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 RS232 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.

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.

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
- Fastest processing time, 0.32μsec/basic command
- Compact design (W 30 x H 90 x D 60mm)
- Short circuit protected transistor outputs
- Built-in analogue volume with two points
- Backup battery
FPΣ (Sigma) CPUs

Outstanding performance in a compact design

FPΣ (Sigma) – Transistor output type

FPΣ (Sigma) – Relay output type

FPΣ (Sigma) – Transistor output type with thermistor input

FPΣ (Sigma) – Relay output type with thermistor input

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

CPU max. 32 I/Os

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

Parallel Expansion BUS

Serial Expansion BUS

...up to 384 I/O!
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) Memory Expansion Unit**

- **FPG-EM1**
  - Memory: 256k words
  - MIL Connector type: FPG-XY64D2T

**FPΣ (Sigma) S-Link Expansion Unit**

- **S-Link Master**
  - 128 Inputs or outputs
  - MIL Connector type: 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

Input only type

Transistor output type

Option:
Output 8 points
FP0-E8YRSA

Analogue I/O Units

Temperature Control Units

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

AC Power Supply

FP0-PSA2

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.

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
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.

**FPΣ (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 FPΣ (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.

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.

- Control is possible using commercially available RS485 devices.
- A 2-channel type communication cassette is used.
FPΣ (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.
FPΣ (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.

Selective 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.

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.

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.

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.

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.

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.

<table>
<thead>
<tr>
<th>Unit type and product number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>1 - axis type</td>
</tr>
<tr>
<td>2 - axis type</td>
</tr>
<tr>
<td>1 - axis type</td>
</tr>
<tr>
<td>2 - axis type</td>
</tr>
</tbody>
</table>
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).

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.
**FPΣ (Sigma)**

Supports the enhancement of your equipment’s performance

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### 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.

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### 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.

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### 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.

General Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature/humidity</td>
<td>0 to 55°C, 30 to 85% RH (No condensation)</td>
</tr>
<tr>
<td>Storage temperature/humidity</td>
<td>–20 to +70°C, 30 to 85% RH (No condensation)</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 55Hz, 1 sweep/min., double amplitude of 0.75mm, 10min. on 3 axes</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>98m/s² or more, 4 times on 3 axes</td>
</tr>
<tr>
<td>Noise immunity</td>
<td>1,000V (P-P) with pulse width 50ns, 1μs (using a noise simulator)</td>
</tr>
<tr>
<td>Basic unit mass</td>
<td>Approx. 80g</td>
</tr>
<tr>
<td>The amount of increase in control unit consumption current</td>
<td>35mA or less (24VDC) (100mA or less (internal 5VDC)</td>
</tr>
</tbody>
</table>

Performance Specifications

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

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.
**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.

**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**

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

*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

<table>
<thead>
<tr>
<th>Protocols</th>
<th>TCP/IP, UDP/IP, SMTP, PPP, NTP, FTP, TELNET, HTTP, MEWTOCOL-COM</th>
</tr>
</thead>
</table>

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 FP0-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

02/2006
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.

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)

Free demonstration disc
# Performance Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of control unit</strong></td>
<td>NPN transistor output type</td>
</tr>
<tr>
<td><strong>Part number</strong></td>
<td>FPG-C32T2H/FPG-C32T2HTM</td>
</tr>
<tr>
<td><strong>Number of I/O points</strong></td>
<td>32 (Input: 16 / Output: 16)</td>
</tr>
<tr>
<td><strong>Program memory</strong></td>
<td>Built-in Flash ROM</td>
</tr>
<tr>
<td><strong>Program capacity</strong></td>
<td>32,000 steps</td>
</tr>
<tr>
<td><strong>Operation speed</strong></td>
<td>0.32 µs-/step, Basic instructions</td>
</tr>
<tr>
<td><strong>Memory for execution</strong></td>
<td></td>
</tr>
<tr>
<td><strong>External input (X)</strong></td>
<td>1184 points</td>
</tr>
<tr>
<td><strong>External output (Y)</strong></td>
<td>1184 points</td>
</tr>
<tr>
<td><strong>Internal relay (R)</strong></td>
<td>4096 points (R0 to R255F)</td>
</tr>
<tr>
<td><strong>Link relay (L)</strong></td>
<td>2048 points</td>
</tr>
<tr>
<td><strong>Data register (DT)</strong></td>
<td>32765 words (DT0-DT32764)</td>
</tr>
<tr>
<td><strong>Link data register (LD)</strong></td>
<td>256 words</td>
</tr>
<tr>
<td><strong>Index register (I)</strong></td>
<td>14 words (0-0D)</td>
</tr>
<tr>
<td><strong>Differential points</strong></td>
<td>Unlimited number of points</td>
</tr>
<tr>
<td><strong>Master control relay points</strong></td>
<td>256 points</td>
</tr>
<tr>
<td><strong>Labels (JP+LOOP)</strong></td>
<td>256 labels</td>
</tr>
<tr>
<td><strong>Number of step ladder</strong></td>
<td>1000 stages</td>
</tr>
<tr>
<td><strong>High-speed counter</strong></td>
<td>Single-phase: 1ch: 50kHz/2ch: 30kHz/3 or 4ch: 20 kHz / Two-phase: 1ch: 20kHz/2ch: 15kHz</td>
</tr>
<tr>
<td><strong>Pulse output</strong></td>
<td>1 channel: 100kHz / 2 channel: 60kHz</td>
</tr>
<tr>
<td><strong>PWM output</strong></td>
<td>2 channels, 1.5 to 12.5 kHz (at resolution of 1000) / 15.6 to 41.7 kHz (at resolution of 100)</td>
</tr>
<tr>
<td><strong>Pulse catch input</strong></td>
<td>9 points (X0-X7)</td>
</tr>
<tr>
<td><strong>Interrupt program</strong></td>
<td>8 points (X0-X7)</td>
</tr>
<tr>
<td><strong>Self-diagnosis functions</strong></td>
<td>Watchdog timer, program syntax checking, etc.</td>
</tr>
<tr>
<td><strong>Clock/Calendar function</strong></td>
<td>Year, month, day, hour, minute, second, and day of week</td>
</tr>
<tr>
<td><strong>Volume input</strong></td>
<td>2 points resolving power 10bits (K0-K1000)</td>
</tr>
<tr>
<td><strong>Thermistor input</strong></td>
<td>2 points, resolution: 10 bits (0 to 1000) (for C32T2HTM, C24R2HTM, and C28P2HTM only)</td>
</tr>
<tr>
<td><strong>Link functions</strong></td>
<td>Computer link (1:1, 1:N)</td>
</tr>
<tr>
<td><strong>Battery life (Battery is optional)</strong></td>
<td>220 days or more* (actual usage value: approx. 840 days)</td>
</tr>
<tr>
<td><strong>Comment storage</strong></td>
<td>All kinds of comments, including I/O comments, remarks and block comments, can be stored (without backup battery)</td>
</tr>
<tr>
<td><strong>Uninterruptible operation for positioning</strong></td>
<td>Available</td>
</tr>
<tr>
<td><strong>Other functions</strong></td>
<td>Program edition during run, constant scan, forced I/O, password, floating point real number operation, PID processing instruction</td>
</tr>
<tr>
<td></td>
<td>Comment memory 128Kbyte</td>
</tr>
</tbody>
</table>

**Notes:**
1) If a battery is not used, only fixed area is backed up (Counter: C1008-C1023, internal relay: R990-R997F. Data register: DT32710-DT32784). 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.
### INPUT SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation method</td>
<td>Optical coupler</td>
</tr>
<tr>
<td>Rated input voltage</td>
<td>24VDC</td>
</tr>
<tr>
<td>Input voltage range</td>
<td>21.6 to 26.4VDC</td>
</tr>
<tr>
<td>Rated input current</td>
<td>3.5mA - 8mA depends on input no.</td>
</tr>
<tr>
<td>Input points per common</td>
<td>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</td>
</tr>
<tr>
<td>Min. ON voltage / Max. OFF current</td>
<td>19.2V / 3mA - 6mA depends on input no.</td>
</tr>
<tr>
<td>Max. ON voltage / Min. OFF current</td>
<td>2.4V / 1.3mA</td>
</tr>
<tr>
<td>Input impedance</td>
<td>3k - 6.8k depends on input no.</td>
</tr>
<tr>
<td>Response time</td>
<td>CPU: 1ms or less, 5µs (HSC, pulse catch, interrupt input) 0.2ms (OFF -&gt; ON) 0.3ms (ON -&gt; OFF)</td>
</tr>
<tr>
<td>Operating indicator</td>
<td>LED</td>
</tr>
</tbody>
</table>

### OUTPUT SPECIFICATIONS - TRANSISTOR OUTPUT TYPE

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage range</td>
<td>5 to 24VDC 24VDC</td>
</tr>
<tr>
<td>Rated input current</td>
<td>3.5mA - 8mA depends on input no.</td>
</tr>
<tr>
<td>Insulation method</td>
<td>Optical coupler</td>
</tr>
<tr>
<td>Output method</td>
<td>Open collector</td>
</tr>
<tr>
<td>Operating load voltage range</td>
<td>4.75 to 26.4VDC 21.6 to 26.4VDC</td>
</tr>
<tr>
<td>Max. load current</td>
<td>For Y0, Y1, Y3, Y4: 0.3A For Y2, Y5 to YF: 0.1A</td>
</tr>
<tr>
<td>Max. surge current</td>
<td>For Y0, Y1, Y3, Y4: 0.9A For Y2, Y5 to YF: 0.5A</td>
</tr>
<tr>
<td>Output points per common</td>
<td>16 points/common 12 points/common</td>
</tr>
<tr>
<td>Response time</td>
<td>OFF -&gt; ON For Y0, Y1, Y3, Y4 at 15mA or less: &lt;2µs For Y2, Y5 and higher: &lt; 0.2ms ON -&gt; OFF For Y0, Y1, Y3, Y4 at 15mA or less: &lt;8µs For Y2, Y5 and higher: &lt; 0.5ms</td>
</tr>
<tr>
<td>Power supply for driving internal circuit</td>
<td>none</td>
</tr>
<tr>
<td>Operating indicator</td>
<td>LED</td>
</tr>
<tr>
<td>Phase fault protection</td>
<td>Thermal protection for Y2, Y5 and higher</td>
</tr>
</tbody>
</table>

### OUTPUT SPECIFICATIONS - RELAY OUTPUT TYPE

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output type</td>
<td>Normally open (1 Form A)</td>
</tr>
<tr>
<td>Rated control capacity</td>
<td>2A 250VAC, 2A 30VDC (max. 4.5A/common)(resistive load)</td>
</tr>
<tr>
<td>Output points per common</td>
<td>8 points/ common</td>
</tr>
<tr>
<td>Response time</td>
<td>OFF -&gt; ON 10ms or less 8ms or less ON -&gt; OFF</td>
</tr>
<tr>
<td>Mechanical life time</td>
<td>20 million operations or more</td>
</tr>
<tr>
<td>Electrical life time</td>
<td>100,000 operations or more</td>
</tr>
<tr>
<td>Operating indicator</td>
<td>LED</td>
</tr>
</tbody>
</table>

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated operating voltage</td>
<td>24VDC</td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>21.6 to 26.4VDC</td>
</tr>
<tr>
<td>Allowable no voltage time</td>
<td>4ms (at 21.6V) 10ms (at 26.4V)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>0°C to +55°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20°C to +70°C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>30 to 85% RH</td>
</tr>
<tr>
<td>Storage humidity</td>
<td>30 to 85% RH</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 to 55HZ, 1 cycle/min., double amplitude of 0.75mm, 10min. on 3 axes</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>98m/s² or more, 4 times on 3 axes</td>
</tr>
<tr>
<td>Noise humidity</td>
<td>1,000V (p-p) with pulse widths 50ns and 1µs</td>
</tr>
<tr>
<td>Operating condition</td>
<td>free from corrosive gasses and excessive dust</td>
</tr>
</tbody>
</table>
# FPΣ (Sigma) Product Overview

## Part numbers

### FPΣ (SIGMA) CONTROL UNITS

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPΣ C28 CPU, 16 inputs, 12 outputs (transistor PNP)</td>
<td>FPG-C28P2H</td>
</tr>
<tr>
<td>FPΣ C32 CPU, 16 inputs, 16 outputs (transistor NPN)</td>
<td>FPG-C32T2H</td>
</tr>
<tr>
<td>FPΣ C24 CPU, 16 inputs, 8 outputs (relay)</td>
<td>FPG-C24R2H</td>
</tr>
<tr>
<td>FPΣ C28 CPU, 16 inputs (+ 2 thermistor inputs), 12 outputs (transistor PNP)</td>
<td>FPG-C28P2HTM</td>
</tr>
<tr>
<td>FPΣ C32 CPU, 16 inputs (+ 2 thermistor inputs), 16 outputs (transistor NPN)</td>
<td>FPG-C32T2HTM</td>
</tr>
<tr>
<td>FPΣ C24 CPU, 16 inputs (+ 2 thermistor inputs), 8 outputs (relay)</td>
<td>FPG-C24R2HTM</td>
</tr>
</tbody>
</table>

### FPΣ (SIGMA) EXPANSION UNITS (LEFT SIDE EXPANSION)

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

### FPΣ (SIGMA) ACCESSORIES

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPΣ 1 channel, RS232C type communication cassette</td>
<td>FPG-COM1</td>
</tr>
<tr>
<td>FPΣ 2 channels, RS232C type communication cassette</td>
<td>FPG-COM2</td>
</tr>
<tr>
<td>FPΣ 1 channel, RS485 type communication cassette</td>
<td>FPG-COM3</td>
</tr>
<tr>
<td>FPΣ 2 channels, RS232C &amp; RS485 type communication cassette</td>
<td>FPG-COM4</td>
</tr>
<tr>
<td>FPΣ battery, for memory backup &amp; clock functions</td>
<td>AFFGB04</td>
</tr>
<tr>
<td>FP Memory Loader, for transfer of programs without a PC or memory unit</td>
<td>AFP8670</td>
</tr>
</tbody>
</table>

### FP0 EXPANSION UNITS (RIGHT SIDE EXPANSION)

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

### AC POWER SUPPLY

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP0 AC power supply, 24VDC, 0.7A</td>
<td>FP0-PSA2</td>
</tr>
</tbody>
</table>
## Global Network

### North America

- **USA**
  - PEW Corporation of America
    - Head Office USA
    - 629 Central Avenue, New Providence, N.J. 07974,
    - Tel. 1-908-464-3550, Fax 1-908-464-8513,
    - www.pewa.panasonic.com

### Europe

- **Headquarters**
  - Panasonic Electric Works Europe AG
    - Rudolf-Diesel-Ring 2, 83667 Holzkirchen,
      - Tel. (08024) 648-0, Fax (08024) 648-111,
      - www.panasonic-electric-works.com

- **Austria**
  - Panasonic Electric Works Austria GmbH
    - Josef Madersperger Str. 2, 2362 Biedermannsdorf,
      - Tel. (02236) 2 68 46, Fax (02236) 461 33,
      - www.panasonic-electric-works.at

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  - Panasonic Electric Works (Hong Kong) Co., Ltd.

- **Japan**
  - Matsushita Electric Works, Ltd.

- **Singapore**
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1. **Please contact our Global Sales Companies in:**
2. **Europe**
   - Headquarters: Panasonic Electric Works Europe AG
   - Austria: Panasonic Electric Works Austria GmbH
     - Josef Madersperger Str. 2, 2362 Biedermannsdorf, Tel. (02236) 2 68 46, Fax (02236) 461 33, www.panasonic-electric-works.at
   - Benelux: Panasonic Electric Works
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1. **North & South America**
   - USA: PEW Corporation of America
     - Head Office USA
     - 629 Central Avenue, New Providence, N.J. 07974,
     - Tel. 1-908-464-3550, Fax 1-908-464-8513,
     - www.pewa.panasonic.com

1. **Asia Pacific / China / Japan**
   - China: Panasonic Electric Works (China) Co., Ltd.
     - 2013, Beijing Fortune, Building No. 5, Dong San Huan Bei Lu, Chaoyang District, Beijing,
       - Tel. (010) 6590-8646, Fax (010) 6590-8647
       - www.panasonic-electric-works.com
   - Hong Kong: Panasonic Electric Works (Hong Kong) Co., Ltd.
     - Rm1601, 16/F, Tower 2, The Gateway, 25 Canton Road, Tsimshatsui, Kowloon, Hong Kong,
       - Tel. (0852) 2956-3118, Fax (0852) 2956-3087
     - www.panasonic-electric-works.com
   - Japan: Matsushita Electric Works, Ltd.
     - 1048 Kadoma, Kadoma-shi, Osaka 571-8686, Japan,
       - Tel. (06) 6908-1050, Fax (06) 6908-5781, www.mew.co.jp/e-acg/
   - Singapore: Panasonic Electric Works Asia Pacific Pte. Ltd.
     - 101 Thompson Road, #25-03/05, United Square, Singapore 307591,
       - Tel. (06255) 5473, Fax (06253) 5689