

FPΣ Lineup

V3, the 32-k-step type PLC, widens the applications!

(No price changes, completely upward compatible)

Control Units



C32 Control unit (NPN Tr.)



C32 Control unit (NPN Tr.)
Left-side expansion type
with linear and circular
interpolation functions



C24 Control unit (Relay output)
Left-side expansion type
with linear and circular
interpolation functions



C28 Control unit (PNP Tr.)
Left-side expansion type
with linear and circular
interpolation functions

V3

FPG-C32TH

FPG-C32T2H

FPG-C24R2H

FPG-C28P2H

Existing
model

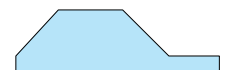
FPG-C32T

FPG-C32T2

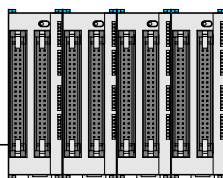
FPG-C24R2

FPG-C28P2

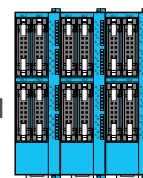
Positioning



FPΣ
Expansion Units
(Up to 4 units can
be added.)



FPΣ
Control Unit



FP0
Expansion Units
(Up to 3 units can
be added.)

FPΣ Expansion Units



Expansion I/O unit
64 points
FPG-XY64D2T



Positioning units
1-axis
transistor output
FPG-PP11



Positioning units
1-axis
line driver output
FPG-PP12



Positioning units
2-axis
transistor output
FPG-PP21



Positioning units
2-axis
line driver output
FPG-PP22



Data memory
expansion unit
FPG-EM1



CC-Link slave unit
FPG-CCLS



S-LINK unit
FPG-SL

Matsushita Electric Industrial Co.,
Ltd. MINAS Series



Motor driver I/F terminal II



AFP8503
1-axis



AFP8504
2-axis

Communication Cassettes



1-channel
RS232C type
FPG-COM1



2-channel
RS232C type
FPG-COM2

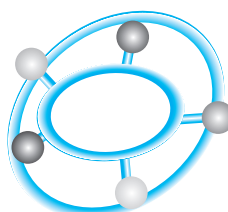


1-channel
RS485 (isolated) type
FPG-COM3



1-channel
RS232C/
1-channel
RS485 (isolated) type
FPG-COM4

Communication



FP Memory Loader



Data clear type/Data hold type
AFP8670/AFP8671



C32 Control unit (NPN Tr.)
with thermistor input

FPG-C32THTM

FPG-C32TTM



C32 Control unit (NPN Tr.)
Left-side expansion type
with linear and circular
interpolation functions
and thermistor input

FPG-C32T2HTM

FPG-C32T2TM



C24 Control unit (Relay output)
Left-side expansion type
with thermistor input

FPG-C24R2HTM

FPG-C24R2TM



C28 Control unit (PNP Tr.)
Left-side expansion type
with linear and circular
interpolation functions
and thermistor input

FPG-C28P2HTM

FPG-C28P2TM

Power Supply Unit



Input:
100 to 240 V AC/
Output:
24 V DC, 0.7 A
FP0-PSA4

FP0 Expansion Units

Input/Output Units

8 points: Input 4/Relay output 4



Terminal block
FP0-E8RS



Connector
FP0-E8RM

16 points: Input 8/Relay output 8



Terminal block
FP0-E16RS



Connector
FP0-E16RM

16 points: Input 8/
Transistor output 8



MIL connector
FP0-E16T (NPN)
FP0-E16P (PNP)

32 points: Input 16/
Transistor output 16



MIL connector
FP0-E32T (NPN)
FP0-E32P (PNP)

8 points: Input 8



MIL connector
FP0-E8X

16 points: Input 16



MIL connector
FP0-E16X

8 points: Relay output 8



Terminal block
FP0-E8YRS

8 points: Transistor output 8



MIL connector
FP0-E8YT (NPN)
FP0-E8YP (PNP)

16 points: Transistor output 16



MIL connector
FP0-E16YT (NPN)
FP0-E16YP (PNP)

Intelligent Units



FP Web-Server
unit
FP-WEB



Thermocouple units
4-channel 8-channel
FP0-TC4 FP0-TC8



Analog I/O unit
(Input: 2
channels/
Output: 1
channel)
FP0-A21



A/D converter
unit
(Input: 8
channels)
FP0-A80



I/O link unit
FP0-IOL



FP0 CC-Link
slave unit
FP0-CCLS



D/A converter unit
(Output: 4 channels)
FP0-A04V FP0-A04I



C-NET Adapter
S2 type
AFP15402



New functions

1. Programming capacity of 32 k steps
2. Operation speed of 0.32 μsec/step for basic instructions
3. New PID instruction (F356 EZPID)
4. Program upload inhibition function
5. Eight-character password protection
6. Modbus master/slave RTU
7. MEWTOCOL Master
8. Tool port: Supports general-purpose serial communications.
9. 512 steps can be rewritten simultaneously in RUN mode.
10. Internal relays: 4,096 points Link relays: 2,048 points

■ Features

1. Programming capacity of 32 k steps, which is approx. 2.7 times bigger than our conventional model

Accommodates an increase in the number and complexity of programs accompanying equipment functionality enhancements.

2. High speed operation

(Operation speed of 0.32 μsec/step for basic instructions)

The embedded RISC processor executes basic instructions 1.2 times faster than our conventional model. The speed for high-level instruction operations, including floating point operations, is also high, reducing the total scan time.

3. Easy temperature control (New PID instruction F356 EZPID)

F356 significantly facilitates PID control programming, which was previously complicated, and thus makes temperature control easier.

■ Performance Specifications

Item		Descriptions			
V3		FPG-C32TH/FPG-C32THTM	FPG-C32T2H/FPG-C32T2HTM	FPG-C24R2H/FPG-C24R2HTM	FPG-C28P2H/FPG-C28P2HTM
Existing model		FPG-C32T/FPG-C32TTM	FPG-C32T2/FPG-C32T2TM	FPG-C24R2/FPG-C24R2TM	FPG-C28P2/FPG-C28P2TM
Number of controllable I/O points	Control unit	32 points (DC input: 16, NPN output: 16)	32 points (DC input: 16, NPN output: 16)	24 points (DC input: 16, relay output: 8)	28 points (DC input: 16, relay output: 12)
	With FP0 expansion units	Max. 128 points (up to 3 units) * When using transistor output type expansion units	Max. 128 points (up to 3 units) * When using transistor output type expansion units	Max. 120 points (up to 3 units) * When using transistor output type expansion units	Max. 124 points (up to 3 units) * When using transistor output type expansion units
	With FPΣ expansion units	Not possible	Max. 288 points (up to 4 units) * When using transistor output type expansion units	Max. 280 points (up to 4 units) * When using transistor output type expansion units	Max. 284 points (up to 4 units) * When using NPN output type expansion units
	With FP0 and FPΣ expansion units	Max. 128 points * When using transistor output type expansion units	Max. 384 points * When using transistor output type expansion units	Max. 376 points * When using transistor output type expansion units	Max. 380 points * When using NPN output type expansion units
Programming method/Control method		Relay symbol/Cyclic operation			
Program memory		Built-in flash ROM (without backup battery)			
Program capacity		32 k steps (V3), 12 k steps (Existing model)			
Number of instructions	Basic	93			
	High-level	216	218	216	218
Operation speed		Basic instruction: 0.32 μs/step (V3), 0.4 μs/step (Existing model)			
Operation memory points	Relay area	Internal relay (R) 4,096 points (V3): R0 to R255F, 1,568 points (Existing model): R0 to R97F (see note 1)			
	Timer/Counter (T/C)	1,024 points (see note 1 and 2) (for initial setting, timer: 1,008 points (T0 to T1007), counter: 16 points (C1008 to C1023) Timer: Counts each unit up to 32767 times (units: 1 ms, 10 ms, 100 ms, or 1 s). Counter: Counts 1 to 32767.			
	Link relays (L)	2,048 points (V3), 1,024 points (Existing model) (see note 1)			
	Data register (DT)	32,765 words (DT0 to DT32764) (see note 1)			
	Link data register (LD)	256 words (V3), 128 words (Existing model) (see note 1)			
Memory area	Index register (I)	14 words (I0 to ID)			
	Differential points	Unlimited			
	Master control relay points (MCR)	256			
	Number of labels (JP and LOOP)	256			
	Number of step ladders	1,000 stages			
Number of subroutines		100 subroutines			
Pulse catch input		8 points (X0 to X7)			
Number of interrupt programs		9 programs (8 external input points (X0 to X7), 1 periodical interrupt point '0.5 ms to 30 s')			
Self-diagnosis function		E. g. watchdog timer, program syntax check			
Real time clock function		Available (year, month, day, hour, minute, second and day of week); however, this function can only be used when a battery has been installed (see note 3).			
Potentiometer (Volume) input		2 points, resolution: 10 bits (K0 to K1000)			
Battery life		220 days or more* (actual usage value: approx. 840 days (25°C). Suggested replacement interval: 1 year. * Value applies when no power is supplied at all.			
Comment storage		All kinds of comments, including I/O comments, remarks, and block comments, can be stored (without backup battery).			
Link function		Computer link (1:1, 1:N) (see note 4) General-purpose communication (1:1, 1:N) (see note 4) (see note 5) PLC link (see note 6)			
Other functions		Program edition during RUN, constant scan, forced on/off, password, floating-point operation, and PID processing			
Linear/Circular interpolation for positioning		Not available	Available	Not available	Available

Notes: 1) If no battery is used, only the fixed area is backed up (counters 16 points: C1008 to C1023, R2480 to R255F (V3)/R900 to R970F (existing model), data registers 55 words: DT32710 to DT32764).
2) When the optional battery is used, data can be backed up. Areas to be held and not held can be specified using the system registers.

3) Precision of calendar timer: - At 0°C 32°F, less than 119 seconds error per month.

- At 25°C 77°F, less than 51 seconds error per month.

- At 55°C 131°F, less than 148 seconds error per month.

4) An optional communication cassette (RS232C type) is required in order to use 1:1 communication. (Re-send processing is recommended.)

5) An optional communication cassette (RS485 type) is required in order to use 1:N communication. (Re-send processing is recommended.)

6) An optional communication cassette (RS485 type) is required.

7) The number of points actually available for use is determined by the hardware configuration.

General Specifications

Item		Description	
Rated operating voltage		24 V DC	
Operating voltage range		21.6 to 26.4 V DC	
Allowed momentary power off time	C32	4 ms at 21.6 V, 7 ms at 24 V, 10 ms at 26.4 V	
	C28		
	C24	3 ms at 21.6 V, 5 ms at 24 V, 8 ms at 26.4 V	
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	C32	Between input/output terminals and power supply terminal/function earth	500 VAC for 1 minute
	C28	Between input terminal and output terminal	
	C24	Between input terminals (X0 to X7)/input terminals (X8 to XF) and power supply terminal/function earth	500 VAC for 1 minute
		Between output terminals and power supply terminal/function earth	1,500 VAC for 1 minute
		Between input terminals (X0 to X7) and input terminals (X8 to XF)	500 VAC for 1 minute
		Between input terminals (X0 to X7)/input terminals (X8 to XF) and output terminals	1,500 VAC for 1 minute
Insulation resistance	C32	Between input/output terminals and power supply terminal/function earth	Min. 100 MΩ (measured with a 500 V DC megger)
	C28	Between input terminal and output terminal	
	C24	Between input terminals (X0 to X7)/input terminals (X8 to XF) and power supply terminal/function earth	
		Between output terminals and power supply terminal/function earth	
		Between input terminals (X0 to X7) and input terminals (X8 to XF)	
		Between input terminals (X0 to X7)/input terminals (X8 to XF) and output terminals	
Vibration resistance		10 to 55 Hz, 1 cycle/min: double amplitude of 0.75 mm/0.030 in., 10 min on 3 axes	
Shock resistance		Shock of 98 m/s ² or more, 4 times on 3 axes	
Noise immunity		1,000 Vp-p with pulse widths 50 ns and 1 μs (based on in-house measurements)	
Operating condition		Free from corrosive gases and excessive dust	

Input Specifications

Item		Description
Insulation method		Optical coupler
Rated input voltage		24 V DC
Operating voltage range		21.6 to 26.4 V DC
Rated input current		For X0, X1, X3, X4: approx. 8 mA For X2, X5 to X7: approx. 4.3 mA For X8 to XF: approx. 3.5 mA
Input points per common		C32, C28: 16 points/common C24: 8 points/common (Either the positive or negative of the input power supply can be connected to the common terminal.)
Min. ON voltage/ Min. ON current		For X0, X1, X3, X4: 19.2 V DC/6 mA For X2, X5 to XF: 19.2 V DC/3 mA
Max. OFF voltage/ Max. OFF current		2.4 V DC/1.3 mA
Input impedance		For X0, X1, X3, X4: 3 kΩ For X2, X5 to X7: 5.6 kΩ For X8 to XF: 6.8 kΩ
Response time	OFF→ON	For input X0, X1, X3, X4: 1 ms or less: normal input 5 μs or less: high-speed counter, pulse catch, interrupt input settings For input X2, X5 to X7: 1 ms or less: normal input 100 μs or less: high-speed counter, pulse catch, interrupt input settings For input X8 to XF: 1 ms or less: normal input only
	ON→OFF	Same as above
Operating mode indicator		LED display

Note: X0 through X7 are inputs for the high-speed counter and have a fast response time.
If used as normal inputs, we recommend inserting a timer in the ladder program as chattering and noise may be interpreted as an input signal.
The above specifications apply when the rated input voltage is 24 VDC and the temperature is 25°C **70°F**.

Output Specifications

1. Relay Output Specifications (C24)

Item		Description
Output type		1a (1 Form A, Normally open)
Rated control capacity		2 A 250 V AC, 2 A 30 V DC (4.5 A or less per common)
Output points per common		8 points/common
Response time	OFF→ON	Approx. 10 ms
	ON→OFF	Approx. 8 ms
Lifetime	Mechanical	Min. 20,000,000 operations
	Electrical	Min. 100,000 operations
Surge absorber		—
Operating mode indicator		LED display

2. Transistor Output Specifications (C32 and C28)

Item		Description	
		C32 (NPN)	C28 (PNP)
Insulation method		Optical coupler	
Output type		Open collector (NPN)	Open collector (PNP)
Rated load voltage		5 to 24 V DC	24 V DC
Operating load voltage range		4.75 to 26.4 V DC	21.6 to 26.4 V DC
Max. load current		For Y0, Y1, Y3, Y4: 0.3 A For Y2, Y5 to YF: 0.1 A	For Y0, Y1, Y3, Y4: 0.5 A For Y2, Y5 to YF: 0.3 A
Max. surge current		For Y0, Y1, Y3, Y4: 0.9 A For Y2, Y5 to YF: 0.5 A	For Y0, Y1, Y3, Y4: 1.5 A For Y2, Y5 to YF: 0.7 A
Output points per common		16 points/common	12 points/common
OFF state leakage current		100 μA or less	
ON state voltage drop		0.5 V or less	
Response time	OFF→ON	For Y0, Y1, Y3, Y4 (When the load current is 15 mA or more.): 2 μs or less For Y2, Y5 to YF: 0.2 ms or less	
	ON→OFF	For Y0, Y1, Y3, Y4 (When the load current is 15 mA or more.): 8 μs or less For Y2, Y5 to YF: 0.5 ms or less	
External power supply for driving internal circuit	Voltage	21.6 to 26.4 V DC	
	Current	70 mA or less	
Response time		Zener diode	
Operating mode indicator		LED display	
Phase fault protection		Thermal protection for Y2, Y5 to YF	

■ High-speed counter, Pulse output and PWM output Specifications

Item		Description	
High-speed counter	Input point number	Single-phase: max. 4 channels	Two-phase: max. 2 channels
	Maximum counting speed	Single-phase: for 1 channel: max. 50 kHz (x 1) for 2 channels: max. 30 kHz (x 2) for 3 or 4 channels: max. 20 kHz (x 3 or 4)	Two-phase: for 1 channel: max. 20 kHz (x 1) for 2 channels: max. 15 kHz (x 2)
	Input mode	Single-phase: incremental, decremental	Two-phase: two-phase, incremental/decremental, incremental/decremental control
	Input contact used (see note 1)	Single-phase: X0: count input (CH0) X1: count input (CH1) X2: reset input (CH0, CH1) X3: count input (CH2) X4: count input (CH3) X5: reset input (CH2, CH3)	Two-phase: X0, X1: count input (CH0) X2: reset input (CH0) X3, X4: count input (CH2) X5: reset input (CH2)
Pulse output	Output point number	Two independent points (simultaneous output possible)	
	Output mode	CW and CCW mode, pulse and direction mode	
	Maximum output frequency	1 channel: max. 100 kHz (x 1) 2 channels: max. 60 kHz (x 2)	(linear interpolation function: max. 100 kHz circular interpolation function: max. 20 kHz)
	High-speed counter used (see note 2)	Two-phase CH0 or CH2	
	Input/Output contact used (see note 1)	X2 or X5: home input Y0 or Y3: CW output or pulse output Y1 or Y4: CCW output or direction output Y2 or Y5: deviation counter reset output	
PWM output	Output point number	Two points (Y0, Y3)	
	Output frequency	1.5 to 12.5 k Hz (at resolution of 1,000), 15.6 k to 41.7 k Hz (at resolution of 100)	
	Output duty	0.0 to 99.9% (at resolution of 1,000), 1 to 99% (at resolution of 100)	
	High-speed counter used (see note 2)	Two-phase CH0 or CH2	
	Output contact used (see note 1)	Y0 or Y3	

Notes: 1) The contacts noted above cannot be allocated for more than one function. Also, contacts that are not assigned to the various functions can be used as general inputs/outputs. Inputs X0 to X5 are pulse catch inputs, and can also be used for interrupt inputs.
2) If using pulse output or PWM output, one channel of the two-phase high-speed counter is used for each output point, in each case. If only one pulse output point is being used, either one point of the two-phase high-speed counter or three points of the single-phase high-speed counter may be used.

■ Serial communication Specifications (1:1 communication) (see note 1)

Item	Description
Communication method	Half duplex transmission
Synchronous method	Start stop synchronous system
Transmission line	RS232C
Transmission distance	15 m 49.21 ft.
Transmission speed (Baud rate)	2,400 bits/s to 115.2 k bits/s (see note 2)
Interface	Conforming to RS232C (connected via the terminal block)

Notes: 1) In order to use the serial communication function (1:1 communication), a RS232C type communication cassette is required.
2) The transmission speed (baud rate) and transmission format are specified using the system registers.

■ PLC link function Specifications (see note 1)

Item	Description
Communication method	Token bus
Transmission method	Floating master method
Transmission line	Twisted-pair cable or VCTF
Transmission distance (Total distance)	1,200 m 3,937 ft.
Transmission speed (Baud rate)	115.2 k bits/s
Number of units (stations)	Maximum 16 units (see note 2)
PLC link capacity	Link relay: 1,024 points, link register: 128 words
Interface	Conforming to RS485 (connected via the terminal block)

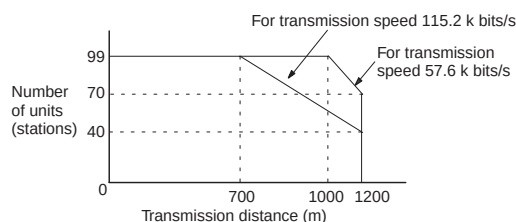
Notes: 1) A RS485 type communication cassette is required in order to use the PLC link function.
2) Unit (station) numbers are specified using the switches on the control unit or the system registers.

■ Serial communication Specifications (1:N communication) (see note 1)

Item	Description
Communication method	Two-wire, half duplex transmission
Synchronous method	Start stop synchronous system
Transmission line	Twisted-pair cable or VCTF
Transmission distance (Total distance)	Maximum 1,200 m 3,937 ft. (see notes 4 and 5)
Transmission speed (Baud rate)	2,400 bits/s to 115.2 k bits/s 19,200 bits/s when a C-NET adapter is connected (see notes 2, 4 and 5)
Number of units (stations)	Maximum 99 units (stations) 32 units (stations) max. when a C-NET adapter is connected (see notes 3, 4 and 5)
Interface	Conforming to RS485 (connected via the terminal block)

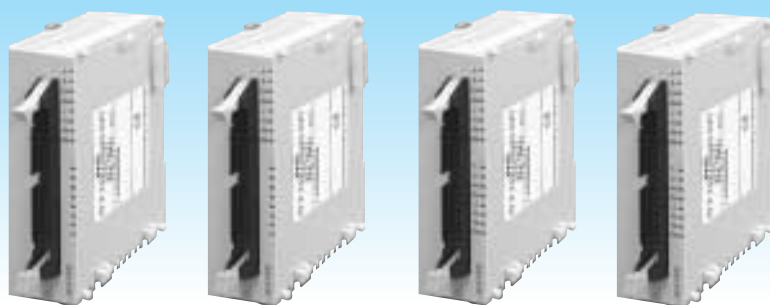
Notes: 1) In order to use the serial communication function (1:N communication), a RS485 type communication cassette is required.
2) The transmission speed (baud rate) and transmission format are specified using the system registers.
3) Unit (station) numbers are specified using the system registers. Up to 31 units (stations) can be set, using the switches on the control unit.

- 4) When connecting a commercially available device that has an RS485 interface, please confirm operation using the actual device. In some cases, the number of units (stations), transmission distance, and transmission speed (baud rate) vary depending on the connected device.
5) The values for the transmission distance, transmission speed (baud rate), and number of units (stations) should be within the values noted in the graph below.



For a transmission speed of 2,400 bits/s to 38.4 k bits/s, you can set up a maximum of 99 units (stations) and a maximum transmission distance of 1,200 m.

FPΣ Positioning Unit



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

■ Features

1. High-speed pulse and startup for great performance in compact package and even supports linear servos

Max. output frequency: 4 Mpps,
Startup speed: 0.005 ms

2. Supports indexed feeding with JOG positioning function

Able to support indexed feed processing applications with high-speed startup and repeated control.

3. Count of feedback pulse possible

Since feedback pulses from encoders, etc., can be counted, control is possible while detecting the out of step and verifying the current position in step motors.

■ Performance Specifications

Part number		FPG-PP11	FPG-PP12	FPG-PP21	FPG-PP22
Output type		Transistor	Line driver	Transistor	Line driver
Occupied I/O points		Input: 16 points, Output: 16 points		Input: 32 points, Output: 32 points	
Number of axes controlled		1 axis		2 axes, independent	
Position command	Command units	Pulse unit (The program specifies whether Increment or Absolute is used.)			
	Max. pulse count	Signed 32 bits (–2,147,483,648 to +2,147,483,647 pulses)			
Speed command	Command range	1 pps to 500 kpps (can set in 1 pps.)	1 pps to 4 Mpps (can set in 1 pps.)	1 pps to 500 kpps (can set in 1 pps.)	1 pps to 4 Mpps (can set in 1 pps.)
Acceleration/deceleration command	Acceleration/deceleration method	Linear acceleration/deceleration, S acceleration/deceleration (this takes the form of an 'S')			
	'S' Acceleration/deceleration	Can select from Sin curve, Secondary curve, Cycloid curve and Third curve.			
	Acceleration/deceleration time	0 to 32,767 ms (can set in 1 ms)			
Home return	Home return speed	Speed setting possible (changes return speed and search speed)			
	Input terminals	Home input, Near home input, Over limit input (+), Over limit input (–)			
	Output terminals	Deviation counter clear output signal			
Operation mode		• E point control (Linear and S accelerations/decelerations selecting possible) • P point control (Linear and S accelerations/decelerations selecting possible) • Home return function (Home search) • JOG operation function *1 • JOG positioning function • Pulser input function *3 - Transfer multiplication ratio (× 1, × 2, × 5, × 10, × 50, × 100, × 500, × 1000 selecting possible) • Real-time frequency change function • Infinity output function			
Startup time		0.02 ms or 0.005 ms possible *2			
Output interface	Output mode	1-pulse output (Pulse/Sign), 2-pulse output (CW/CCW)			
Feedback counter function *3	Countable range	Signed 32 bits (–2,147,483,648 to +2,147,483,647 pulses)			
	Input mode	2-phase input, Direction distinction input, Individual input (transfer multiple available for each.)			
Other functions		• The flag to compare the elapsed value is built in. (The timing signal outputs at the optional position during an operation.)			
Internal current consumption (at 5 V DC)		150 mA max.		220 mA max.	
External power supply	Voltage	21.6 V DC to 26.4 V DC			
	Current consumption	20 mA		35 mA	
Mass		Approx. 75 g max.		Approx. 80 g max.	

^{*1}: When selected Linear acceleration/deceleration operation, the target speed can be changed during an operation.

^{*2}: The startup time can be changed by the control code setting in the shared memory.
The factory setting (default setting) is 0.02 ms.
The startup time is the time from the start request to the first pulse output.

^{*3}: Pulser input function and feedback counter function use the same pulse input terminal, so the both cannot function simultaneously.

FPΣ/FP0 CC-Link Slave Unit

Available for Open Network CC-Link



FPΣ CC-Link Slave Unit
FPG-CCLS



FP0 CC-Link Slave Unit
FP0-CCLS

Specification

1. General Specifications

Rated operating voltage	24 V DC
Operating voltage range	21.6 to 26.4 V DC
Rated current consumption	CC-Link Unit: 40 mA or less/24 V DC Increase amount in the control unit when expansion units are added: 40 mA or less/24 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 (non-condensing)
Storage humidity	30 to 85% RH (non-condensing)
Breakdown voltage	Between RS485 terminal and power supply terminal/function earth: 500 V AC for 1 minute
Insulation resistance	Between RS485 terminal and power supply terminal/function earth: Min. 100 (measured with a 500 V DC megger)
Vibration resistance	10 to 55 Hz, 1 cycle/min. Double amplitude: 0.75 mm/0.030 in., 10 min. on 3 axes
Shock resistance	98 m/s ² or more, 4 times on 3 axes
Noise immunity	1,000 V p-p with pulse width 50 ns and 1 μs (based on in-house measurements)
Operating condition	Free from corrosive gases and excessive dust
Weight	FPΣ CC-Link slave unit: Approx. 90 g, FP0 CC-Link slave unit: Approx. 80 g

2. CC-Link Communication Specifications

Version	CC-Link Ver.1.10		
Communication method	Broadcast polling method		
Transmission speed	10 M bit/s, 5 M bit/s, 2.5 M bit/s, 625 k bit/s, 156 k bit/s		
Max. transmission distance ^{Note 1)}		Ver.1.10 CC-Link cable CC-Link high-performance cable	CC-Link cable
	10 M bit/s	100 m	100 m
	5 M bit/s	160 m	150 m
	2.5 M bit/s	400 m	200 m
	625 k bit/s	900 m	600 m
	156 k bit/s	1200 m	1200 m
Interface	RS485		
Station type	Remote device station		
Number of occupied stations	FPΣ: 1 to 4 stations (switch changeover), FP0: 1 station		

Features

1. Fit into Open Network System

Even when PLCs from other manufacturers are used, a system with high-speed positioning, temperature control and S-LINK connection can be established.

2. Advanced I/O Points and Data Read/Write

FPΣ CC-Link slave unit: Max. 112 I/O points each, 16-word data read/write
FP0 CC-Link slave unit: Max.16 I/O points each, 4-word data read/write

Unit Differences

	FPΣ CC-Link slave unit	FP0 CC-Link slave unit
PLC to be connected	FPΣ	FPΣ/FP0
Max. I/O points	Input: 112, Output: 112	Input: 16, Output: 16
Max. data	Read: 16-word data, Write: 16-word data	Read: 4-word data, Write: 4-word data
Limitations	—	- One FP0 CC-Link slave unit can be installed on the extremely right in the expansion position. - When an FP0 CC-Link slave unit is used together with an FP0 thermocouple unit in a system, the measurement accuracy of the thermocouple unit is as shown in ^{note 2)} below.
Recommendation	When CC-Link is mainly used	When S-LINK and CC-Link are used together

Note 1) Length of the multi-drop connected cables at both ends

The cable length has restrictions in communication speed, CC-Link version, and dedicated cables to be used.

For details concerning the CC-Link, refer to the CC-Link Partner Association.

Note 2) When an FP0 thermocouple unit is used with an FP0 CC-Link slave unit, the measurement accuracy of the thermocouple unit which is installed on the left of the CC-Link slave unit is as shown in the table below.

Thermocouple	Standard specifications	When CC-Link slave unit with a thermocouple unit
K.J.T	0.8°C	2°C
R	0 to 99.9°C	3°C
	100 to 299.9°C	5°C
	300 to 1500°C	4°C

FPΣ S-LINK unit

Comprises the S-LINK wire-saving system (SUNX Ltd.) and controls up to 128 I/O points at a transmission distance of up to 400 m.

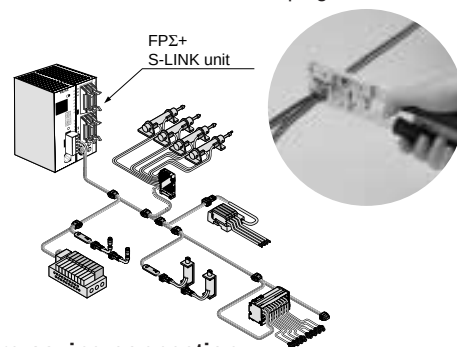


FPG-SL

■ Features

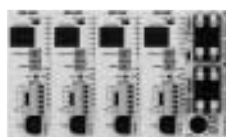
1. T-branches allow you to freely determine the wiring layout.

A wire-saving layout is available with a four-wire cable (two signal wires and two power wires), and a flexible layout is available with T-branches. You can easily make T-branches with one operation of the dedicated wire-crimping tool.



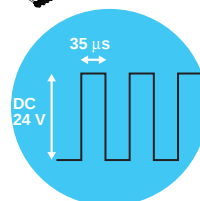
2. Up to four units can be connected. Each unit can control up to 128 I/O points.

One unit controls up to 128 I/O points. Up to four S-LINK units can be connected to one FPΣ control unit.



3. Highly reliable wire-saving connection is available.

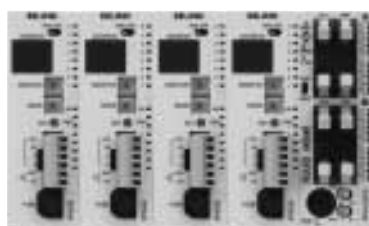
Approx. 60 different types of S-LINK I/O devices can be connected, meeting the diverse needs for I/O. The high transmission voltage (24 V DC) and wide clock pulse width (35 μs) provide high noise immunity. Flexible and reliable wire-saving connection is available.



● Refer to SUNX Limited's S-LINK catalogs and manuals for details and I/O devices of the S-LINK system.

■ No time-consuming programming for communications is required

The control unit automatically recognizes I/O allocations by the S-LINK unit installation position. It can be used as though it were an ordinary expansion I/O unit.

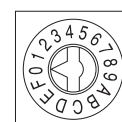


When 64 input points and 64 output points are set to each unit

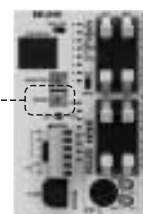
X100 - X13F, Y100 - Y13F
X180 - X21F, Y180 - Y21F
X260 - X29F, Y260 - Y29F
X340 - X37F, Y340 - Y37F

■ Setting of the number of I/O points

The balance between the number of input and output points within 128 can be selected in increments of 32 points by a rotary switch.

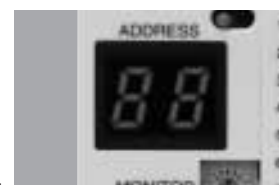


Example:
Setting 8 → 64 input points
64 output points



■ Indication of the address of I/O devices in error state

Even if the main line is broken, making it impossible to recognize an I/O device, the device address will be indicated on the display of the S-LINK unit. This function significantly reduces the time required for solving problems found during equipment start-up checks and for recovery work at the operation site.



■ Performance specifications

Transmission method	Bi-directional time division multiplex transmission
Synchronization	Bit/Frame synchronization
Transmission protocol	S-LINK protocol
Transmission line	Exclusive flat cable or cabtyre cable
Transmission speed	28.5 k bits/s
Transmission distance *1	Main signal line: Extensible to 200 m (400 m when a booster is used)
Connection	T-branch multi-drop wiring or multi-drop wiring
Number of I/O points	128 points max. (The number of I/O points can be selected in increments of 32 points.)

*1: Refer to SUNX Limited's S-LINK catalogs and manuals for the booster.

FPΣ Data Memory Expansion Unit

Data capacity expandable up to 256 k words



FPG-EM1

■ Features

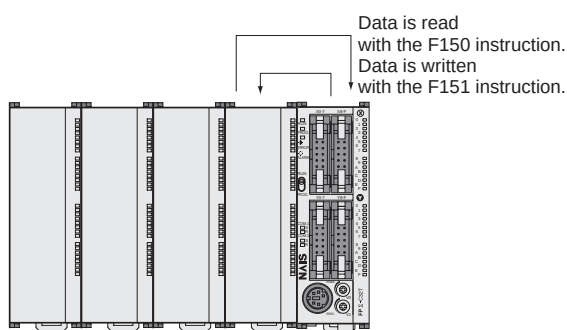
- 1. Ability to store large amounts of data suited for remote monitoring**
With a large storage of 256 k words, this memory unit is best suited to store remote monitoring logs.
- 2. Harness its power for multi-model manufacturing equipment**
Ability to store large amounts of data allows the unit to store production data for multiple models. There is no need to download new production data every time there is a product switch-out.
- 3. A FPΣ unit can connect up to 4 units, allowing to store up to 1024 k words.**

■ 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 55 Hz, 1 sweep/min., Double amplitude of 0.75mm, 10 min. on 3 axes (Towards X, Y & Z directions)
Shock resistance	98 m/s ² or more, 4 times on 3 axes (Towards X, Y & Z directions)
Noise immunity	1,000 V (P-P) with pulse width 50 ns, 1 μs (using a noise simulator)
Operating condition	Must be free from corrosive gases and excessive dust
Basic unit mass	Approx. 80 g
The amount of increases in control unit consumption current	35 mA or less (24 V DC) (100 mA or less (internal 5 V DC))

■ Performance Specifications

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



■ Programming tool FPGWIN GR

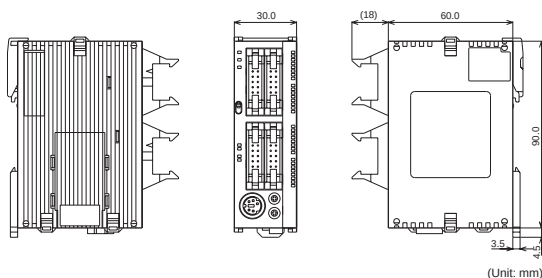
Instructions F150 and F151, necessary to use data memory expansion units, are converted in versions 2.13 or later. Difference files are available at <http://www.nais-e.com/plc/>

FPΣ Dimensions and Restrictions when combining unit and using programming tools

■ FPΣ Control units

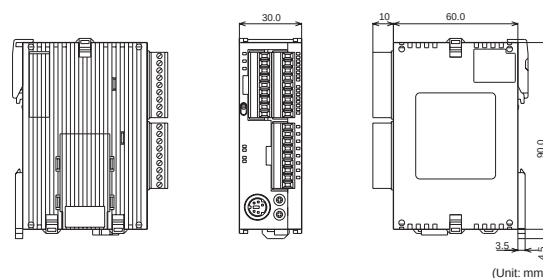
V3 FPG-C32TH/FPG-C32T2H/FPG-C28P2H
FPG-C32THTM/FPG-C32T2HTM/FPG-C28P2HTM

FPG-C32T/FPG-C32T2/FPG-C28P2
FPG-C32TTM/FPG-C32T2TM/FPG-C28P2TM



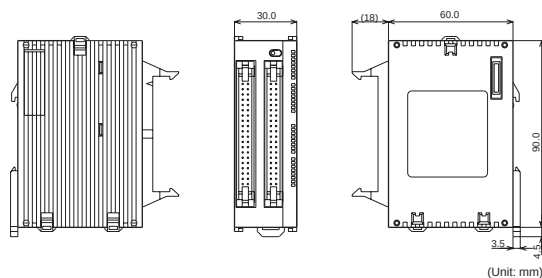
V3 FPG-C24R2H/FPG-C24R2HTM

FPG-C24R2/FPG-C24R2TM

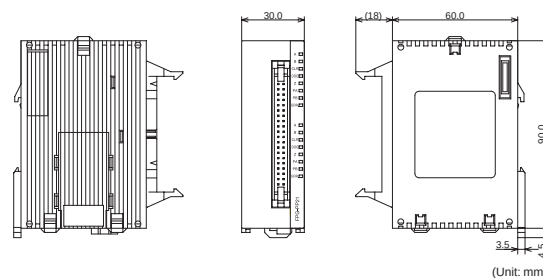


■ FPΣ Expansion units/FP0 Expansion units

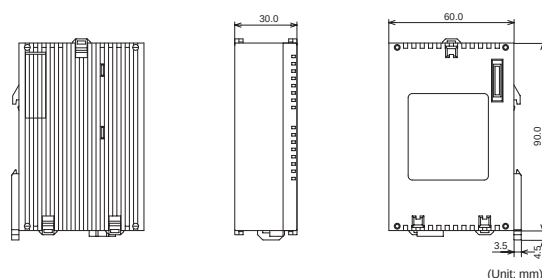
FPG-XY64D2T



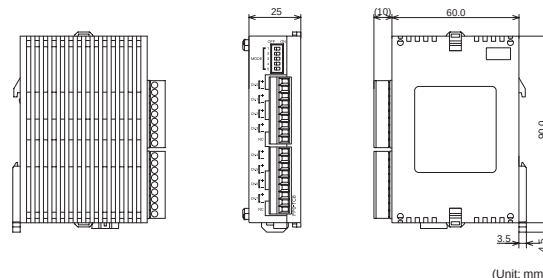
FPG-PP11/FPG-PP12/FPG-PP21/FPG-PP22



FPG-EM1



FP0-TC4/FP0-TC8



■ Restrictions when combining unit and using programming tools

1. Expansion I/O units for the FPΣ

- 1) The left-side expansion type FPΣ control unit is necessary for use with the FPΣ expansion I/O unit.
The previously available control units (Part No.: FPG-C32T/FPG-C32TTM, Product No.: AFGP2543/AFGP2543TM) cannot be used for expansion.
- 2) A maximum of four units can be used for expansion.

2. FPΣ and FP0 shared expansion I/O units and intelligence units

When combining expansion I/O units and intelligence units a maximum of up to three units can be added to the right side of control unit.

3. Programming tools

- 1) Either FPGWIN GR Ver. 2 or FPGWIN Pro Ver. 4 are necessary for use with the FPΣ control unit.
Users of FPGWIN GR Ver. 1 will have to upgrade.
However, the upgrade only applies to Version 1.1 or higher. Those users with versions below Version 1.1 are asked to send us your user registration card. Upon receipt we will send you Version 1.1.
- 2) Either FPGWIN GR Ver. 2.1 or FPGWIN Pro Ver. 4.1 are necessary for use the left-side expansion type FPΣ control unit. An upgrade service is available from our programmable controller home page at <http://www.nais-e.com/plc/>
- 3) Handy-type programmers cannot be used with the FPΣ series PLC.

FPΣ Product types

① Control units

Product name	Specifications		Part No.	Product No.
FPΣ C32 Control unit	Input 16 points DC, Transistor output (NPN) 16 points I/O control points when expanded: Max. 128 points	V3 32 k steps	FPG-C32TH	AFPG2543H
		12 k steps	FPG-C32T	AFPG2543
FPΣ C32 Left-side expansion type Control unit	Input 16 points DC, Transistor output (NPN) 16 points I/O control points when expanded: Max. 384 points Built-in linear interpolation and circular interpolation functions	V3 32 k steps	FPG-C32T2H	AFPG2643H
		12 k steps	FPG-C32T2	AFPG2643
FPΣ C32 Left-side expansion type Control unit	Input 16 points DC, Relay output 8 points I/O control points when expanded: Max. 376 points (transistor output)	V3 32 k steps	FPG-C24R2H	AFPG2423H
		12 k steps	FPG-C24R2	AFPG2423
FPΣ C28 Left-side expansion type Control unit	Input 16 points DC, Transistor output (PNP) 12 points I/O control points when expanded: Max. 380 points Built-in linear interpolation and circular interpolation functions	V3 32 k steps	FPG-C28P2H	AFPG2653H
		12 k steps	FPG-C28P2	AFPG2653
FPΣ C32 Control unit with thermistor input	Input 16 points DC, Transistor output (NPN) 16 points I/O control points when expanded: Max. 384 points	V3 32 k steps	FPG-C32THTM	AFPG2543HTM
		12 k steps	FPG-C32TTM	AFPG2543TM
FPΣ C32 Left-side expansion type Control unit with thermistor input	Input 16 points DC, Transistor output (NPN) 16 points I/O control points when expanded: Max. 384 points Built-in linear interpolation and circular interpolation functions	V3 32 k steps	FPG-C32T2HTM	AFPG2643HTM
		12 k steps	FPG-C32T2TM	AFPG2643TM
FPΣ C24 Left-side expansion type Control unit with thermistor input	Input 16 points DC, Relay output 8 points I/O control points when expanded: Max. 376 points (transistor output)	V3 32 k steps	FPG-C24R2HTM	AFPG2423HTM
		12 k steps	FPG-C24R2TM	AFPG2423TM
FPΣ C28 Left-side expansion type Control unit with thermistor input	Input 16 points DC, Transistor output (PNP) 12 points I/O control points when expanded: Max. 380 points Built-in linear interpolation and circular interpolation functions	V3 32 k steps	FPG-C28P2HTM	AFPG2653HTM
		12 k steps	FPG-C28P2TM	AFPG2653TM

* Thermistors with a resistance from 200 Ω to 75 kΩ can be used.

② Communication cassettes

Product name	Specifications	Part No.	Product No.
FPΣ 1-channel, RS232C type Communication cassette	Cassette for control unit installation. Enables communications with devices with RS232C interface.	FPG-COM1	AFPG801
FPΣ 2-channel, RS232C type Communication cassette	Cassette for control unit installation. Enables communications with devices with RS232C interface.	FPG-COM2	AFPG802
FPΣ 1-channel, RS485 type Communication cassette	Cassette for control unit installation. PLC linking between FPΣs or communication with devices with RS485 interface possible.	FPG-COM3	AFPG803
FPΣ 1-channel, RS232C/ 1-channel, RS485 type Communication cassette	Cassette for control unit installation. Enables communications with devices with RS232C, RS485 interface.	FPG-COM4	AFPG806

③ Expansion I/O units for FPΣ

Product name	Specifications	Part No.	Product No.
FPΣ 64-points expansion I/O unit	Input 32 points DC, Transistor output 32 points Max. possible expansion is with a total of 4 units to the left side of the FPΣ control units	FPG-XY64D2T	AFPG3467 *

* Replace "4" in the third last digit of Product No. with "5" to order the PNP output type.

④ Expansion I/O units for FPΣ and FP0

Product name	Specifications	Part No.	Product No.
FP0-E8 expansion unit	Input 8 points DC	FP0-E8X	AFP03003
FP0-E8 expansion unit	Input 4 points DC, Relay output 4 points	FP0-E8RS	AFP03023
FP0-E8 expansion unit	Relay output 8 points	FP0-E8YRS	AFP03020
FP0-E8 expansion unit	Transistor output (NPN) 8 points	FP0-E8YT	AFP03040 *
FP0-E16 expansion unit	Input 16 points DC	FP0-E16X	AFP03303
FP0-E16 expansion unit	Input 8 points DC, Relay output 8 points	FP0-E16RS	AFP03323
FP0-E16 expansion unit	Input 8 points DC, Transistor output (NPN) 8 points	FP0-E16T	AFP03343 *
FP0-E16 expansion unit	Transistor output (NPN) 16 points	FP0-E16YT	AFP03340 *
FP0-E32 expansion unit	Input 16 points DC, Transistor output (NPN) 16 points	FP0-E32T	AFP03543 *

* Replace "4" in the second last digit of Product No. with "5" to order the PNP output type.

⑤ Intelligent units for FPΣ

Product name	Specifications	Part No.	Product No.
FPΣ Positioning unit	1 axis, Transistor output	FPG-PP11	AFPG430
FPΣ Positioning unit	1 axis, Line driver output	FPG-PP12	AFPG432
FPΣ Positioning unit	2 axes, Transistor output	FPG-PP21	AFPG431
FPΣ Positioning unit	2 axes, Line driver output	FPG-PP22	AFPG433
FPΣ Data memory expansion unit	256 k words	FPG-EM1	AFPG201
FPΣ CC-LINK slave unit	Unit to connect to CC-Link	FPG-CCLS	AFPG7943
FPΣ S-LINK unit	Unit to connect to SUNX S-LINK I/O devices	FPG-SL	AFPG780

⑥ Intelligent units for FPΣ and FP0

Product name	Specifications	Part No.	Product No.
FP0 Thermocouple unit	K, J, T, R thermocouple, Resolution: 0.1°C	FP0-TC4	AFP0420
	K, J, T, R thermocouple, Resolution: 0.1°C	FP0-TC8	AFP0421
FP Web-Server unit	Unit for connecting FP series/RS232C interface and Ethernet Web-Server function and E-mail sending function	FP-WEB	AFP0610
FP0 I/O Link unit	This is a link unit designed to connect FP0 as a station to MEWNET-F (our remote I/O system).	FP0-IOL	AFP0732
FP0 CC-Link Slave unit	Unit to connect to FP0 CC-Link	FP0-CCLS	AFP07943
FP0 A/D Converter Unit	Analog input 8 points: 0 to 5 V, -10 to +10 V, -100 to +100 mV, 0 to 20 mA Resolution: 1/4000 (12 bits)	FP0-A80	AFP0401
FP0 D/A Converter Unit	Analog output 4 points: FP0-A04V: -10 to +10 V (Resolution: 1/4000) FP0-A04I: 4 to 20 mA (Resolution: 1/4000)	FP0-A04V	AFP04121
		FP0-A04I	AFP04123
FP0 Analog I/O unit	Analog input 2 points: 0 to 5 V, -10 to +10 V Analog output 1 points: -10 to +10 V, 0 to 20 mA Resolution: 1/4000 (12 bits)	FP0-A21	AFP0480

*1: Refer to the FAQ section on our website for thermocouple units.

⑦ Power supply unit

Product name	Specifications	Part No.	Product No.
FP0 Power supply unit	Input: 100 to 240 V AC, Output: 24 V DC 0.7 A	FP0-PSA4	AFP0634

⑧ Options

Product name	Specifications	Product No.
Backup battery for FPΣ	Battery for full-time back up of operation memory and clock/calendar function	AFPG804
FP0 Slim 30 type mounting plate	Plastic plate to mount FPΣ units and FPΣ expansion units on a panel (including 10 pieces)	AFP0811
Slim type FP0 mounting plate	Plastic plate to mount FP0 expansion units on a wall (including 10 pieces)	AFP0803
Power cable for FPΣ	Included with control unit. Maintenance part. 1 m length	AFPG805
FP Memory loader	Data clear type	AFP8670
	Data hold type	AFP8671

⑨ Programming tools

Product name	Specifications		Product No.
Standard programming tool software Control FPCWIN GR Ver.2	English-language menu	Full type (for all type FP series PLC)	AFPS10520
		Small type (for FP0, FPΣ)	AFPS11520
		Upgrade (to upgrade from Ver.1.1)	AFPS10520R
	Chinese-language menu	Standard	AFPS10820
		Upgrade (to upgrade from Ver.1.1)	AFPS10820R
	Korean-language menu	Standard	AFPS10920
Conforms to IEC61131-3 programming tool software Control FPCWIN Pro Ver.5	English-language menu	Full type (for all type FP series PLC)	AFPS50550
		Small type (for FP0, FPΣ)	AFPS51550
PC connection cable	Between D-sub 9 pins and DIN 5 pins, 3 m length		AFC8503

⑩ Motor Driver I/F Terminal II

Product name	Specifications	Product No.
Motor Driver I/F Terminal II 1-axis type	I/F terminal for connecting the MINAS series and FPΣ Positioning unit/FP2	AFP8503
Motor Driver I/F Terminal II 2-axis type	Multi function type Positioning unit.	AFP8504
Exclusive cable for MINAS AIII Series, 1 m 3.281 ft	Cable for connecting the MINAS A IV/AIII series and motor driver I/F terminal II. The transmission speed becomes 500 kbps at a maximum when connected to the MINAS A IV Series.	AFP85131
Exclusive cable for MINAS AIII Series, 2 m 6.562 ft		AFP85132
Exclusive cable for MINAS S Series, 1 m 3.281 ft	Cable for connecting the MINAS E/S series and motor driver I/F terminal II.	AFP85141
Exclusive cable for MINAS S Series, 2 m 6.562 ft		AFP85142
Connection cable for FP2 Positioning unit, 0.5 m 1.640 ft	Cable for connecting the FPΣ Positioning unit/FP2 Multi function type Positioning unit and motor driver I/F terminal II.	AFP85100
Connection cable for FP2 Positioning unit, 1 m 3.281 ft		AFP85101

These materials are printed on ECF pulp.
These materials are printed with earth-friendly vegetable-based (soybean oil) ink.



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