

Analog I/O Expansion Modules

Features:

- 8 modules
- 0-10V, 4-20mA, RTD, Thermocouple, Thermistor inputs, 0-10V DC or -10V DC to 10V DC output
- 12 or 16-bit resolution
- Fast conversion time
- Maximum of 56 I/O can be configured in the MicroSmart Pentra system
- Easy to configure using a Macro instruction in WindLDR

Modules

Appearance	Part Number	I/O Points	Input	Output	Resolution	Terminal
	FC4A-J8C1	8 (8 inputs)		—	16-bit (0-50000)	
	FC4A-L03A1	3 (2 inputs, 1 output)	0-10V DC, 4-20mA	0-10V DC, 4-20mA	12-bit (0-4095)	
	FC4A-J2A1	2 (2 inputs)		—		Removable Screw Terminals
	FC4A-J4CN1	4 (4 inputs)	0-10V DC, 4-20mA, RTD, Thermocouple	—	16-bit (0-50000)	
	FC4A-L03AP1	3 (2 inputs, 1 output)	RTD, Thermocouple	0-10V DC, 4-20mA	12-bit (0-4095)	

PLCs

Operator Interfaces

Automation Software

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Communication & Networking

Analog I/O Expansion Modules

Modules (cont.)

Appearance	Part Number	I/O Points	Input	Output	Resolution	Terminal
	FC4A-J8AT1	8 (8 inputs)	Thermistor (NTC/PTC)	—	12-bit (0-4000)	Removable Screw Terminals
	FC4A-K2C1	2 (2 outputs)	—	-10 to 10V DC, 4-20mA	16-bit (0-50000)	
	FC4A-K1A1	1 (1 output)	—	0-10V DC, 4-20mA	12-bit (0-4095)	

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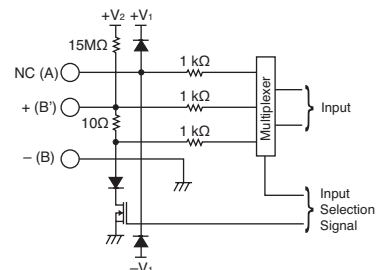
Communication & Networking

Analog I/O Modules Specifications

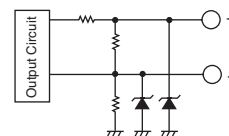
Analog I/O Module Specifications

Part Number	FC4A-L03A1	FC4A-L03AP1	FC4A-J2A1	FC4A-K1A1
Input Points	2	2	2	—
Input Signal	Voltage input (0 to 10V DC) Current input (4 to 20mA)	Thermocouple Resistance thermometer	Voltage input (0 to 10V DC) Current input (4 to 20mA)	—
Output Points	1	1	—	1
Output Signal	Voltage output (0 to 10V DC) Current output (4 to 20mA)	Voltage output (0 to 10V DC) Current output (4 to 20mA)	—	Voltage output (0 to 10V DC) Current output (4 to 20mA)
Power Voltage	24V DC			
Allowable Voltage Range	20.4 to 28.8V DC			
External Current Draw *	45mA (24V DC)	40mA (24V DC)	35mA (24V DC)	40mA (24V DC)
Connector on Mother Board	MC1.5/11-G-3.81BK (Phoenix Contact)			
Connector Insertion/Removal Durability	100 times minimum			
Applicable Ferrule	1 terminal: A1 0.5-8 WH, 2 terminals: A1-TWIN 2×0.5-8 WH			
Internal Current Draw	50mA (5V DC)			
Internal Power Consumption	0.34W (at 24V DC while all I/Os are ON)			
Weight	85g			

Input Circuit



Output Circuit



Part Number	FC4A-J4CN1	FC4A-J8C1	FC4A-J8AT1	FC4A-K2C1
I/O Points	4 inputs	8 inputs	8 inputs	2 outputs
Power Voltage	24V DC			
Allowable Voltage Range	20.4 to 28.8V DC			
Connector on Mother Board	MC1.5/11-G-3.81BK (Phoenix Contact)			
Connector Insertion/Removal Durability	100 times minimum			
Internal Current Draw	5V DC	30mA	30mA	30mA
	24V DC	0mA	0mA	45mA
External Current Draw *	50mA (24V DC)	40mA (24V DC)	25mA (24V DC)	75mA (24V DC)
Weight	140g	140g	125g	110g

* The external current draw is the value when all the analog inputs are used and the analog output value is at 100%.

Analog Input Specifications (1)

Part Number		FC4A-L03A1, FC4A-J2A1		FC4A-L03AP1	
Input Signal		Voltage Input 0 to 10V	Current Input 4 to 20mA	Thermocouple Type K (0 to 1300°C) Type J (0 to 1200°C) Type T (0 to 400°C)	Resistance Thermometer Pt100 3-wire type (–100 to 500°C)
Input Impedance		1 MΩ minimum	10Ω	1 MΩ minimum	1 MΩ minimum
Allowable Conductor Resistance (per wire)		—	—	—	200Ω maximum
Input Detection Current		—	—	—	1.0mA maximum
Sampling Duration Time		20ms maximum		20ms maximum	
Sampling Repetition Time		20ms maximum		20ms maximum	
Total Input System Transfer Time		105ms + 1 scan time		200ms + 1 scan time	
Input		Single-ended	Differential		
Operating Mode		Self-scan			
Conversion Method		Σ Δ type ADC			
Input Error	Maximum Error at 25°C	±0.2% of full scale		±0.2% of full scale plus reference junction compensation accuracy (±4°C maximum)	±0.2% of full scale
	Temperature Coefficient	±0.006% of full scale /°C			
	Repeatability after Stabilization Time	±0.5% of full scale			
	Non-linearity	±0.2% of full scale			
	Maximum Error	±1% of full scale			
Digital Resolution		4096 increments (12 bits)			
Output Value of LSB		2.5mV	4μA	Type K: 0.325°C Type J: 0.300°C Type T: 0.100°C	0.15°C
Data Type in Application Program		Default: 0 to 4095 (12-bit data) Optional: –32768 to 32767 (optional range designation) ¹			
Monotonicity		Yes			
Input Data Out of Range		Detectable ²			
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% maximum when a 500V clamp voltage is applied to the power and I/O wiring			Accuracy is not assured when noise is applied.
	Input Filter	No			
	Cable	Twisted pair shielded cable is recommended for improved noise immunity		—	
	Crosstalk	2 LSB maximum			
Dielectric Strength		500V (between input and power circuit)			
Type of Protection		Photocoupler-isolated (between input and internal circuit)			
Effect of Improper Input Connection		No damage			
Maximum Permanent Allowed Overload (No Damage)		13V DC	40mA	—	
Selection of Analog Input Signal		Using software programming			
Calibration or Verification to Maintain Rated Accuracy		N/A			



- 1: The 12-bit data (0 to 4095) processed in the analog I/O module can be linear-converted to a value between -32768 and 32767. The optional range designation, and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
- 2: When an error is detected, a corresponding error code is stored to a data register allocated to analog I/O operating status.

Analog Input Specifications (2)

Part Number		FC4A-J4CN1, FC4A-J8C1		FC4A-J4CN1		FC4A-J8AT1	
Input Signal		Voltage Input	Current Input	Thermocouple	Resistance Thermometer	NTC Thermistor	PTC Thermistor
Input Range		0 to 10V	4 to 20mA	Type K (0 to 1300°C) Type J (0 to 1200°C) Type T (0 to 400°C)	Pt100, Pt1000 3-wire type (–100 to 500°C) Ni100, Ni1000 3-wire type (–60 to 180°C)	–50 to +150°C	
Input Impedance		1 MΩ minimum	12 Ω (FC4A-J4CN1)	0.9 MΩ minimum	—	—	
			100Ω (FC4A-J8C1)	—	—	—	
Input Detection Current		—	—	—	0.1mA	0.1mA	
Sampling Duration Time		FC4A-J4CN1: 5ms maximum				1ms maximum	
		FC4A-J8C1: 1ms maximum		—		—	
Sampling Repetition Time		FC4A-J4CN1: 5ms maximum				10ms × channels	
		FC4A-J8C1: 1ms maximum		—		—	
Total Input System Transfer Time		FC4A-J4CN1: 40ms/ch + 1 scan time				10ms/ch + 1 scan time	
		FC4A-J8C1: 6ms/ch + 1 scan time		—		—	
Input		Single-ended input					
Operating Mode		Self-scan					
Conversion Method		Σ Δ type ADC (FC4A-J4CN1), Successive approximation register method (FC4A-J8C1, FC4A-J8AT1)					
Input Error	Maximum Error at 25°C	—		±0.005% of full scale /°C			
	Plus Reference Junction Compensation Accuracy	—	—	—	±2°C maximum		—
	Temperature Coefficient	±0.005% of full scale/°C					
	Repeatability after Stabilization Time	±0.5% of full scale				±0.5% of full scale /°C	
	Non-linearity	±0.04% of full scale				Non-linear	
	Maximum Error	±1% of full scale				±1% of full scale	
Digital Resolution		50000 increments (16 bits)		Type K: Approx. 24000 increments (15 bits) Type J: Approx. 33000 increments (15 bits) Type T: Approx. 10000 increments (14 bits)	Pt100: Approx. 6400 increments (13 bits) Pt1000: Approx. 64000 increments (16 bits) Ni100: Approx. 4700 increments (13 bits) Ni1000: Approx. 47000 increments (16 bits)	Approx. 4000 increments (12 bits)	
Output Value of LSB		0.2mV	0.32μA	Type K: 0.058°C Type J: 0.038°C Type T: 0.042°C	Pt100: 0.086°C Pt1000: 0.0086°C Ni100: 0.037°C Ni1000: 0.0037°C	30Ω	
Data Type in Application Program		Default: 0 to 50000 Optional: –32768 to 32767 (optional range designation) ²				Default: 0 to 4000	
						Optional: –32768 to 32767 (optional range designation) ¹	
						Temperature: C, °F	—
		—		Temperature: °C, °F		Resistance: 0 to 10000	
Monotonicity		Yes					
Input Data Out of Range		Detectable					
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	Accuracy is not assured when noise is applied.					
	Input Filter	Software selectable					
	Cable	Twisted pair shielded cable is recommended for improved noise immunity			—		Twisted pair shielded cable is recommended for improved noise immunity
	Crosstalk	2 LSB maximum					
Isolation		Between input and power circuit: Isolated Between input and internal circuit: Photocoupler-isolated					

Effect of Improper Input Connection	No damage			
Maximum Permanent Allowed Overload (No Damage)	11V DC	22mA DC	—	—
Selection of Analog Input Signal	Using software programming			
Calibration or Verification to Maintain Rated Accuracy	N/A			

- 1: The 16-bit data (0 to 50000) processed in the analog I/O module can be linear-converted to a value between -32768 and 32767. The optional range designation, and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.
- 2: When an error is detected, a corresponding error code is stored to a data register allocated to analog I/O operating status.

Analog Output Specifications

Part Number		FC4A-L03A1	FC4A-L03AP1	FC4A-K1A1	FC4A-K2C1
Output Voltage		0 to 10V DC			-10 to +10V DC
Output Range		4 to 20mA			
Load Impedance		Voltage Output: 2kΩ minimum Current Output: 300kΩ maximum			
Load		Resistive load			
Settling Time		50ms	130ms	50ms	1ms/ch
Total Output Transfer Time		50ms + 1 scan time	130ms + 1 scan time	50ms + 1 scan time	1ms × channels+ 1 scan time
Output Error	Maximum Error at 25× C	±0.2% of full scale			
	Temperature Coefficient	±0.015% of full scale/°C			±0.005% of full scale/°C
	Repeatability after Stabilization Time	±0.5% of full scale			
	Output Voltage Drop	±1% of full scale			
	Non-linearity	±0.2% of full scale			
	Output Ripple	1 LSB maximum			
	Overshoot	0%			
	Total Error	±1% of full scale			
Digital Resolution		4096 increments (12 bits)			50000 increments (16 bits)
Output Value of LSB	Voltage	2.5mV			0.4mV
	Current	4μA			0.32μA
Data Type in Application Program		Default: 0 to 4095 (standard)			-25000 to 25000 (voltage)
		Optional: -32768 to 32767 (optional range designation) ¹			0 to 50000 (current)
Monotonicity		Yes			
Current Loop Open		Undetectable			
Noise Resistance	Maximum Temporary Deviation during Electrical Noise Tests	±3% maximum when a 500V clamp voltage is applied to the power and I/O wiring			Not assured
	Cable	Twisted pair shielded cable is recommended for improved noise immunity			Twisted pair cable
	Crosstalk	None			2 LSB maximum
Isolation	Between output and power circuit	500V			Isolated
	Between output and internal circuit	Photocoupler-isolated			
Effect of Improper Output Connection		No damage			
Selection of Analog Output Signal		Using software programming			
Calibration or Verification to Maintain Rated Accuracy		N/A			

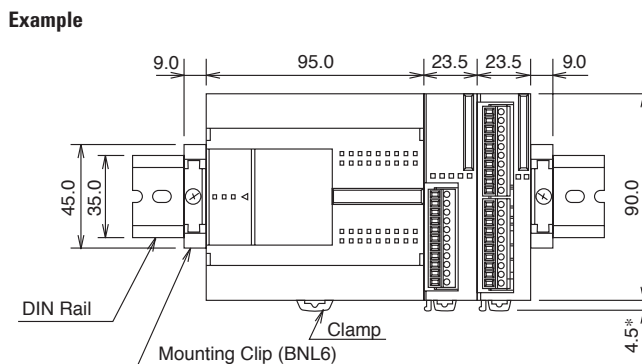
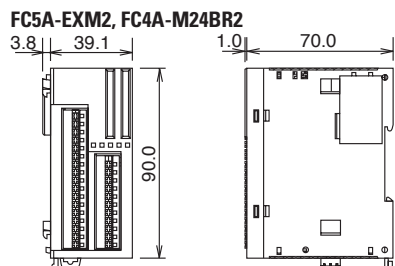
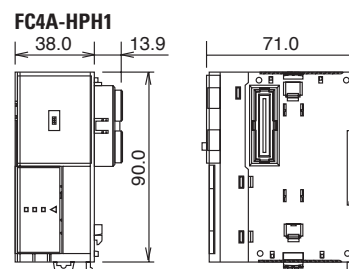
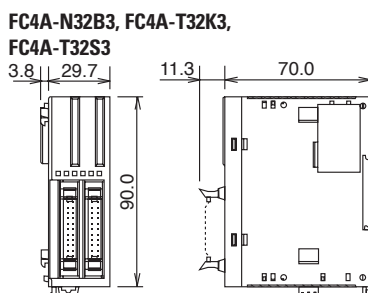
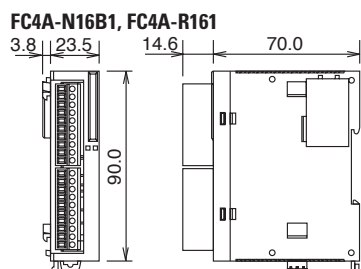
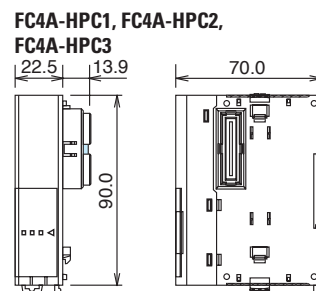
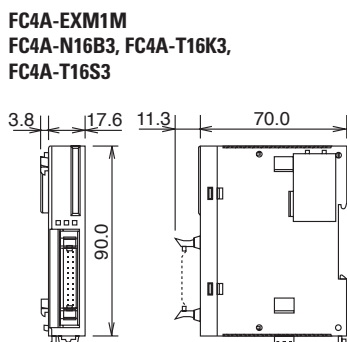
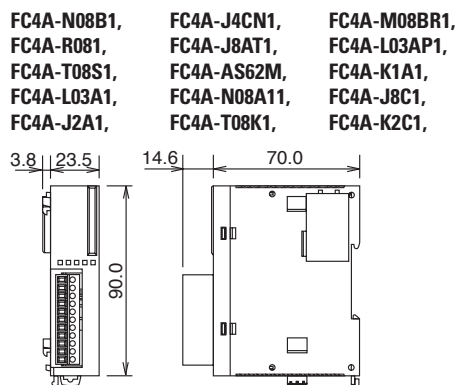
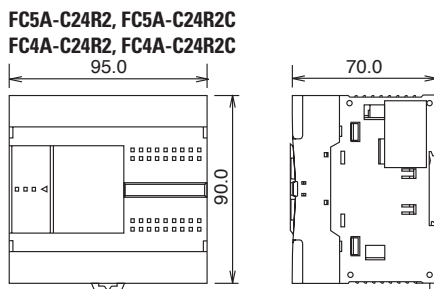
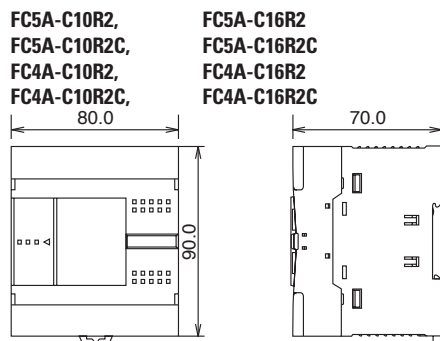
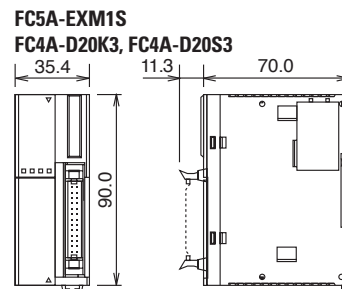
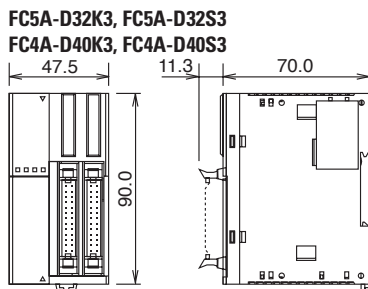
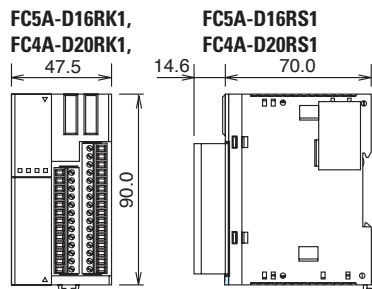
- 1: The 12-bit data (0 to 4095) processed in the analog I/O module can be linear-converted to a value between -32768 and 32767. The optional range designation, and analog I/O data minimum and maximum values can be selected using data registers allocated to analog I/O modules.

Expansion Interface Module Specifications

Part Number		FC5A-EXM1M (Expansion Interface Master Module)	FC5A-EXM1S (Expansion Interface Slave Module)	FC5A-EXM2 (Expansion Interface Module)
Rated Power Voltage		—	24V DC (supplied from external power)	24V DC (supplied from external power)
Allowable Voltage Range		—	20.4 to 26.4V DC (including ripple)	20.4 to 26.4V DC (including ripple)
Current Draw		Internal power (supplied from CPU module): 90mA (5V DC) 0mA (24V DC)	Internal power (supplied from CPU module): 0mA (5V DC) 0mA (24V DC) External power: With I/O modules 750mA (26.4V DC) ¹	Internal power (supplied from CPU module): 50mA (5V DC) 0mA (24V DC) External power: With I/O modules 750mA (26.4V DC) ¹
Maximum Power Consumption (External Power) ¹		—	19W (26.4V DC)	19W (26.4V DC)
Allowable Momentary Power Interruption		—	10ms minimum (24V DC)	10ms minimum (24V DC)
I/O Expansion		Between CPU module and expansion interface module Connectable CPU modules: FC5A-D16RK1/D16RS1/D32K3/D32S3 Connectable I/O modules: 7 maximum Beyond the expansion interface module Connectable I/O modules: 8 digital I/O modules maximum (AC input modules are not applicable) ²		
I/O Refresh Time ³		3.6ms		2.8ms
Communication between CPU Module and Expansion Interface Module		Asynchronous communication (I/O refresh of I/O modules on both sides of the expansion interface module is asynchronous.)		
Isolation from Internal Circuit		Only communication interface part is isolated		Not isolated
EMC Compliant Cable Length		1m (FC5A-KX1C)		—
Power Supply Connector	Connector on Mother Board	—	MKDSN1.5/3-5.08-BK (Phoenix Contact)	MSTB2.5/3-GF-5.08BK (Phoenix Contact)
	Connector Insertion/Removal Durability	—	—	100 times minimum
Expansion Cable Connector	Connector on Mother Board	FCN-365P024-AU (Fujitsu Component)		—
	Connector Insertion/Removal Durability	100 times minimum		—
Weight		70g	135g	140g

- 1: Power consumption by the expansion interface module and eight I/O modules.
2: The maximum number of relay outputs that can be turned on simultaneously is 54 points.
3: Maximum I/O refresh time of the expansion interface module. D8252 stores the refresh time.

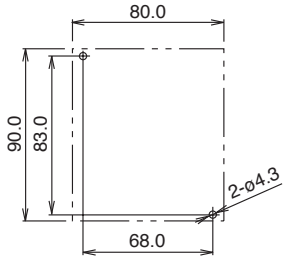
Dimensions (mm)



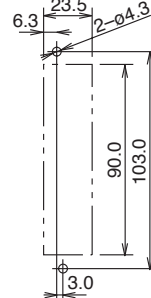
The figure illustrates a system setup consisting of the all-in-one 24-I/O CPU module, an 8-point relay output module, and a 16-point DC input module mounted on a 35-mm-wide-DIN rail using BNL6 mounting clips.

Mounting Hole Layout (mm)

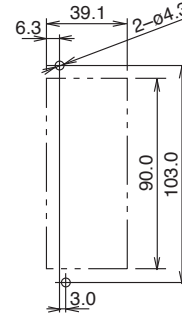
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FC5A-C10R2C, FC5A-C16R2C
FC4A-C10R2, FC4A-C16R2
FC4A-C10R2C, FC4A-C16R2C



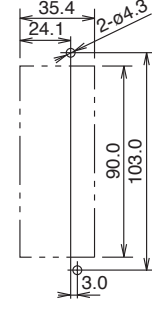
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FC4A-J2A1, FC4A-K1A1
FC4A-J4CN1, FC4A-T8C1
FC4A-J8AT1, FC4A-K2C1



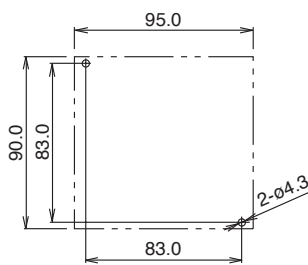
FC5A-EXM2
FC4A-M24BR2



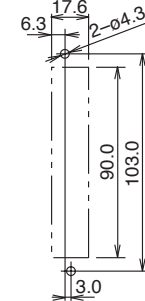
FC5A-EXM1S, FC4A-D20K3
FC4A-D20S3



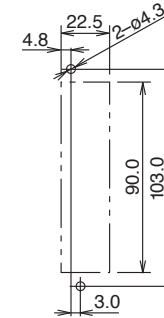
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FC4A-C24R2, FC4A-C24R2C



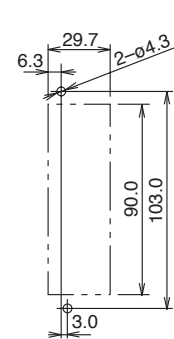
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FC4A-N16B3, FC4A-T16K3,
FC4A-T16S3



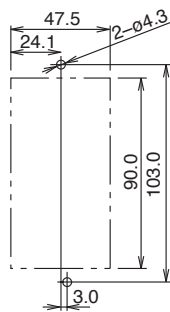
FC4A-HPC1 FC4A-HPC2
FC4A-HPC3



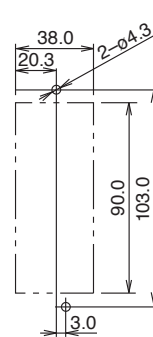
FC4A-N32B3, FC4A-T32K3,
FC4A-T32S3



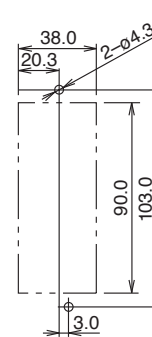
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FC5A-D16RS1
FC5A-D32K3
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FC4A-D20RK1
FC4A-D20RS1
FC4A-D40K3
FC4A-D40S3



FC4A-HPH1

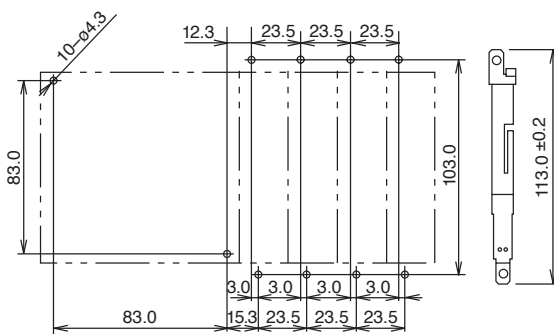


FC4A-HPH1

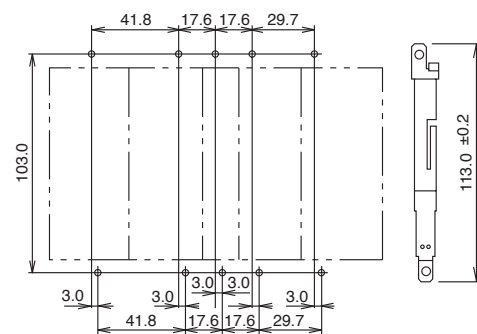


Examples

Mounting hole layout for FC5A-C24R2 or FC4A-C24R2 and four 23.5mm-wide I/O modules



Mounting hole layout from left, FC4A-HPH1, FC4A-D20K3, FC4A-N16B3, FC4A-N32B3, and FC4A-M24BR2 modules



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