Sigma) memory, you no longer need to download new production data every time you switch manufacturing process.
- Up to 4 units can be connected to the FPΣ (Sigma), allowing up to 1024k words to be stored.



FPG-EM1



General Specifications

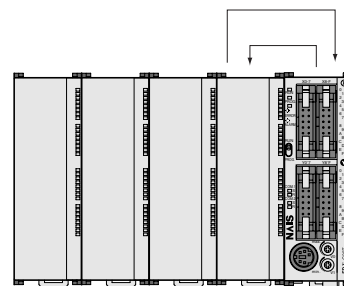
Item	Description
Ambient temperature/humidity	0 to 55°C, 30 to 85% RH (No condensation)
Storage temperature/humidity	-20 to +70°C, 30 to 85% RH (No condensation)
Vibration resistance	10 to 55Hz, 1 sweep/min., double amplitude of 0.75mm, 10min. on 3 axes
Shock resistance	98m/s ² or more, 4 times on 3 axes
Noise immunity	1,000V (P-P) with pulse width 50ns, 1μs (using a noise simulator)
Basic unit mass	Approx. 80g
The amount of increase in control unit consumption current	35mA or less (24VDC) (100mA or less (internal 5VDC))

Performance Specifications

Item	Description
Memory capacity	256 kilowords (1k words x 256 banks)
Battery life	5 years or more
5V Power consumption	100mA or less
Number of I/O points	Input 16 points

Programming tool FPWINGR/FPWIN Pro

Instructions F150 and F151 are necessary for reading from and writing to memory expansion units. You can use these instructions with FPWINGR Vers. 2.13 or later or FPWIN Pro Vers. 4.02 or later.



Data is read with the F150 instruction.

Data is written with the F151 instruction.

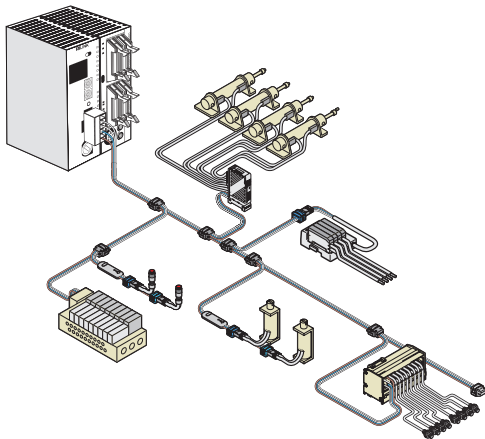
FPΣ (Sigma) S-Link Expansion Unit

Flexible wire-saving link system S-Link

Features

- Up to four S-Link units can be attached to one FPΣ (Sigma) CPU.
- Each unit supports up to 128 I/O signals over a pair of wires up to a distance of 200m (400m when a booster is used).
- The combination of input and output point quantities (a total of 128 points max.) can be set by the rotary switch in increments of 32 points.
- The transmission line connection is realized via a T-branch multi-drop wiring with hook-up connectors. Adding devices is rendered easy and maintenance is easy.

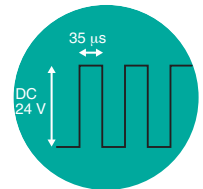
FPΣ (Sigma) + S-Link unit



FPG-SL

Features

- The four-wire cable (two signal wires and two power wires) enables efficient wiring, and the T-branch wiring enables a flexible connection layout.
- About 60 types of S-Link input/output devices can be connected to this unit, enabling it to meet diverse I/O needs. In addition, the high transmission voltage (24VDC) and the wide clock width (35μs) provide high noise immunity. Flexible and reliable wiring is available, reducing the wiring work.



Features

- The control unit automatically recognizes I/O allocation in accordance with the attached S-Link unit position, making the S-Link unit as easy to use as a common expansion I/O device.
- If the main wire is broken and an input/output device cannot be recognized, then the S-Link unit displays the device number. This function significantly reduces the time required for troubleshooting during an equipment startup check or recovering from on-site problems.



Specifications

Transmission method	Bi-directional time-divided multiple signal transmission
Synchronization	Bit synchronization, frame synchronization
Transmission protocol	S-Link protocol
Transmission line	Exclusive flat cable or cabtyre cable
Transmission speed	28.5 kbps
Transmission distance *1	Main signal wires: Extensible up to 200m (400m when a booster is used)
Connection method	T-branch multi-drop wiring or multi-drop wiring
Number of I/O points	128 points max. (adjustable in encrements of 32 I/O points)

*1 For boosters, see the S-Link catalog and manual issued by SUNX Limited.

FP Web-Server

Program/Operate the FPΣ (Sigma) using a LAN or WAN network

The multifunctional FP Web-Server provides users with the option of connecting the FPΣ (Sigma) or any other FP Series PLC to the Internet/Intranet thus enabling bi-directional communication. No changes to the PLC programs are necessary. Simply assign an IP address to the FP Web-Server and connect the PLC to the FP Web-Server via the serial RS232C interface. A standard browser e.g. MS Internet Explorer or Netscape Navigator can be used for access at the PC.



The FP Web-Server's 3 interfaces

- 10BaseT (RJ45, twisted pair)
 - connects to the Ethernet at 10 Mbit/s
- RS232C (screw terminal)
 - connects to the FPΣ (Sigma) at 1200 to 115.2 kbit/s
- RS232C (SUB-D 9 male)
 - connects to a modem (PPP)

Highlights

■ Web-Server:

- PLC data represented as HTML (or XML) pages
- Access via standard Internet browser
- PLC data handling via HTML and Java Applet
- Optional: Password protection, IP-Lok security

■ RS232C device server:

- Ethernet <--> RS232C conversion (MEWTOCOL)
- Transparent RS232C data tunneling via Ethernet
- Programming and visualisation via TCP or UDP

■ Modbus- TCP protocol:

- Communication via standard industrial Ethernet protocol (server and client)

■ Email:

- PLC can send emails
- Email via LAN email server or Internet dial-up
- PLC-defined or pre-stored mail text
- PLC data array as attachment to an email

■ Modem/Ethernet gateway:

- FP Web-Server can be dialed up via modem
- One remote gateway for multiple FP Web-Servers in a local Ethernet network

■ Network time server synchronisation:

- PLC real-time clock update via NTP server

Protocols	TCP/IP, UDP/IP, SMTP, PPP, NTP, FTP, TELNET, HTTP, MEWTOCOL-COM
Number of browsers	Up to 64 browsers can be connected to one FP Web-Server
Number of emails	4 predefined in FP Web Flash memory 1 programmable in PLC DT memory as ASCII
Number of email addresses	4 predefined in FP Web flash memory, 1000 addresses in PLC DT memory, assuming an average of 32 characters are used per email address and that an FPO-T32CP is used, which has 16k word memory
Number of PLC per unit	Two PLCs can be connected 3-pin port (port number: 9094) DB8 port (port number: 9095)
IP address	DHCP or manually set by software
Security	Password and DIP switch
Operating power	24VDC, 75mA (max.)
Dimensions	25 x 90 x 60mm (W x H x D)
LEDs	Power, COM Ethernet connection, COM data exchange
Flash memory	512KBytes
Standards fulfilled	CE, UL, cUL

Control FPWIN Pro

Programming according to the international standard IEC 61131-3

FPWIN Pro is the Panasonic programming software developed according to the international standard IEC 61131-3 (for Windows 98, NT V4.0, 2000, ME or XP). This new version is a result of experience gained over many years. We were one of the first PLC manufacturers to offer an IEC 61131-3 programming software, and we are a leading member of the international organisation PLCopen.

Multiple address assignment is caught automatically by the compiler

Local variables are allocated automatically by the compiler

Type safe programming using simple or complex data types

Input and output variables are defined once in the global variable list

Functions can be saved in libraries for future reuse

Navigator with tree representation of called functions provides an overview even for very complex projects

Comfortable programming in the graphical LD editor (ladder diagram)

One instruction for different data types (overloaded instructions)

Temporary variables are allocated and released automatically by the compiler

Long variable names make the program self-explanatory

The SFC editor (Sequential Function Chart) allows you to easily visualize processes

Additional window for monitoring and forcing variables

Special functions for controlling the SFC program from another program

Using aliases names for PLC-independent access on the special data registers, e.g. RTC

Structuring with selection statements

Using loops for running through incoming data

...or arrays

The ST editor (Structured Text) solves complex programming tasks

Using STRING functions for analyzing incoming data...
...or for generating formatted output strings

Easy handling of formulas and arithmetic expressions

Free demonstration disc



The most important highlights at a glance:

- One software for all FP Series PLCs.
- 5 programming languages (instruction list, ladder diagram, function block diagram, sequential function chart, structured text) available for all PLCs.
- Programme organisation units, task and project management provide clear structure.
- Reuse of ready-made functions and function blocks saves time for programming and debugging.
- Online monitoring and diagnostics.
- Forcing – Turning off input and output contacts via the PC.
- Modem communication for remote programming, service and diagnostics.
- Extensive comments – online documentation created hand in hand with the program.
- 6 languages are supported: English, German, French, Italian, Spanish and Japanese.

Part numbers:

- FPWINPROF: Full version supports all FP Series PLCs
- FPWINPROS: Small version, supports FP-e, FP0, FP-M, FP1, FP-X and FPΣ (Sigma)

FPΣ (Sigma)

Specification tables

PERFORMANCE SPECIFICATIONS

Item	Description		
Type of control unit	NPN transistor output type	PNP transistor output type	Relay output type
Part number	FPG-C32T2H/FPG-C32T2HTM	FPG-C28P2H/FPG-C28P2HTM	FPG-C24R2H/FPG-C24R2HTM
Number of I/O points			
No expansion	32 (Input: 16 / Output: 16)	28 (Input: 16 / Output: 12)	24 (Input: 16 / Output: 8)
with expansion	Max. 384	Max. 380	Max. 376
Program memory	Built-in Flash ROM		
Program capacity	32,000 steps		
Operation speed	0.32 μs- /step, Basic instructions		
Memory for execution			
External input (X)	1184 points		
External output (Y)	1184 points		
Internal relay (R)	4096 points (R0 to R255F)		
Timer/Counter (T/C)	1024 points ^{1, 2} / At reset: timer 1008 points (T0-T1007), counter 16 points (C1008-C1023), Timer range is selected by instructions from 1ms, 10ms, 100ms, 1s / Counter: 1 to 32767 counts		
Link relay (L)	2048 points ¹		
Data register (DT)	32765 words (DT0-DT32764) ¹		
Link data register (LD)	256 words ¹		
Index register (I)	14 words (I0-ID)		
Differential points	Unlimited number of points		
Master control relay points	256 points		
Labels (JP+LOOP)	256 labels		
Number of step ladder	1000 stages		
Number of subroutine	100 subroutines		
High-speed counter	Single-phase: 1ch: 50kHz/2ch: 30kHz/3 or 4ch: 20 kHz / Two-phase: 1ch: 20kHz/2ch: 15kHz		
Pulse output	1 channel: 100kHz / 2 channel: 60kHz		
PWM output	2 channels, 1.5 to 12.5 kHz (at resolution of 1000) / 15.6 to 41.7 kHz (at resolution of 100)		
Pulse catch input	8 points (X0-X7)		
Interrupt program	9 programs (external 8 points, 1 periodical interrupt point 0.5ms - 30s)		
Self-diagnosis functions	Watchdog timer, program syntax checking, etc.		
Clock/Calendar function	Year, month, day, hour, minute, second, and day of week ^a		
Volume input	2 points resolving power 10bits (K0-K1000)		
Thermistor input	2 points, resolution: 10 bits (0 to 1000) (for C32T2HTM, C24R2HTM, and C28P2HTM only)		
Link functions	Computer link (1:1, 1:N) ^{3, 4} General communication (1:1, 1:N) ^{3, 4} PLC link ⁴		
Battery life (Battery is optional)	220 days or more* (actual usage value: approx. 840 days (25°C). Suggested replacement interval: 1 year		
Comment storage	All kinds of comments, including I/O comments, remarks and block comments, can be stored (without backup battery)		
Linear/circular interpolation for positioning	Available	Available	Not available
Other functions	Program edition during run, constant scan, forced I/O, password, floating point real number operation, PID processing instruction Comment memory 128Kbyte		

Notes: 1) If a battery is not used, only fixed area is backed up (Counter: C1008-C1023, internal relay: R900-R97F, Data register: DT32710-DT32764). If a battery is used, backup is possible: Area-setting of hold or no-hold is possible by system register.

2) Points can be increased using auxiliary timer.

3) Optional communication cassette (RS232C type) is necessary for 1:1 communication.

4) Optional communication cassette (RS485 type) is necessary for 1:N communication.

5) Optional communication cassette (RS485 type) is necessary.

6) Optional battery is necessary in order to use Clock/Calendar function. Precision calendar timer: at 25°C = 77°F less than 51-second error per month / at 0°C = 32°F less than 119-second error per month / at 55°C = 131°F less than 148-second error per month.

*Value applies when no power is supplied at all.

FPΣ (Sigma)

Specification tables

INPUT SPECIFICATIONS

Insulation method	Optical coupler
Rated input voltage	24VDC
Input voltage range	21.6 to 26.4VDC
Rated input current	3.5mA - 8mA depends on input no.
Input points per common	8 points/common (FPG-C24), 16 points/common (FPG-C32/C28), 32 points/common (FPG-XY64). Either the positive or negative of input power supply can be connected to terminal
Min. ON voltage / Max. OFF current	19.2V / 3mA - 6mA depends on input no.
Max. ON voltage / Min. OFF current	2.4V / 1.3mA
Input impedance	3k - 6.8k depends on input no.
Response time	CPU: 1ms or less, 5μs (HSC, pulse catch, interrupt input) Expansion: 0.2ms (OFF -> ON) 0.3ms (ON -> OFF)
Operating indicator	LED

OUTPUT SPECIFICATIONS - TRANSISTOR OUTPUT TYPE

Item	FPG-C32 (NPN)	FPG-C28 (PNP)
Insulation method	Optical coupler	
Output method	Open collector	
Rated voltage range	5 to 24VDC	24VDC
Operating load voltage range	4.75 to 26.4VDC	21.6 to 26.4VDC
Max. load current	For Y0, Y1, Y3, Y4: 0.3A For Y2, Y5 to YF: 0.1A	For Y0, Y1, Y3, Y4: 0.5A For Y2, Y5 to YB: 0.3A
Max. surge current	For Y0, Y1, Y3, Y4: 0.9A For Y2, Y5 to YF: 0.5A	For Y0, Y1, Y3, Y4: 1.5A For Y2, Y5 to YB: 0.7A
Output points per common	16 points/common	12 points/common
Response time	OFF -> ON For Y0, Y1, Y3, Y4 at 15mA or less: <2μs For Y2, Y5 and higher: < 0.2ms	
	ON -> OFF For Y0, Y1, Y3, Y4 at 15mA or less: <8μs For Y2, Y5 and higher: < 0.5ms	
Power supply for driving internal circuit	none	
Operating indicator	LED	
Phase fault protection	Thermal protection for Y2, Y5 and higher	

OUTPUT SPECIFICATIONS - RELAY OUTPUT TYPE

Output type	Normally open (1 Form A)
Rated control capacity	2A 250VAC, 2A 30VDC (max. 4.5A/common)(resistive load)
Output points per common	8 points/ common
Response time	OFF -> ON 10ms or less ON -> OFF 8ms or less
Mechanical life time	20 million operations or more
Electrical life time	100.000 operations or more
Surge absorber	21.6 to 26.4VDC (70mA)
Operating indicator	LED

GENERAL SPECIFICATIONS

Rated operating voltage	24VDC
Operating voltage range	21.6 to 26.4VDC
Allowable no voltage time	4ms (at 21.6V), 10ms (at 26.4V)
Ambient temperature	0°C to +55°C
Storage temperature	-20°C to +70°C
Ambient humidity	30 to 85% RH (Non-condensing)
Storage humidity	30 to 85% RH (Non-condensing)
Vibration resistance	10 to 55Hz, 1 cycle/min., double amplitude of 0.75mm, 10min. on 3 axes

Shock resistance	98m/s ² or more, 4 times on 3 axes
Noise humidity	1,000V (p-p) with pulse widths 50ns and 1μs
Operating condition	free from corrosive gasses and excessive dust

FPΣ (Sigma) Product Overview

Part numbers

FPΣ (SIGMA) CONTROL UNITS

Product Name	Part Number
FPΣ C28 CPU, 16 inputs, 12 outputs (transistor PNP)	FPG-C28P2H
FPΣ C32 CPU, 16 inputs, 16 outputs (transistor NPN)	FPG-C32T2H
FPΣ C24 CPU, 16 inputs, 8 outputs (relay)	FPG-C24R2H
FPΣ C28 CPU, 16 inputs (+ 2 thermistor inputs) , 12 outputs (transistor PNP)	FPG-C28P2HTM
FPΣ C32 CPU, 16 inputs (+ 2 thermistor inputs) , 16 outputs (transistor NPN)	FPG-C32T2HTM
FPΣ C24 CPU, 16 inputs (+ 2 thermistor inputs), 8 outputs (relay)	FPG-C24R2HTM

FPΣ (SIGMA) EXPANSION UNITS (LEFT SIDE EXPANSION)

Product Name	Part Number
FPΣ 64-points I/O Expansion Unit, 32 inputs, 32 outputs (transistor PNP)	FPG-XY64D2P
FPΣ 64-points I/O Expansion Unit, 32 inputs, 32 outputs (transistor NPN)	FPG-XY64D2T
FPΣ Memory Expansion Unit, 256k words	FPG-EM1
FPΣ Positioning Expansion Unit, 1 axis type, transistor output	FPG-PP11
FPΣ Positioning Expansion Unit, 1 axis type, line driver output	FPG-PP12
FPΣ Positioning Expansion Unit, 2 axes type, transistor output	FPG-PP21
FPΣ Positioning Expansion Unit, 2 axes type, line driver output	FPG-PP22
FPΣ S-Link Master Expansion Unit	FPG-SL
FPΣ CC-Link Slave Expansion Unit	FPG-CCLS

FPΣ (SIGMA) ACCESSORIES

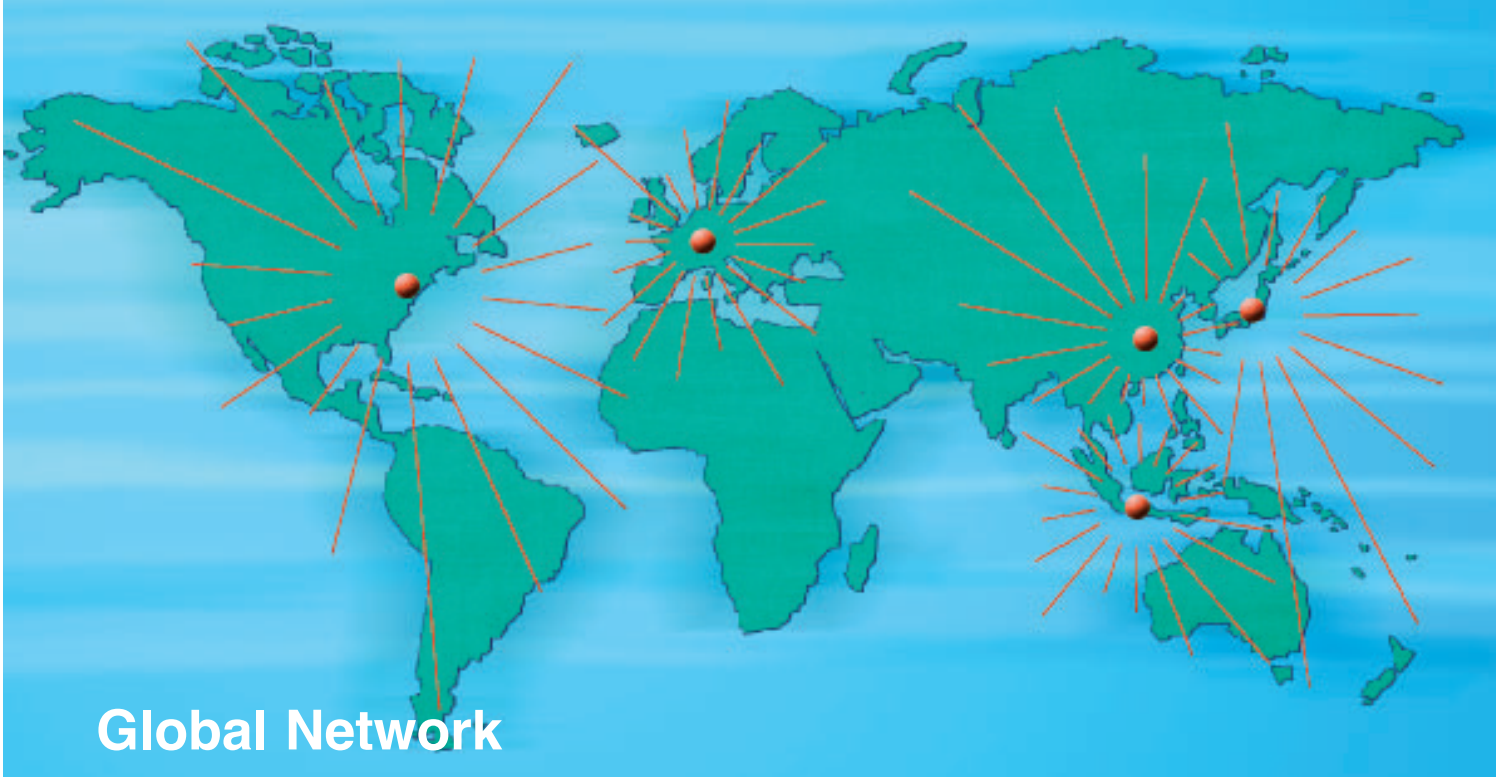
Product Name	Part Number
FPΣ 1 channel, RS232C type communication cassette	FPG-COM1
FPΣ 2 channels, RS232C type communication cassette	FPG-COM2
FPΣ 1 channel, RS485 type communication cassette	FPG-COM3
FPΣ 2 channels, RS232C & RS485 type communication cassette	FPG-COM4
FPΣ power supply cable, 1m	AFP805
FPΣ battery, for memory backup & clock functions	AFP804
FP Memory Loader, for transfer of programs without a PC or memory unit	AFP8670

FP0 EXPANSION UNITS (RIGHT SIDE EXPANSION)

Product Name	Part Number
FP0-E8RS, 4 inputs, 4 outputs (relay)	FP0-E8RSA
FP0-E8X, 8 inputs	FP0-E8XA
FP0-E8YP, 8 outputs (transistor PNP)	FP0-E8YPA
FP0-E8YT, 8 outputs (transistor NPN)	FP0-E8YTA
FP0-E16RS, 8 inputs, 8 outputs (relay)	FP0-E16RSA
FP0-E16P, 8 inputs, 8 outputs (transistor, PNP)	FP0-E16PA
FP0-E16T, 8 inputs, 8 outputs (transistor, NPN)	FP0-E16TA
FP0-E16X, 16 inputs	FP0-E16XA
FP0-E16YP, 16 outputs (transistor PNP)	FP0-E16YPA
FP0-E16YT, 16 outputs (transistor NPN)	FP0-E16YTA
FP0-E32P, 16 inputs, 16 outputs (transistor, PNP)	FP0-E32PA
FP0-E32T, 16 inputs, 16 outputs (transistor, NPN)	FP0-E32TA
FP0-E32RS, 16 inputs, 16 outputs (relay)	FP0-E32RS
FP0-A21A, 2 analogue inputs, 1 analogue output	FP0-A21A
FP0A04V, 4 analogue outputs, -10 to 10V	FP0-A04V
FP0-A04I, 4 analogue outputs, 4 to 20mA	FP0-A04I
FP0-A80A, 8 analogue inputs	FP0-A80A
FP0 thermocouple unit, 4 inputs	FP0-TC4
FP0 thermocouple unit, 8 inputs	FP0-TC8
FP0 RTD input unit, 6 inputs	FP0-RTD6
FP0 PROFIBUS DP slave or remote I/O unit	FP0-DPS2
FP0 I/O link unit (MEWNET-F slave)	FP0-IOL

AC POWER SUPPLY

Product Name	Part Number
FP0 AC power supply, 24VDC, 0.7A	FP0-PSA2



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