Panasonic
INDUSTRY

RTEX EtherCAT

Motion Controller

GM1 SERIES

CE Marking conformity

PLC + Motion + Communication
All - in - one

IN Better Solution

RTEX type

EtherCAT type

2025.5

PLC + Motion + Communication

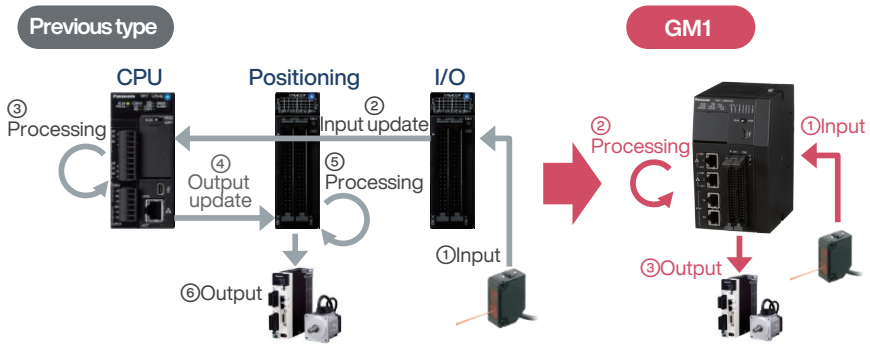
Integrate PLC and motion

Standardization of PLC programming

Enhanced communication between the upper level and the device

Integrate PLC and motion

High speed motion control Fastest cycle 500 µs
Multitask control by function aggregation



Motion control

- Positioning / Speed control / Torque control
- Cam synchronization, Gear synchronization, CNC control

Multitask control

- High speed motion control
- Display / Device / Upper communication
- Data processing

Standardization of PLC programming

Break away from manufacturer-dependent programming

Programming: IEC61131-3 standard compliant, PLCopen
Supports 6 languages: LD / ST / FBD / SFC / IL / CFC
Componentization by library function
Supports object orientation

GM Programmer

*It can be downloaded free of charge from our website.

Enhanced communication between the upper level and the device

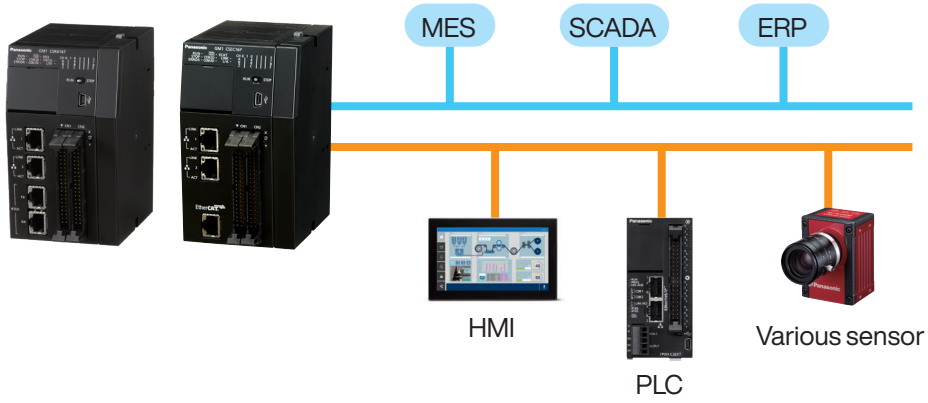
Supports various network protocols

Communication with upper levels

OPC UA Server
FTP Server
MQTT Client
SNTP Client
DNS Client

Communication between devices

EtherNet/IP
Modbus
Codesys V3 communication



System configuration

PLC + Motion + Communication

MES/SCADA

- OPC UA Server
- FTP Server

Communication with upper levels

GM Programmer
- PLC programming
- Motion programming
- Various setting

Communication between devices

Motion Controller
GM1

Codesys V3 communication

HMI
WH Series

PLC

Various sensor

High-speed network for servo RTEX Realtime Express

32 real axes + 20 virtual axes

AC servo motor
MINAS A6N

EtherCAT

32 real axes + 20 virtual axes

AC servo motor
MINAS A6B

Stack type

■ Various communication,
Built-in I / O port
Ethernet 2 port
*IP address can be set for each port
RS-232C 1 port
General-purpose I/O: 16 points each
High-speed counter input: 2 channels
PWM output: 4 channels
SD memory card

Up to 15 expansion units

Digital Input / output unit	Analog input / output unit	Pulse output unit	Serial Communication unit
			

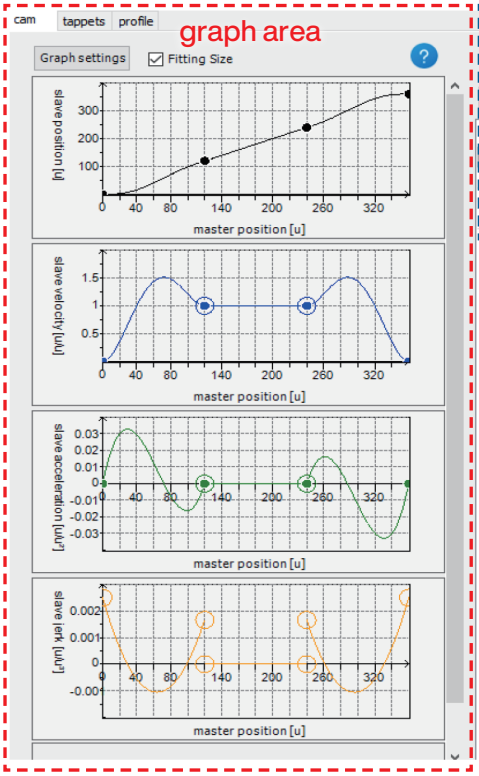
* Realtime Express and RTEX are registered trademarks of Panasonic Holdings Corporation.
Realtime Express is a high-speed and synchronous motion network exclusively developed by our company.
* The EtherCAT is a registered trademark of patented technology licensed from Beckhoff Automation GmbH in Germany.

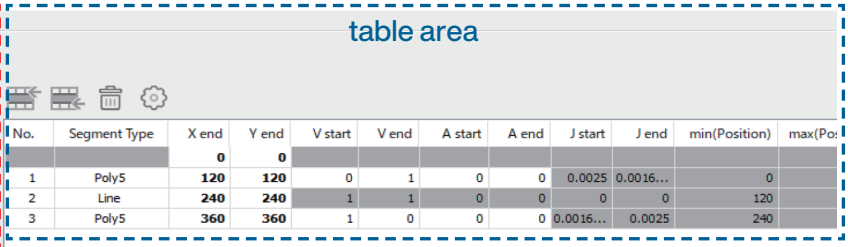
Cam synch control with improved usability for diverse applications

Extended cam editor

Ver.1.4 Additional Features

Create cam waveforms more easily by intuitively editing graphs and numerically editing sections.





No.	Segment Type	X end	Y end	V start	V end	A start	A end	J start	J end	min(Position)	max(Po:
		0	0								
1	Poly5	120	120	0	1	0	0	0.0025	0.0016...	0	
2	Line	240	240	1	1	0	0	0	0	120	
3	Poly5	360	360	1	0	0	0	0.0016...	0.0025	240	

It is possible to move, detach, and attach nodes.
Streamline trial and error in cam waveform editing.

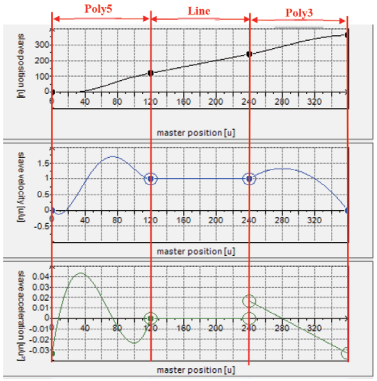
Node	Characteristic	Operation Of Dragging Nodes	<Shift>key + Operation Of Dragging Nodes
Movable Node	The value of the slave axis can be changed	Drag Down / Drag Up	The value of the master axis can be changed. Only the slave axis position graph can be dragged left and right, but the result of the change is also reflected in the velocity, acceleration, and jerk of the slave axis. Drag Right / Drag Left
Fixed Node	The value of the axis cannot be changed	Can't move up or down	
Mixed Node	Has the Characteristic of an active node on one side and a fixed node on the other side	Drag Down(Separation) / Drag movable node up(sorption)	

Supports multiple types of cam waveforms

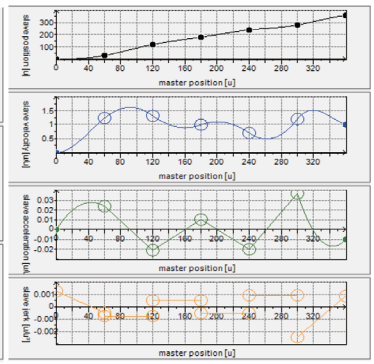
Ver.1.4 Additional Features

You can freely draw a cam waveform using a generic cam curve.

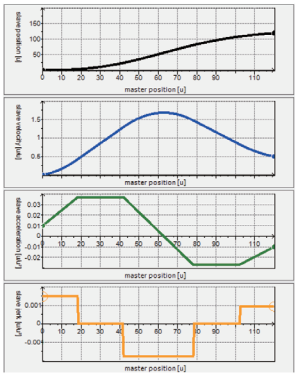
Applies to applications using dedicated cam curves.



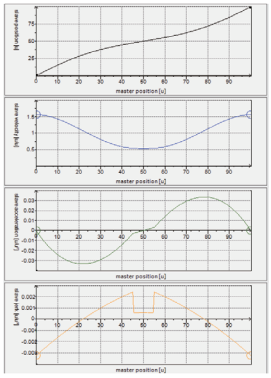
Line
Poly3,Poly5



Spline 4-3-4



Floating Trapezoid



Rotary knife A

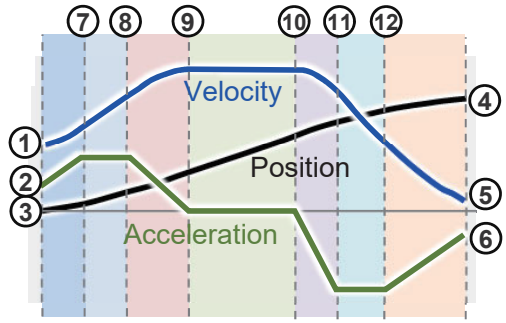
Function blocks optimized for each application

Floating Trapezoid

Patent pending

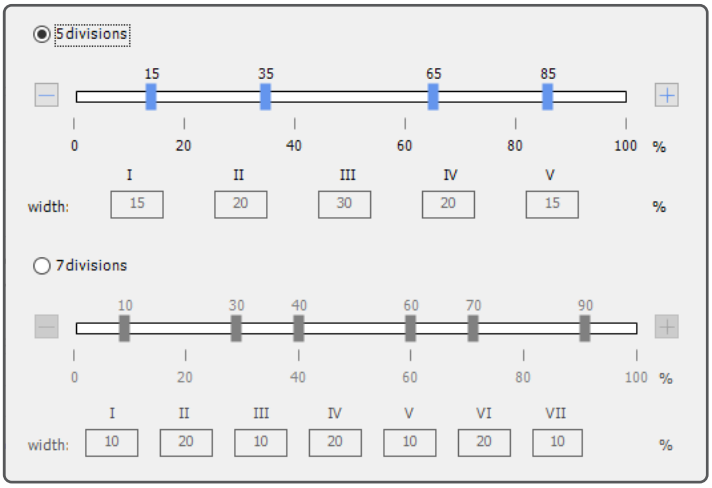
UP Ver.1.4 Additional Features

It combines the versatility of a trapezoid with the connectivity of a quintic curve. You can create cam waveforms that suppress rapid acceleration and deceleration.



Connection conditions ①+⑥ Time allocation ⑦～⑫

It has about twice the editing freedom of a conventional curve.



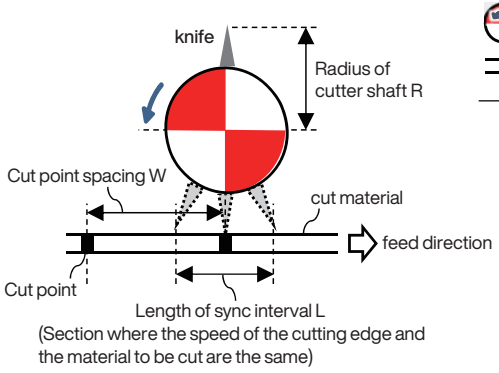
Check the waveform and use the sliders to adjust the time distribution for each section.

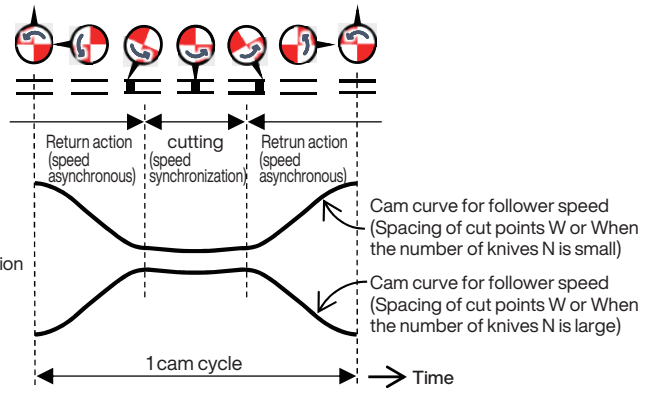
Rotary cutter

In packaging machines and cutting machines, it is possible to perform cutting operations that synchronize the speed of the cutter blade with the feed direction of the product.The cut surface is cleaner than the cutting method with constant circumferential speed.

Configuration parameters

Project	Value	Unit	SettingValue	Content
N: Number of Knives	1	-	1 to 10	Set the number of knives. The angle between each knife must be equal.
R: Radius of cutter axis	30.0	mm	1 to 500	Set the rotary cutter axis radius for from the view of its knife tips.
L: Length of synchronization	10.0	mm	(0.001*W < L < 0.8*W) && (L < 1.6...	Set the length of synchronous section. The knife and cut material have same velocity in the synchronous section.
W: Width between cut points	100.0	mm	1 to 10000	Set the width between cut points.

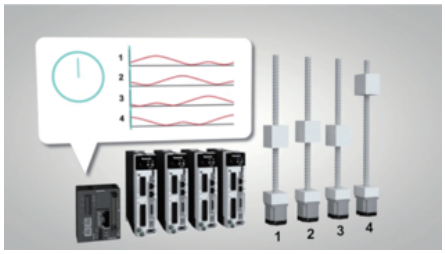




Application example

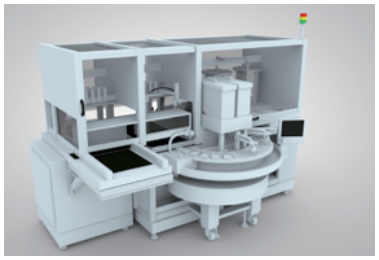
Electronic cam

Even complex mechanical cams can be changed to electronic cams



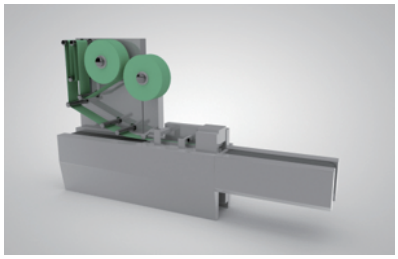
Processing machine

Supports reciprocating motion of acceleration-constant velocity-deceleration



Packaging machine, Cutting machine

Compatible with rotary cutter

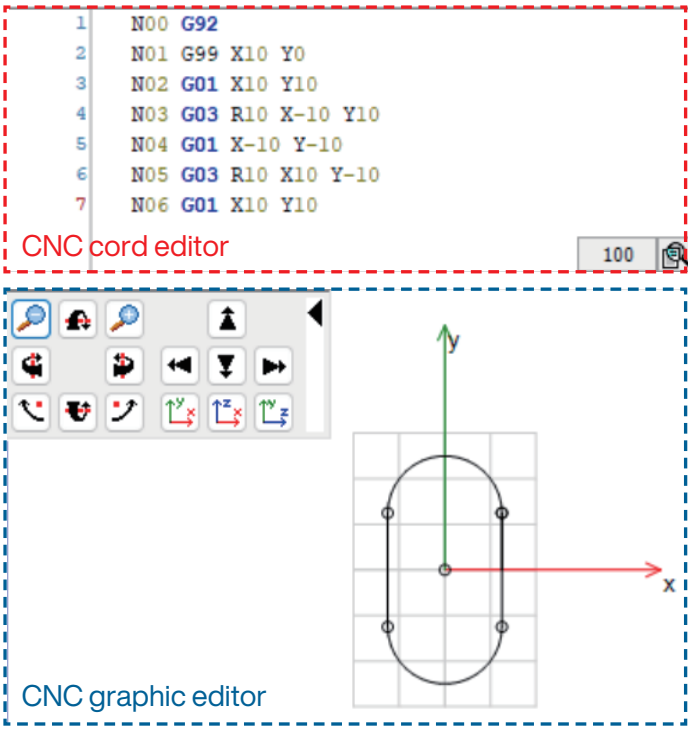


We also have other application examples, so please feel free to contact us.

Expanding CNC synchronous control for broader usability

CNC program editor

You can easily create a program for the first time because you can check the trajectory while writing the program.



G-cord

G00/G01	Linear interpolation
G02/G03	Circular interpolation
G04	Dwell time
G15□G19	Plane specification
G20	Repeated processing, Conditional branching
G36/G37	Internal counter processing
G40/G42	Tool radius correction
G43	Tool Length Correction
G50/G52	Path Smoothing
G53/G56	Coordinate Conversion
G75	Timing Synchronization
G90/G91	Absolute/Relative coordinates specification
G92	Start position specification
G98/G99	Circular arc coordinate specification

M-cord

Freely customizable
Can be freely written by programming

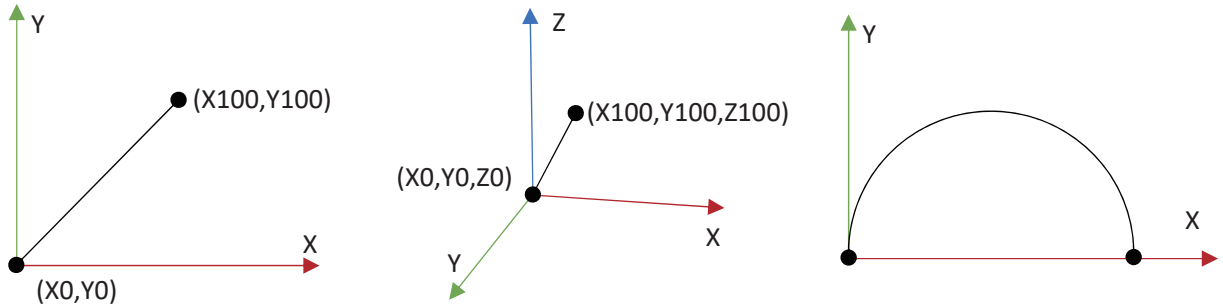
Subprograms

CNC program to another CNC programcan be started

Supports various CNC programs

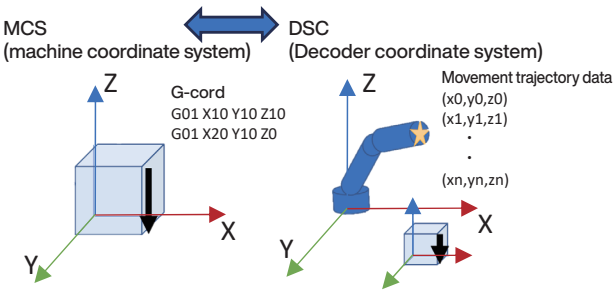
2-axis, 3-axis linear (circular) interpolation

Move from current coordinates to target coordinates by linear (circular) interpolation



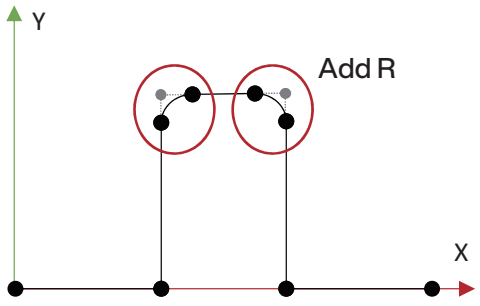
Coordinate transformation

Work and tool coordinates are also supported.



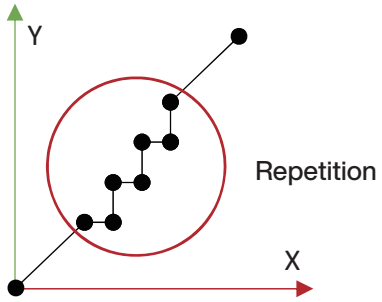
Smooth the path, add R to the path

Path connections can be changed to smooth trajectories



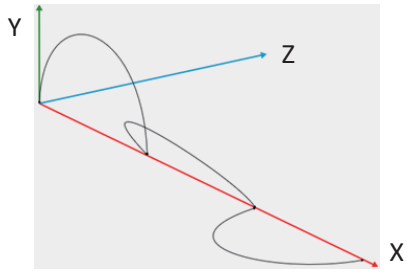
Iterative processing

Possible to repeat by incrementing the counter or by conditional branching



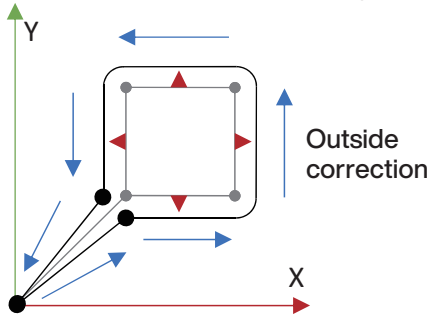
Change of machining plane, coordinate transformation

Set the plane on which circular interpolation will be performed. 3D processing is also applicable



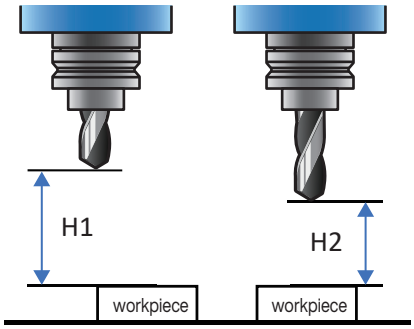
Tool diameter compensation

Correction is performed at the specified distance inside and outside the rectangle.



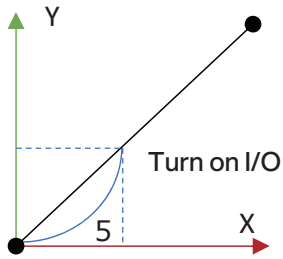
Tool length compensation

Correct the path according to the tool length used



H-switch function

This function allows you to turn the IO output ON/OFF when the interpolation movement distance reaches a predetermined amount.



Subprograms

Programs can be modularized.

CNC1.cnc

```
N0 G01 X$g_x$ Y0 F50 E30 E-30
N10 G01 X0 Y$g_y$
N20 CNC2[25]
N30 G01 X0 Y-200
```

CNC2.cnc

```
SUBPROGRAM CNC2{#RADIUS : LREAL}
N010 G91
N020 G02 X#RADIUS*2 Y0 R#RADIUS Z2.5 F100 E-100 E100
N030 G02 X-#RADIUS*2 Y0 R#RADIUS Z7.5
END_SUBPROGRAM
```

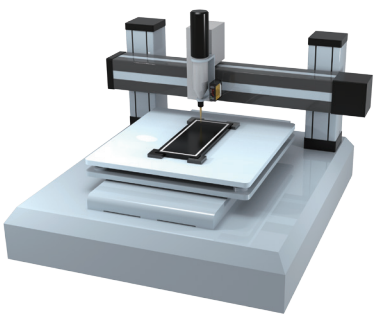
Application example

NC processing machine

Compatible with various G-codes

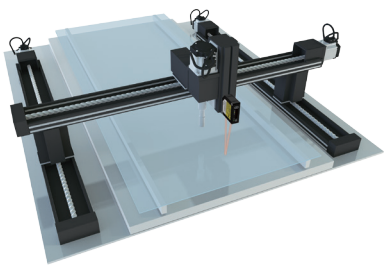
Dispenser

Program-linked coating start timing



Robotic control

XYZ axis mechanism, gantry control

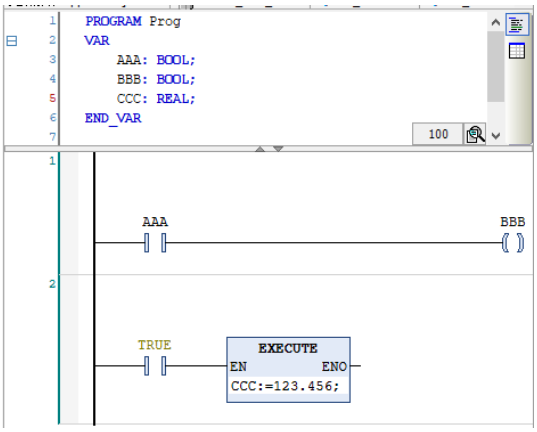


We also have other application examples, so please feel free to contact us.

PLC

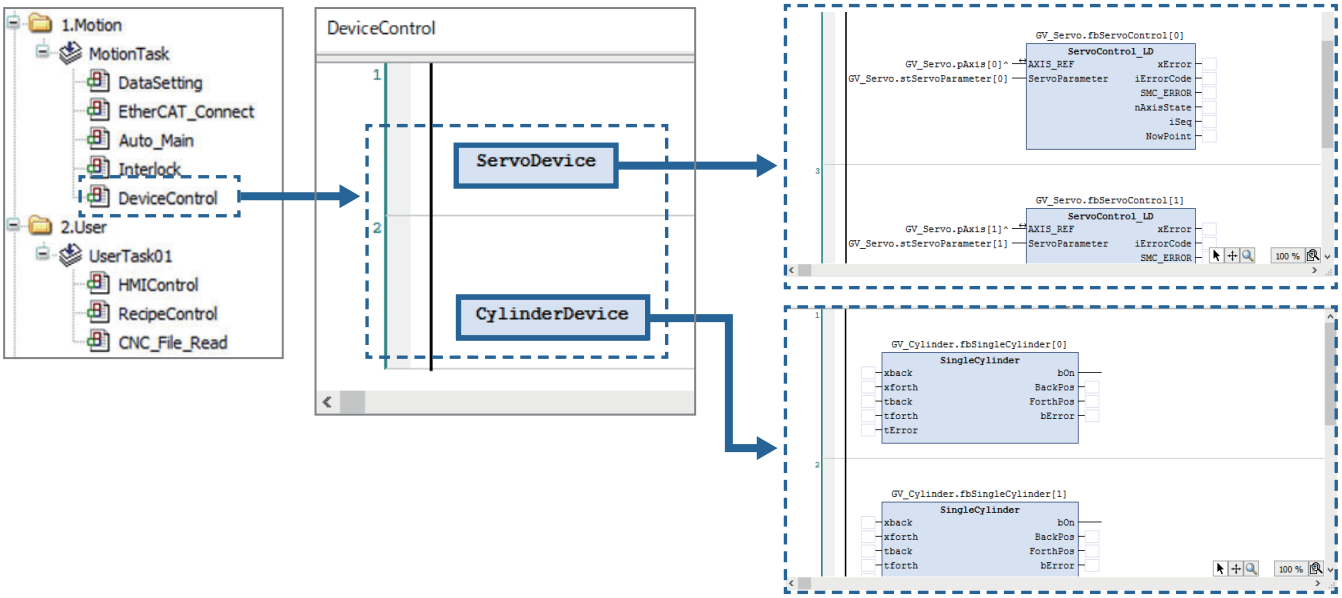
Achieve object-oriented programming

- Divided implementation by POU (program configuration unit)
- Program part, function part (FB, FUN), variable definition part (structure, enumeration, union)
- FB methods and inheritance (equivalent to class concept), interfaces available
- Realization of componentization by library function



Sample image of modularization and structuring

Realization of highly readable programs through modularization and structuring.
Contributes to reducing design man-hours as it is easy to reuse designs.



Enables project data management

Recipe manager function

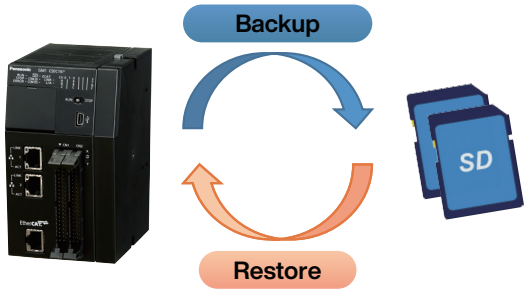
- Management of product type data
- Backup / restore of retained data

RecipeData

Variable	Type	Name	Comment	Minimal Value	Maximal Value	Current Value	InitialRecipe	Rcp1	Rcp2
GVL.stRecipesData.int_val[0]	INT	Width		0	10		0	0	0
GVL.stRecipesData.int_val[1]	INT	Height		0	100		1	1	1
GVL.stRecipesData.int_val[2]	INT	Weight		0	99		2	2	2
GVL.stRecipesData.int_val[3]	INT	Length1		0	10000		3	3	3
GVL.stRecipesData.int_val[4]	INT	Length2		0	10000		4	4	4
GVL.stRecipesData.int_val[5]	INT	Length3		0	10000		5	5	5
GVL.stRecipesData.int_val[6]	INT						6	6	6
GVL.stRecipesData.int_val[7]	INT						7	7	7
GVL.stRecipesData.int_val[8]	INT						8	8	8
GVL.stRecipesData.int_val[9]	INT						9	9	9

Project management function

- Operation of the main unit or program (FB)
- Project backup to SD
- Project restore from SD

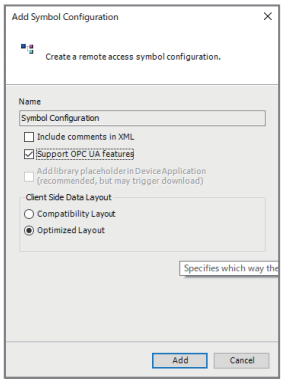


Communication

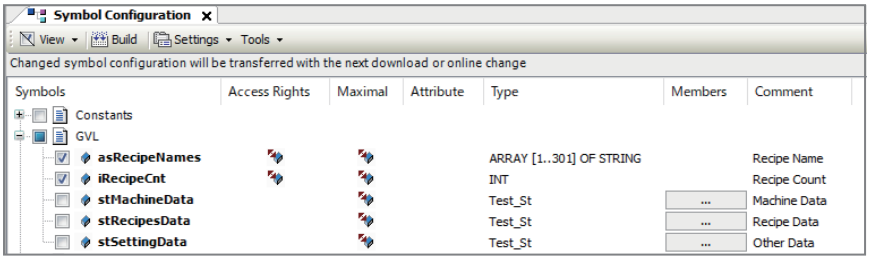
Communication settings can be configured easily

Easy registration to OPC UA server

1. Enabling/disabling OPU UA server



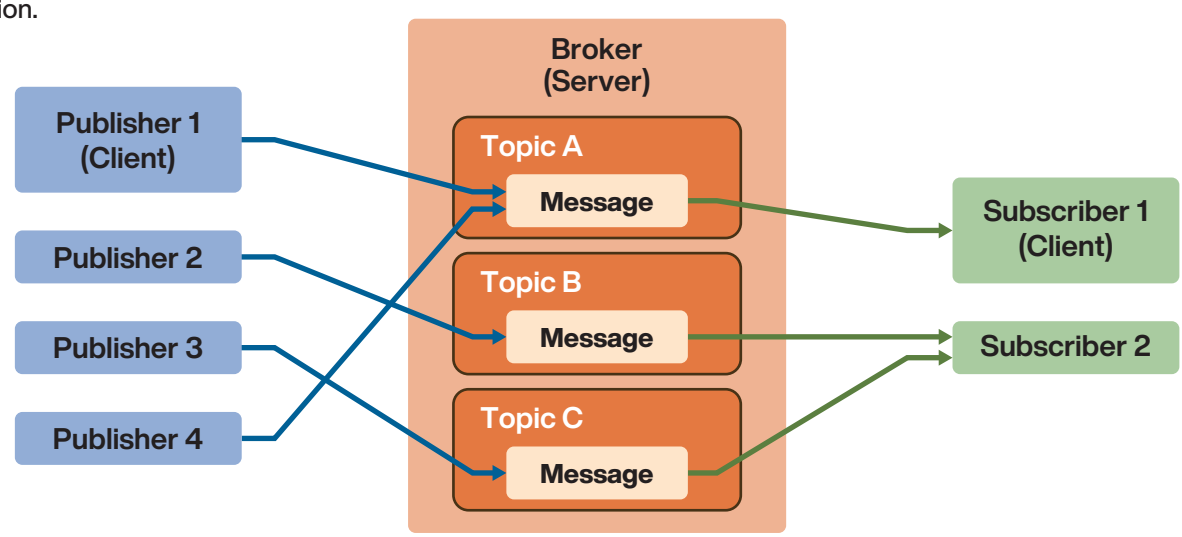
2. Check and register the variables to be published.It can support OPC UA, which is attracting attention in IoT, with only setting (no program required).



Easily program MQTT clients compatible with PubSub model

Ver.1.4 Additional Features

By building an asynchronous communication system, it is possible to add or reduce equipment while the site is in operation.



Also supports FTP server, DNS, and SNTP connections.

RTEX: Expanded from 16 to 32 axes

Ver.1.4 Additional Features

The number of connected devices has been doubled compared to the previous model, making it applicable to a variety of applications.

AC Servo Motor
MINAS A6N

Specifications

GM1 Controller unit common specifications

RTEX type
AGM1CSRX16T

EtherCAT type
AGM1CSEC16T
AGM1CSEC16P

Item	Specifications
Rated voltage	24 V DC
Operating voltage range	20.4 to 28.8 V DC
Allowable momentary power failure time	24 V DC 10 ms or less (at Product shipment)
Operating ambient temperature	0 to +55 °C
Storage ambient temperature	-40 to +70 °C
Operating ambient humidity	10 to 95 %RH (at +25 °C, no condensation or icing)
Storage ambient humidity	10 to 95 %RH (at +25 °C, no condensation or icing)
Vibration resistance (Leakage current 5 mA)	500 V AC for one minute (Note 1)
Insulation resistance (Test voltage 500 V DC)	100 MΩ or more (Note 1)
Vibration resistance	Compliant with JIS B 3502, IEC 61131-2 5 to 8.4 Hz, half amplitude 3.5 mm 8.4 to 150 Hz acceleration 9.8 m/s^2 10 sweeps each in X, Y and Z directions (1 octave/min)
Shock resistance	Compliant with JIS B 3502, IEC 61131-2 147 m/s^2, 3 times each in the X, Y, Z directions
Noise resistance	1000 V [P-P]with pulse widths of 1 µs and 50 ns (using a noise simulator) (Power supply terminal)
Atmosphere	Free of corrosive gases No excessive dust
European EU standards	EMC : EN 61131-2 RoHS : EN IEC 63000
Overvoltage category	Category II or less
Pollution degree	2

(Note 1): For details about the Dielectric strength or the Insulation resistance, check on the specifications of each product.

Specifications of the USB Port

Item	Specifications
Standard	USB2.0 Fullspeed
Connector shape	USB miniB type

Specifications of the COM Port (RS-232C)

Item		Specifications
No. of channels		1
Physical layer		RS-232C, three-wire system (non-isolated)
Transmission distance		MAX. 15 m
Communication mode		1:1 communication
Communication method		Half-duplex transmission
Transmission line		Multicore shielded wire
Baud rate		9600 / 19200 / 38400 / 57600 / 115200 bps
Communication format	Data length	7 bit / 8 bit
	Parity	None, odd, even
	Stop bit	1 bit / 2 bit
	Start code	None
	End code	None
Connector shape		Removable terminal block (5-pin)

Specifications of the LAN Port

Item		Specifications
Number of ports		2
Communication interface		Ethernet 100BASE-TX / 10BASE-T
Baud rate		100 Mbps / 10 Mbps, automatic negotiation
Max. segment length		100 m (Note 1)
Max. distance between nodes		100BASE-TX 2 segments
		10BASE-T 5 segments
Communication cable		Shielded twisted pair (TIA/EIA-568B CAT5e or higher)
Communication protocol		TCP/IP UDP
No. of simultaneous connections	LAN1	Maximum 16 units (System connection: 1 unit, user connection: 15 units)
	LAN2	Max. 32 units, general-purpose: 16 units A cycle restriction is applied depending on the total number of connections.
Communication method		Full-duplex / half-duplex communication
TCP/IP protocol		TCP/IP compliant (IPV4)
Functions		• Modifying or holding the network settings (IP, Subnet, Gateway) • Possible to set the same or different networks between Ethernet ports. • Routing between Ethernet ports is not performed.
LED display	LINK	Lit when connection is established with the device on the Ethernet network.
	ACT	Flashes when some communication is performed such as transmitting commands and responses with the devices with established connections.

(Note 1): The standards cite 100m as the maximum, but noise resistance measures such as attaching a ferrite core may be necessary in some cases, depending on the usage environment. Also, it is recommended to position a hub near the control board, and limit the length within 10m.

Specifications of the RTEX/EtherCAT

Item	Specifications (RTEX type)	Specifications (EtherCAT type)
Baud rate	100 Mbps	
Physical layer	100BASE-TX full duplex (IEEE 802.3u)	
Cable	Shielded twisted pair (TIA/EIA-568B CAT5e or higher)	
Topology	Ring	Daisy chain (No branching)
Insulation method	Pulse transformer	
Connector	8-pin RJ45	
Maximum cable length	Between nodes: 100 m, total length: 200 m	
Transmission distance		Between nodes: 100 m, total length: 200 m
Communication cycle	500 µs to 2 ms	500 µs or more
Command update period	500 µs to 4 ms	
Operation command	Profile position, cyclic position / speed / torque	
Number of connectable axes	32 real axes , 20 virtual axes (Total 52 axes)	

High-speed Counter Input Specifications

Item	Specifications		
	Input A, B, Z signals		
	24 V DC	5 V DC	
		Open collector connection	Line driver connection
Insulation method	Optical coupler		
Rated input voltage	12 V DC to 24 V DC	5 V DC	Equivalent to AM26LS31
Operating voltage range	10.8 V DC to 26.4 V DC	3.5 V DC to 5.5 V DC	
Input points per common	Independent common for each point		
Min. ON voltage / Min. ON current	10 V DC / 4 mA	3 V DC / 4 mA	
Max. OFF voltage / Max. OFF current	2 V DC / 2 mA	1 V DC / 0.5 mA	
Input impedance	Approx. 3.9 kΩ	Approx. 560 Ω	
Operating mode indicator	6-point LED display		

Input Specifications

Item		Specifications
Insulation method		Optical coupler
Rated input voltage		24 V DC
Rated input current		Approx. 3 mA (at 24 V DC)
Input impedance		Approx. 6.8 kΩ
Operating voltage range		21.6 to 26.4 V DC
Min. ON voltage / Min. ON current		19.2 V DC / 6 mA
Max. OFF voltage / Max. OFF current		2.4 V DC / 1 mA
Response time	OFF→ON	135 µs max. (Possible to change by using the input time constant selection function)
	ON→OFF	135 µs max. (Possible to change by using the input time constant selection function)
Input points per common		16 points/1 common
Operating mode indicator		16-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P)

Output Specifications

Item		Specifications (sink type)	Specifications (source type) (EtherCAT type)
Insulation method		Optical coupler	Optical coupler
Output type		NPN open collector	PNP open collector
Rated load voltage		5 to 24 V DC	24 V DC
Allowable load voltage range		4.75 to 26.4 V DC	21.6 to 26.4 V DC
Max. load current		0.1 A	
Common restrictions		1.6 A/common	
Max. inrush current		1.0 A	
OFF state leakage current		1 µA or less	2 µA or less
ON state max. voltage drop		0.7 V or less	0.7 V or less
Response time	OFF→ON	6 µs or less (at an ambient temperature of 25°C)	
	ON→OFF	15 µs or less (at an ambient temperature of 25°C)	
External connection method	Voltage	4.75 to 26.4 V DC	21.6 to 26.4 V DC
	Current	15 mA or less (at 24 V DC)	200 mA or less (at 24 V DC)
Surge absorber		Zener diode	
Short-circuit protection		Provided (to automatically protect every eight points) (Note 1)	
Input points per common		16 points/1 common	
Operating mode indicator		16-point LED display (Lit when ON, SW selection)	
External connection method		Connector connection (Compliant with the MIL standard, 40P)	

(Note 1): When the maximum inrush current is exceeded, eight output points in the same protection block are turned OFF simultaneously.

Specifications

Digital Input Unit Specifications

AGM1X64D2

Item		Specifications
Insulation method		Optical coupler
Rated input voltage		24 V DC
Rated input current		Approx. 3.4 mA (at 24 V DC)
Input impedance		Approx. 6.8 kΩ
Operating voltage range		20.4 to 26.4 V DC
Min. ON voltage / Min. ON current		19.2 V DC / 2.5 mA
Max. OFF voltage / Max. OFF current		5 V DC / 1.5 mA
Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)
	ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)
Input points per common		32 points/1 common
Operating mode indicator		Operating mode indicator: 32-point LED display (Lit when ON, SW selection)
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)

Digital Output Unit Specifications

AGM1Y64T
AGM1Y64P

Item		Specifications (sink type)	Specifications (source type)
Insulation method		Optical coupler	
Output type		NPN open collector	PNP open collector
Rated load voltage		5 to 24 V DC	
Allowable load voltage range		4.75 to 26.4 V DC	
Max. load current		0.3 A (20.4 to 26.4 V DC), 30 mA (4.75 V DC)	
Common restrictions		3.2 A/common	
Max. inrush current		0.6 A	
OFF state leakage current		1 μA or less	
ON state max. voltage drop		0.5 V or less	
Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)	
	ON→OFF	0.3 ms or less (Load current: 2 mA or more)	0.5 ms or less (Load current: 2 mA or more)
External power supply	Voltage	4.75 to 26.4 V DC	
	Current	120 mA or less (at 24 V DC)	140 mA or less (at 24 V DC)
Surge absorber		Zener diode	
Short-circuit protection		None	
Input points per common		32 points/1 common	
Operating mode indicator		32-point LED display (Lit when ON, selection using the display selector switch)	
External connection method		Connector connection (Compliant with the MIL standard, 40P, two pieces used)	

Digital Input / Output unit Specifications

AGM1XY64D2T
AGM1XY64D2P

Item			Specifications (sink type)	Specifications (source type)
Input specifications	Insulation method		Optical coupler	
	Rated input voltage		24 V DC	
	Rated input current		Approx. 3.4 mA (at 24 V DC)	
	Input impedance		Approx. 6.8 kΩ	
	Operating voltage range		20.4 to 26.4 V DC	
	Min. ON voltage / Min. ON current		19.2 V DC / 2.5 mA	
	Max. OFF voltage / Max. OFF current		5 V DC / 1.5 mA	
	Response time	OFF→ON	0.2 ms max. (Possible to change by using the input time constant selection function)	
		ON→OFF	0.2 ms max. (Possible to change by using the input time constant selection function)	
	Input points per common		32 points/1 common	
Output specifications	Insulation method		Optical coupler	
	Output type		NPN open collector	PNP open collector
	Rated load voltage		5 to 24 V DC	
	Allowable load voltage range		4.75 to 26.4 V DC	
	Max. load current		0.3 A (20.4 to 26.4 V DC), 30 mA (4.75 V DC)	
	Common restrictions		3.2 A/common	
	Max. inrush current		0.6 A	
	OFF state leakage current		1 μA or less	
	ON state max. voltage drop		0.5 V or less	
	Response time	OFF→ON	0.1 ms or less (Load current: 2 mA or more)	
		ON→OFF	0.3 ms or less (Load current: 2 mA or more)	0.5 ms or less (Load current: 2 mA or more)
	External power supply	Voltage	4.75 to 26.4 V DC	
		Current	120 mA or less (at 24 V DC)	140 mA or less (at 24 V DC)
	Surge absorber		Zener diode	
	Short-circuit protection		None	
	Input points per common		32 points/1 common	
Operating mode indicator			32-point LED display (Lit when ON, selection using the display selector switch)	
External connection method			Connector connection (Compliant with the MIL standard, 40P, two pieces used)	

Analog input unit Specifications

AGM1AD8

Item		Specifications
No. of input points		8 ch
Input range (resolution)	Voltage	-10 to +10 V DC (Resolution: 1/64,000) 0 to +10 V DC (Resolution: 1/32,000) -5 to +5 V DC (Resolution: 1/64,000) 0 to +5 V DC (Resolution: 1/32,000) +1 to +5 V DC (Resolution: 1/25,600) (Note 1)
	Current	0 to + 20 mA (Resolution: 1/32,000) +4 to + 20 mA (Resolution: 1/25,600) (Note 1)
Conversion speed		50 µs/ch
Exceeding the rated range		Possible to output up to the rated value ± 2%. With the 0 to 20 mA range, the lower limit is not supported for exceeding the rated range. (Note 2)
Total accuracy		±0.2 %F.S. or less (at +25 °C) ±0.4 %F.S. or less (at 0 to +55 °C)
Input impedance		Voltage input: Approximately 1 MΩ; current input: Approximately 250 Ω
Absolute max. input		Voltage input: Approximately -15 V to +15 V; current input: Approximately -30 mA to +30 mA
Insulation method		Between input terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Non-insulated
Execution / Non-execution channel settings		Possible to make non-converted channel settings.
Input range selection		Possible to make settings on a channel-by-channel basis.
Average processing	Number of averaging times	Setting range of 2 to 60,000 times
	Time average	Time setting range of 1 to 1,500 ms
	Moving average	Setting range of 2 to 2,000 times
Offset / Gain settings		A desired value within the digital output range can be set for the offset value. Setting range: -3000 to +3000 A desired value within the digital output range can be set for the gain value. Setting range: +9000 to +11000 (90 % to 110 %)
Scale conversion settings		A desired value within the digital output range can be set for the scale conversion setting value. Setting range: -32768 to +32767
Upper limit / lower limit comparison		Output if the value is outside the preset upper limit or lower limit. Setting range: -32768 to +32767
Max. / Min. hold		Holding max. / min. values sampled
Disconnection detection		Disconnection detection is possible for the following ranges. Possible to select auto or manual resetting. • 1 to 5 V range (Detection level: 0.7 V or less) • 4 to 20 m Arange (Detection level: 2.8 mA or less)

(Note 1): The full scale (F.S.) on the accuracy of an analog voltage input range from +1 to +5 V and that of an analog current input range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.
(Note 2): When a value exceeding the rated value ±2% is set, the output is rounded to a value equivalent to the rated value ±2%.

Analog output unit Specifications

AGM1DA4

Item		Specifications
No. of output points		4 ch
Output range (resolution) (Note 1)	Voltage	-10 to +10 V DC (Resolution: 1/64,000) 0 to +10 V DC (Resolution: 1/32,000) -5 to +5 V DC (Resolution: 1/64,000) 0 to +5 V DC (Resolution: 1/32,000) +1 to +5 V DC (Resolution: 1/25,600)
	Current	0 to +20 mA(Resolution: 1/32,000) +4 to +20 mA (Resolution: 1/25,600)
Conversion speed		50 µs/4 ch
Exceeding the rated range		Possible to output up to the rated value ± 2%. With the 0 to 20 mA range, the lower limit is not supported for exceeding the rated range. (Note 2)
Total accuracy		±0.2 %F.S. or less (at +25 °C) ±0.4 %F.S. or less (at 0 to +55 °C)
Output impedance (voltage output)		0.5 Ω or less
Maximum output current (voltage output)		10 mA
Output allowable load resistance (current output)		500 Ω or less
Insulation method		Between output terminals and internal circuit: Photocoupler and isolated DC/DC converter Between channels: Non-insulated
Execution / Non-execution channel settings		Possible to make non-converted channel settings.
Clipping function		Upper and lower output limits can be set for digital input values. Setting range: -32,640 to +32,640
Scale conversion settings		A desired value within the digital input range can be set for the scale conversion setting value. Setting range: -32768 to +32767
Offset / Gain settings		A desired value within the digital input range can be set for the offset value. Setting range: -3,000 to + 3,000 A desired value within the digital input range can be set for the gain value. Setting range: + 9000 to +11000 (90 % to 110 %)
Analog output hold (in STOP mode)		A desired output value while in STOP mode can be set as a digital value. Setting range: -32640 to +32640

(Note 1): The full scale (F.S.) on the accuracy of an analog voltage output range from +1 to +5 V and that of an analog current output range from +4 to +20 mA are 0 to +5 V and 0 to +20 mA, respectively.
(Note 2): When a value exceeding the rated value ±2% is set, the output is rounded to a value equivalent to the rated value ±2%.

Specifications

Performance Specifications of the Pulse Output Unit

AGM1PG04T
AGM1PG04L

Item		Specifications	
Product No.		AGM1PG04T	AGM1PG04L
Output type		Transistor	Line driver
Number of control axes		4 axis, independent	
Position command	Command unit	Pulse unit (for increment or absolute)	
	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	1 pps to 4 Mpps
		(can be set in 1 pps.)	(can be set in 1 pps.)
Acceleration / deceleration command	Acceleration / deceleration method	Linear acceleration / deceleration, S-shaped acceleration / deceleration control	
	S-shape pattern	Sine curve, Cubic curve (can be select)	
Home return	Home return speed	Speed setting possible (changes return speed and search speed)	
	Input signal	Home input, near home input, over limit input (+), over limit input (-)	
	Output signal	Deviation counter clear signal	
Operation mode		•E-point control (Linear and S-shaped acceleration / deceleration) •P-point control (Linear and S-shaped acceleration / deceleration) •Home return (Home search) •JOG operation (Note 1) •JOG positioning •Pulser input operation (Note 2) Transfer multiplication ratio (×1, ×2, ×5, ×10, ×50, ×100, ×500, ×1000) •Real-time frequency change function	
Startup time		0.001 ms / 0.005 ms / 0.02 ms	
Output interface	Output mode	Pulse/Sign, CW/CCW	
Feedback counter function (Note 2)	Counting range	Signed 32 bits (-2,147,483,648 to +2,147,483,647 pulses)	
	Input mode	2-phase input, direction identification input, individual input (transfer multiple available for each mode)	
	Max. counting speed	4 MHz (2-phase input)	
		1 MHz (Direction distinction input and individual input)	
Other functions		•Built-in over limit input (+) and over limit input (-) •Servo ON output incorporated	

(Note 1): When Linear acceleration/deceleration operation is selected, the target speed can be changed during an operation.
(Note 2): "Pulser input operation" and "Feedback counter" use the same pulse input terminal. Either function of the two can only be used.

Serial Communication Unit

AGM1NSCS2
AGM1NSCM2
AGM1NSCS1M1

Item		Specifications		
Product No.		AGM1NSCS2	AGM1NSCM2	AGM1NSCS1M1
Interface	Connector 1	RS-232C	RS-422A / 485	RS-232C
	Connector 2	RS-232C	RS-422A / 485	RS-422A / 485
Communication method	RS-232C	Full-duplex / half-duplex	-	Full-duplex / half-duplex
	RS-422A	-	Full-duplex / half-duplex	Full-duplex / half-duplex
	RS-485	-	Half-duplex	Half-duplex
Transmission distance (Note 1)	RS-232C	Max. 15 m	-	Max. 15 m
	RS-422A	-	Max. 1,200 m (Note 1) (total extension distance)	Max. 1,200 m (Note 1) (total extension distance)
	RS-485			
Transmission mode Number of destination units	RS-232C	1:1	-	1:1
	RS-422A	-	1:1	1:1
	RS-485	-	1:N (N = 32 max.)	1:N (N = 32 max.)
Protocol		General-purpose communication / Modbus-RTU (master / slave)		
Baud rate	General-purpose communication	1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 / 230,400 bps		
	Modbus-RTU	1,200 / 2,400 / 4,800 / 9,600 / 19,200 / 38,400 / 57,600 / 115,200 bps		
Maximum data length	General-purpose communication	1,024 Byte		
	Modbus-RTU	252 Byte		
Communication format	Data length	7bit / 8bit		
	Parity	None, odd, even		
	Stop code	1bit / 2bit		
	Start code	None		
	End code	None		

(Note 1): Check the transmission distance using the actual unit as it may depend on the destination device. The recommended transmission distance is 100 m or less.

List of consumption current

Unit type		Consumption current
GM1 controller RTEX type	AGM1CSRX16T	400 mA or less
GM1 controller EtherCAT type	AGM1CSEC16T	400 mA or less
	AGM1CSEC16P	400 mA or less
Digital Input / output unit	AGM1X64D2	90 mA or less (*1)
	AGM1Y64T	160 mA or less (*1)
	AGM1Y64P	160 mA or less (*1)
	AGM1XY64D2T	120 mA or less (*1)
	AGM1XY64D2P	120 mA or less (*1)
Analog input / output unit	AGM1AD8	160 mA or less (*1)
	AGM1DA4	320 mA or less (*1)
Pulse output unit	AGM1PG04T	120 mA or less (*1)
	AGM1PG04L	120 mA or less (*1)
Serial Communication Unit	AGM1NSCS2	120 mA or less (*1)
	AGM1NSCM2	140 mA or less (*1)
	AGM1NSCS1M1	150 mA or less (*1)

*1 This is the increase in the current consumption of the controller.
(Operating voltage range: 20.4 - 28.8 V)

Product types

Controller

Product name	Number of axes	Network	Number of I/O	High-speed counter	Rated voltage	Output specifications	Part No.
GM1 controller *1 	32 axes	RTEX	Input: 16 points Output: 16 points	2 ch	24 V DC	Transistor output sink(NPN)	**AGM1CSRX16T**
		EtherCAT					**AGM1CSEC16T**
						Transistor output sauce(PNP)	**AGM1CSEC16P** *2

Digital Input / output unit

Product name	Type	Number of I/O	Specifications	Part No.
Digitsl Input / output unit *1 	DC input	Input: 64 points	24 V DC 32 points/1 common	**AGM1X64D2**
	Transistor output sink(NPN)	Output: 64 points	Maximum load current: 0.3 A (20.4 to 26.4 V DC), 30 mA (4.75 V DC) 3.2 A/common 32 points/1 common	**AGM1Y64T**
	Transistor output sauce(PNP)			**AGM1Y64P** *2
	DC input Transistor output sink(NPN)	Input: 32 points Output: 32 points	Input: 24 V DC 32 points/1 common Output: Maximum load current: 0.3 A (20.4 to 26.4 V DC), 30 mA (4.75 V DC) 3.2 A/common 32 points/1 common	**AGM1XY64D2T**
	DC input Transistor output sauce(PNP)			**AGM1XY64D2P** *2

Analog input / output unit

Product name	Specifications	Number of channels	Part No.
Analog input unit 	Conversion speed 50 µs/ch Resolution 16 bit (maximum) Accuracy ±0.2 %F.S. or less (at+25 °C)	8 ch	**AGM1AD8**
Analog output unit 	Conversion speed 50 µs/4 ch Resolution 16 bit (maximum Accuracy ±0.2 %F.S. or less (at+25 °C)	4 ch	**AGM1DA4**

Pulse output unit

Product name	Output type	Number of control axes	Speed command	Part No.
Pulse output unit *1 	Transistor	4 axes	1 pps to 500 kpps	**AGM1PG04T**
	Line driver		1 pps to 4 Mpps	**AGM1PG04L**

Serial communication unit

Product name	Specifications	Part No.
Serial Communication Unit 	RS-232C × 2ch	**AGM1NSCS2**
	RS-422A/485 × 2ch	**AGM1NSCM2**
	RS-232C × 1ch RS-422A/485 × 1ch	**AGM1NSCS1M1**

Option

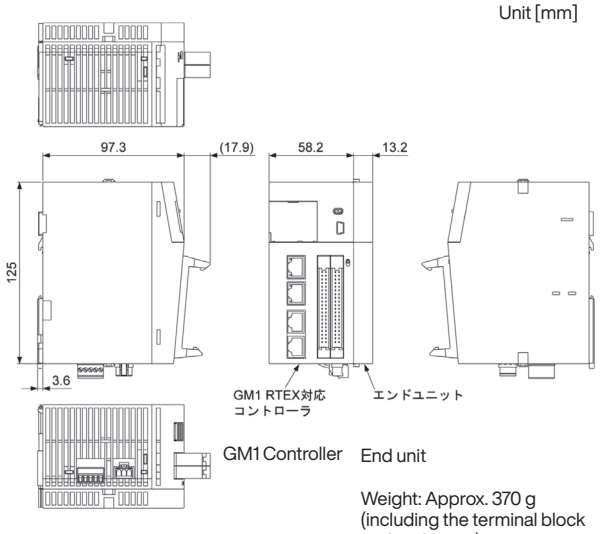
Product name	Description	Part No.
Discrete-wire connector set (40-pin) 	For GM1 Controller, for Expansion Unit (including 2 pieces)	**AFP2801**
Flat cable connector set (40-pin) 	Used when wiring flat cable For GM1 Controller, for Expansion Unit (including 2 pieces)	**AFP2802**
Push-in connector set (40-Pole) 	Used when connecting with ferrule terminals For GM1 Controller, for Expansion Unit (including 2 pieces)	**AFP2808**

*1 Connectors are not included with GM1 controller, Digital Input/Output unit and Pulse output unit. Please ensure you have the following connectors.
Discrete-wire connector set (Part No.: AFP2801) Flat cable connector set (Part No.: AFP2802) Push-in connector set (Part No.: AFP2808)
Power cable (Part No.: AFPG805) is included with GM1 controller.
*2 The PNP type complies with Korean KC from May 2024 production lot.

Dimensions

GM1 controller (RTEX type)

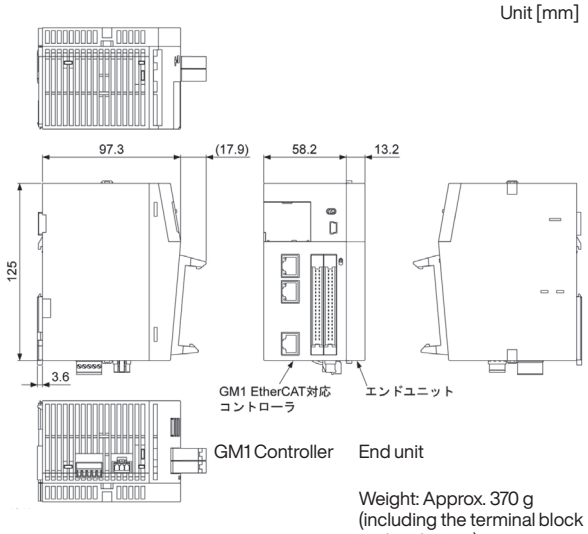
Unit [mm]



Weight: Approx. 370 g
(including the terminal block and end cover)

GM1 controller (EtherCAT type)

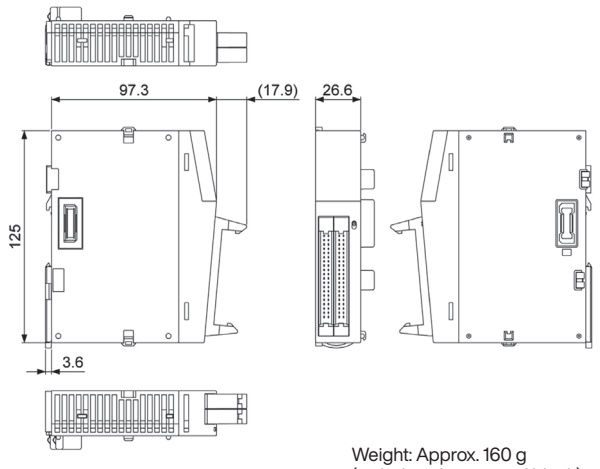
Unit [mm]



Weight: Approx. 370 g
(including the terminal block and end cover)

Digital Input / output unit / Pulse output unit

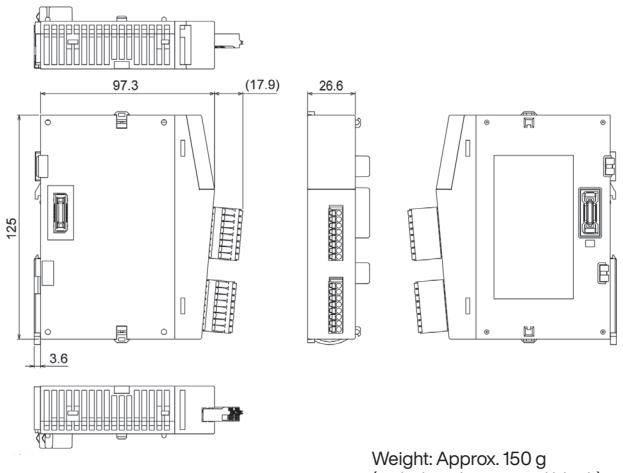
Unit [mm]



Weight: Approx. 160 g
(including the terminal block)

Analog input / output unit

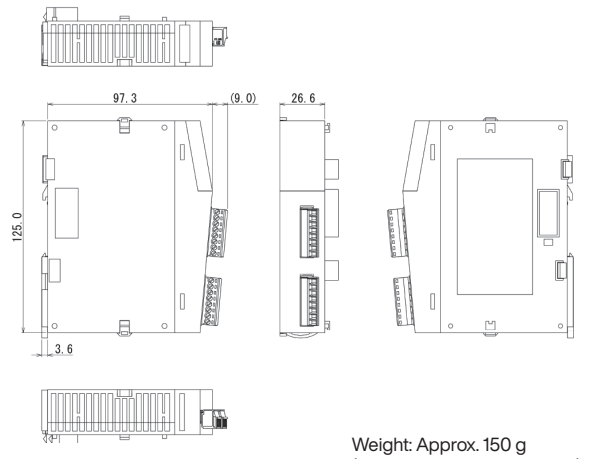
Unit [mm]



Weight: Approx. 150 g
(including the terminal block)

Serial communication unit

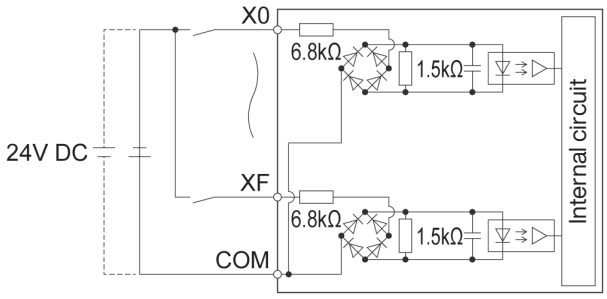
Unit [mm]



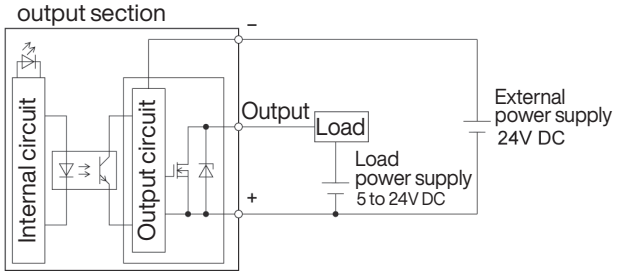
Weight: Approx. 150 g
(including the terminal block)

Circuit Diagram

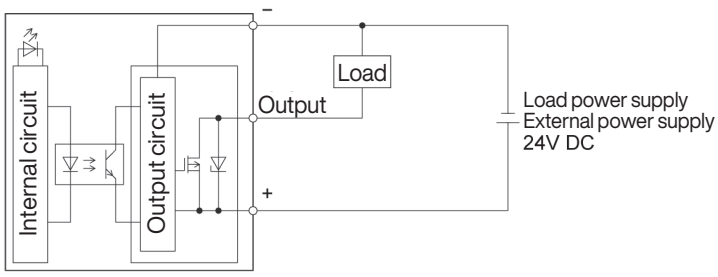
■ Internal circuit diagram of the GM1 Controller input section



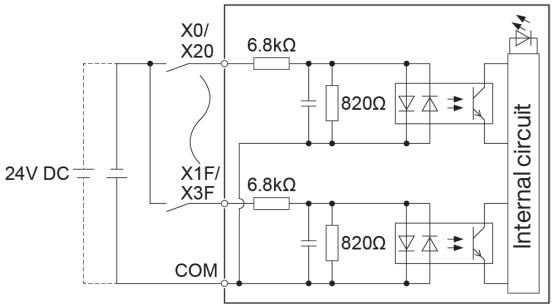
■ Internal circuit diagram of the GM1 Controller (sink type) output section



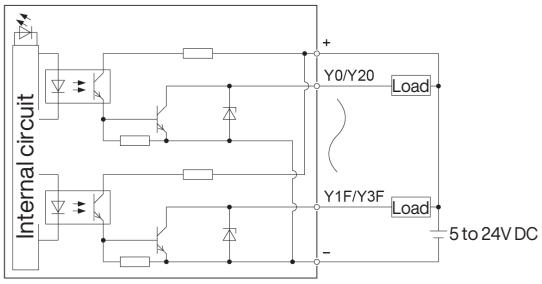
■ Internal circuit diagram of the GM1 Controller output section



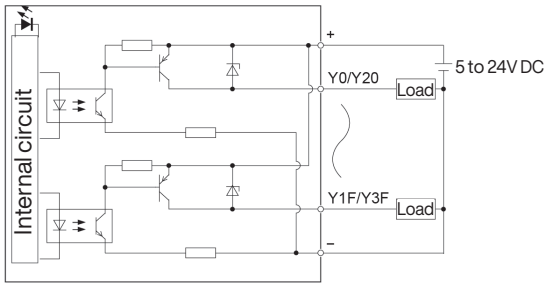
■ Internal circuit diagram of the 64-point digital input unit



■ Internal circuit diagram of the 64-point digital output unit (sink type)

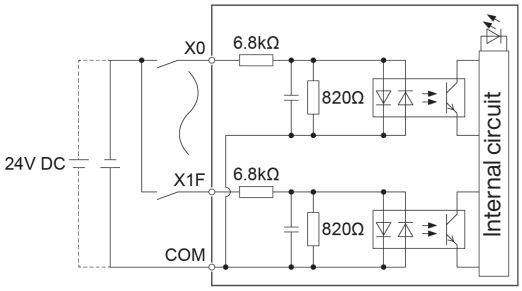


■ Internal circuit diagram of the 64-point digital output unit (source type)

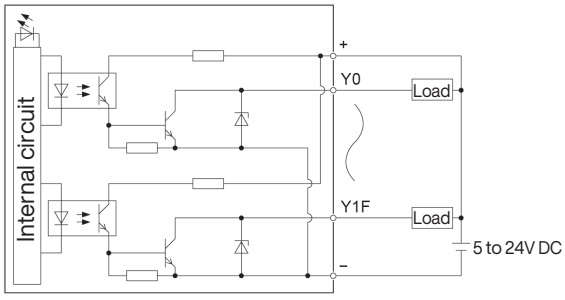


■ Internal circuit diagram of the 64-point digital input / output unit (sink type)

Input section (32 points)

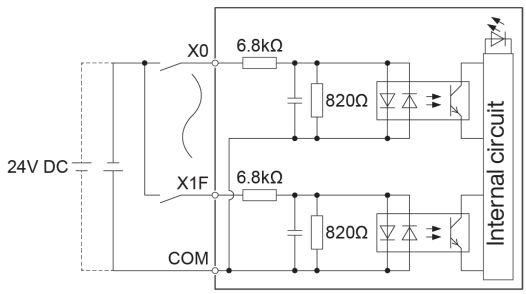


Output section (32 points)

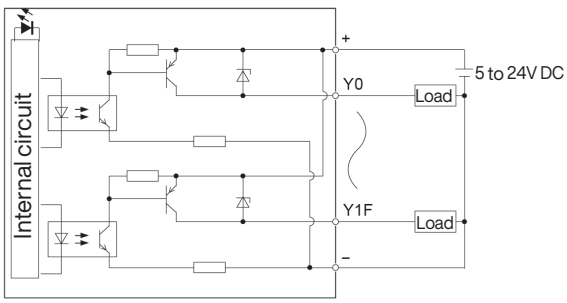


■ Internal circuit diagram of the 64-point digital input / output unit (source type)

Input section (32 points)



Output section (32 points)



MINAS A6 Family

Programmable Controller

Controller

RTEX
Realtime Express

EtherCAT®

Simple network
small axis
and distributed control

Open network
multi-axis and high-speed

Amplifier

Standard type
A6NE series

Multi function type
A6NF series

Standard type
A6NM series
A6NL series
Special Order Product

Rotary motor

Linear motor / DD motor

*The photograph represents A6NM series.

Standard type
A6BE series

Multi function type
A6BF series

Standard type
A6BM series
A6BL series
Special Order Product

Rotary motor

Linear motor / DD motor

*The photograph represents A6NM series.

AC Servo Motor

Motor

MSMF
Low inertia

MQMF
Middle inertia/
Flat type

MDMF
Middle inertia

MGMF
Middle inertia/
Low speed/High torque type

MHMF
High inertia

Special Order Product For more information, visit the website or please request to our distributors separately.

Motor Line-up

Motor			Rated output (kW)	Rated rotational speed (Max. speed) (r/min)	Rotary encoder 23 bit absolute	Enclosure	Motor lead-out configuration	Features	Applications
Low inertia	MSMF	 80 mm sq. or less	0.05 0.1 0.2 0.4 0.75 1.0	3000 (6000)	○	IP65	Leadwire	• Small capacity • Suitable for high speed application • Suitable for all applications	• Bonder • Semiconductor production equipment • Packing machines etc
		 80 mm sq. or less	0.05 0.1 0.2 0.4 0.75 1.0	3000 (6000)	○	IP67	Connector		
		 100 mm sq. or more	1.0 1.5 2.0 3.0	3000 (5000)	○	IP67	Connector	• Middle capacity • Suitable for the machines directly coupled with ball screw and high stiffness and high repetitive application	• SMT machines • Food machines • LCD production equipment etc
			4.0 5.0	3000 (4500)					
Middle inertia	MQMF (Flat type)	 80 mm sq. or less	0.1 0.2 0.4	3000 (6500)	○	IP65	Leadwire	• Small capacity • Flat type and suitable for low stiffness machines with belt driven • Motors with gear reducers are also available.	• SMT machines • Inserter machines • Belt drive machines • unloading robot
		 80 mm sq. or less	0.1 0.2 0.4	3000 (6500)	○	IP67	Connector		
	MDMF	 130 mm sq. or more	1.0 1.5 2.0 3.0 4.0 5.0	2000 (3000)	○	IP67 (22.0 kW : IP44)	Connector (22.0 kW : Terminal)	• Middle capacity • Suitable for low stiffness machines with belt driven	• Conveyors • Robots • Machine tool etc
			7.5	1500 (3000)					
			11.0 15.0 22.0	1500 (2000)					
	MGMF (Low speed/ High torque type)	 130 mm sq. or more	0.85 1.3 1.8 2.4 2.9 4.4 5.5	1500 (3000)	○	IP67	Connector	• Middle capacity • Suitable for low speed and high torque application	• Conveyors • Robots • Textile machines etc
High inertia	MHMF	 80 mm sq. or less	0.05 0.1 0.2 0.4	3000 (6500)	○	IP65	Leadwire	• Small capacity • Suitable for low stiffness machines with belt driven • Motors with gear reducers are also available.	• Conveyors • Robots etc
			0.75 1.0	3000 (6000)					
		 80 mm sq. or less	0.05 0.1 0.2 0.4	3000 (6500)	○	IP67	Connector		
			0.75 1.0	3000 (6000)					
		 130 mm sq. or more	1.0 1.5 2.0 3.0 4.0 5.0	2000 (3000)	○	IP67	Connector	• Middle capacity • Suitable for low stiffness machines with belt driven, and large load moment of inertia	• Conveyors • Robots • LCD manufacturing equipment etc
			7.5	1500 (3000)					

NETWORK MOTION

	GM1	FP0H	FP-XH M8N
Controller			
Network	RTEX EtherCAT	RTEX	RTEX
Corresponding AC servomotor	MINAS A6N / A5N MINAS A6B / A5B	MINAS A6N / A5N	MINAS A6N / A5N
Maximum number of sync axes	RTEX 32 axes EtherCAT 32 axes	4/8 axes	8 axes
Command update period (Max.)	500 µs	1 ms	1 ms
Operation command	position / speed / torque	position	position
Interpolation control	Straight line / Arc / Spiral	Straight line / Arc / Spiral	Straight line / Arc / Spiral
Synchronization command	Cam synchronization, Gear synchronization, CNC control	Synchronization, Electronic cam, Electronic clutch, Electronic gear	Synchronization, Electronic cam, Electronic clutch, Electronic gear
Tool	GM Programmer	Control FPWIN GR7 Control FPWIN Pro7	Control FPWIN GR7 Control FPWIN Pro7
Ethernet Port	2 port *IP address can be set for each port	2 port *Only one IP address can be set	none
Communication protocol (Ethernet)	OPC UA, EtherNet / IP, Modbus-TCP, CodesysV3	EtherNet / P, Modbus-TCP, MC protocol	
FTP server function	○	○	
System scale	Large ←		→ Small

⚠ Safety Precautions

- **Before you use the product, please carefully read through the instruction manual, the installation instructions and the manuals, and understand them in detail to use the product properly.**

Please contact .....

Panasonic Industry Co., Ltd.
Industrial Device Business Division
7-1-1 Morofuku, Daito City, Osaka, 574-0844, Japan
industrial.panasonic.com/ac/e/

Panasonic INDUSTRY

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No.PCE-GM1-7 2025.5