

XPSMCMAI0400•

Instruction Sheet (Original Language)

10/2020

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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At a Glance

Document Scope

This information is about the usage and configuration of the XPSMCMAl0400• expansion modules for the XPSMCMC10804• Modular Safety Controller.

Validity Note

The characteristics that are described in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Product Related Information

The XPSMCM• can reach a maximum Safety Integrity Level (SIL) 3 as per IEC 61508, a maximum Safety Integrity Level Claim Limit (SILcl) as per IEC 62061, and a maximum Performance Level (PL) e, category 4, as per ISO 13849-1. However, the definitive SIL and PL of the application depends on a number of safety-related components, their parameters, and the connections that are made, as per the risk analysis.

The module must be configured in accordance with the application-specific risk analysis and all the applicable standards.

Pay particular attention in conforming to any safety information, different electrical requirements, and normative standards that would apply to your adaptation.

WARNING

INSUFFICIENT SAFETY-RELATED FUNCTIONS

- Perform a risk assessment as per ISO 12100 and/or other equivalent assessment and appropriately consider all applicable regulations and standards that apply to your machine/process before using this software.
- In your risk assessment, determine all requirements regarding the Safety Integrity Level (SIL), the Performance Level (PL), and any other safety-related requirements and capabilities applicable to your machine/process.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

NOTE: Configuration of the module is the sole responsibility of the installer or user.

XPSMCAI0400• Expansion Modules

Safety-related Information

NOTE: The safety-related function can be compromised if this equipment is not used for the intended purpose and in accordance with the instructions in the present document. This equipment must only be used as safety-related equipment on machines intended to protect persons, material, and installations.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected input devices, contactors, and drives prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires.
- Install and use this equipment only in locations known to be non-hazardous.
- Do not use the equipment described herein to supply other, external equipment.
- Always use properly rated voltage sensing equipment to confirm that the power is removed.
- Avoid contacting terminals with hand or tools until the power has been confirmed removed.
- Follow all electrical safety regulations and standards (for example, lockout/tag-out, phase grounding, barriers) to reduce the possibility of contact with hazardous voltages in the work area.
- Remove locks, tags, barriers, temporary ground straps, and replace and secure all covers, doors, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before reapplying power to the unit.
- Complete thorough hardware tests and system commissioning to verify that line voltages are not present on the control circuits before using your hardware operationally.
- Use only the specified voltage when operating this equipment and any associated products.

Failure to follow these instructions will result in death or serious injury.

DANGER

LOSS OF DESIGNATED SAFETY FUNCTION

- Install the XPSMCM• Modular Safety Controller system in an enclosure with a degree of protection of at least IP 54.
- Use a Protective Extra Low Voltage (PELV) power supply to isolate the equipment from line voltage.
- Do not directly connect the equipment to line voltage.

Failure to follow these instructions will result in death or serious injury.

DANGER

POTENTIAL FOR EXPLOSION

Install and use the Modular Safety Controller in non-hazardous locations only.

Failure to follow these instructions will result in death or serious injury.

NOTE: The observation of operating limits and duty cycles is of particular importance for equipment designed to perform a safety-related function. If this module has been subjected to electrical, mechanical, or environmental stresses in excess of its stated limits, do not use it.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Do not exceed any of the rated operating limits for the equipment specified in the present document.
- Immediately cease using and replace any equipment that has or might have been subjected to conditions in excess of its rated operating limits.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

WARNING

UNINTENDED EQUIPMENT OPERATION

- You must carry out a risk assessment in accordance with ISO 12100.
- Validate the entire system/machine in accordance with the required performance level and risk assessment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

User Responsibilities

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user, machine builder, or system integrator to perform the appropriate and complete risk analysis, evaluation, and testing of the products with respect to the relevant specific application or use thereof.

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Qualified Personnel

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

Module and Function Description

The XPSMCMIAI0400• is an analog input expansion module. The XPSMCMIAI0400• module can only be configured with the XPSMCMC10804• Modular Safety Controller. The XPSMCMIAI0400• provides up to four single or two dual channel of safety-related analog inputs. Each of the four channels is isolated and must be configured by SoSafe Configurable as voltage input or current input.

XPSMCMIAI0400• can support a wide range of analog sensors (usually installed in a redundant configuration) such as:

- Temperature sensors
- Level sensors
- Load cell
- Position sensors
- Etc.

The expansion module supports two inputs `NODE_ADDR0` and `NODE_ADDR1` which are used to set a physical address to the module:

	NODE_ADDR0 (Terminal 2)	NODE_ADDR1 (Terminal 3)
NODE 0	0 (or not connected)	0 (or not connected)
NODE 1	24 Vdc	0 (or not connected)
NODE 2	0 (or not connected)	24 Vdc
NODE 3	24 Vdc	24 Vdc

NOTE: Do not use the same physical address for two units of the same module reference.

NOTE: The LEDs **ADDR 1** and **ADDR 0** correspond to the `NODE_ADDR1` and `NODE_ADDR0` in this table respectively.

NOTE: The node address wiring must match the configuration settings.

Current Sensor Input/Output

IN_S1/OUT_S1, IN_S2/OUT_S2, IN_S3/OUT_S3, IN_S4/OUT_S4

XPSMCMIAI0400• can provide up to four external safety-related input/output for external current sensor. Each channel of XPSMCMIAI0400• can supply sensors with 24 Vdc at 30 mA (maximum load current).

The safety-related analog inputs are used to connect transducers with:

- 0...20 mA or 4...20 mA (selectable by SoSafe Configurable) safety-related analog current signals: IN_S1/OUT_S1, IN_S2/OUT_S2, IN_S3/OUT_S3, IN_S4/OUT_S4.

Voltage Sensor Input/Output

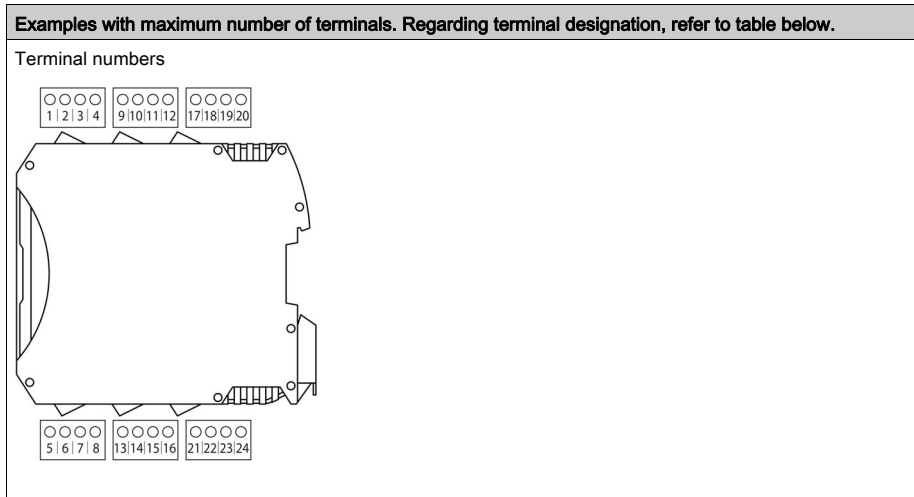
NEG_S1/POS_S1,NEG_S2/POS_S2,NEG_S3/POS_S3,NEG_S4/POS_S4

XPSMCMIAI0400• can provide up to four external input/output for external voltage sensor. Each channel of XPSMCMIAI0400• can supply sensors with 24 Vdc at 30 mA.

The safety-related analog inputs are used to connect transducers with:

- 0...10 Vdc (selectable by SoSafe Configurable) safety-related analog voltage signals: NEG_S1/POS_S1, NEG_S2/POS_S2, NEG_S3/POS_S3, NEG_S4/POS_S4.

Terminals



Terminal	Signal	LED	Type	Description	Operation
1	24 VDC	PWR	-	24 Vdc power supply	-
2	NODE_ADDR0	ADDR0	Input	Node selection	Input type 3 according to EN 61131-2. Maximum resistance 1.2 kΩ.
3	NODE_ADDR0	ADDR1			
4	0 VDC	PWR	-	0 Vdc power supply	-
<p>(1) Input impedance (channel configured as current input) = 200 Ω according to EN 61131-2. (2) Input impedance (channel configured as voltage input) = 250 kΩ according to EN 61131-2.</p>					

Terminal	Signal	LED	Type	Description	Operation
9	24VDC_S1	CH 1	Output	Sensor 1 connections	Isolated 24 Vdc power supply for sensor 1
10	IN_S1		Input		0/20 mA sensor 1 input ⁽¹⁾
	NEG_S1		Input		0/10 V sensor 1 negative input ⁽²⁾
11	OUT_S1		Output		0/20 mA sensor 1 output ⁽¹⁾
	POS_S1		Input		0/10 V sensor 1 positive input ⁽²⁾
12	0 VDC_S1		Output		Isolated 0 Vdc reference for sensor 1
13	24VDC_S3	CH 3	Output	Sensor 3 connections	Isolated 24 Vdc power supply for sensor 3
14	IN_S3		Input		0/20 mA sensor 3 input ⁽¹⁾
	NEG_S3		Input		0/10 V sensor 3 negative input ⁽²⁾
15	OUT_S3		Output		0/20 mA sensor 3 output ⁽¹⁾
	POS_S3		Input		0/10 V sensor 3 positive input ⁽²⁾
16	0 VDC_S3		Output		Isolated 0 Vdc reference for sensor 3
17	24VDC_S2	CH 2	Output	Sensor 2 connections	Isolated 24 Vdc power supply for sensor 2
18	IN_S2		Input		0/20 mA sensor 2 input ⁽¹⁾
	NEG_S2		Input		0/10 V sensor 2 negative input ⁽²⁾
19	OUT_S2		Output		0/20 mA sensor 2 output ⁽¹⁾
	POS_S2		Input		0/10 V sensor 2 positive input ⁽²⁾
20	0 VDC_S2		Output		Isolated 0 Vdc reference for sensor 2
21	24VDC_S4	CH 4	Output	Sensor 4 connections	Isolated 24 Vdc power supply for sensor 4
22	IN_S4		Input		0/20 mA sensor 4 input ⁽¹⁾
	NEG_S4		Input		0/10 V sensor 4 negative input ⁽²⁾
23	OUT_S4		Output		0/20 mA sensor 4 output ⁽¹⁾
	POS_S4		Input		0/10 V sensor 4 positive input ⁽²⁾
24	0 VDC_S4		Output		Isolated 0 Vdc reference for sensor 4

(1) Input impedance (channel configured as current input) = 200 Ω according to EN 61131-2.

(2) Input impedance (channel configured as voltage input) = 250 kΩ according to EN 61131-2.

Wiring Example

Analog signals are susceptible to electromagnetic interference. Interference may lead to unreliable analog signal values and to unintended behavior of the module.

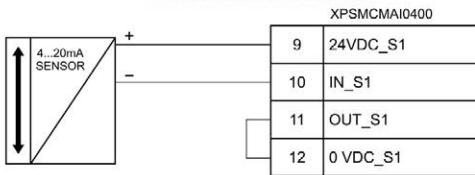
⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

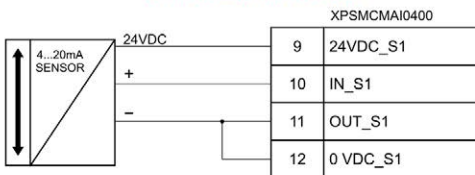
Use shielded cables for analog device connection and ensure the shields are terminated to Protective Earth (Ground) on both ends of the cable.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

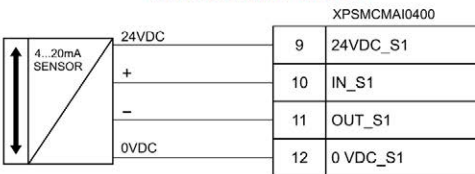
2 WIRES CURRENT SENSOR



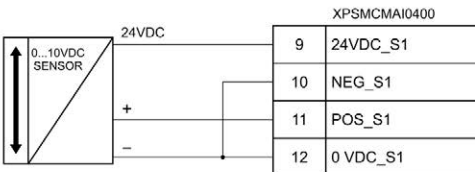
3 WIRES CURRENT SENSOR



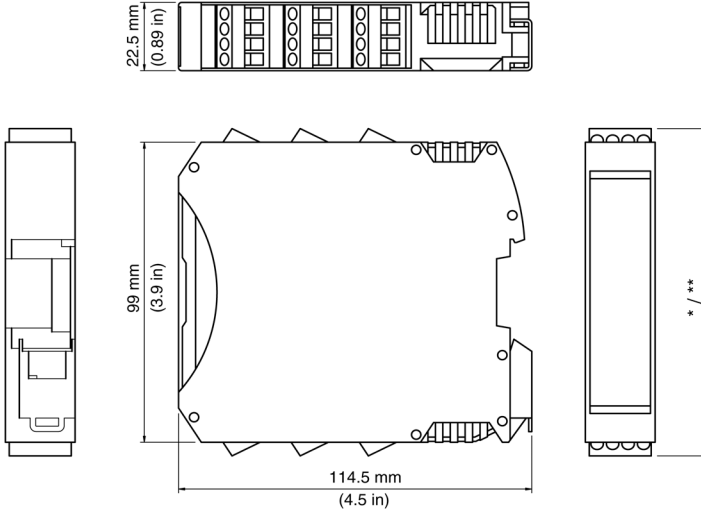
4 WIRES CURRENT SENSOR



3 WIRES VOLTAGE SENSOR



Dimensions



- * Screw terminals 108 mm (4.25 in)
- ** Spring terminals 118 mm (4.67 in)

Mount the modules (Modular Safety Controller and any I/O expansion modules) in an electric cabinet with an IP54 degree of protection. The minimum clearance below and above the controller is 40 mm (1.57 in). Allow at least 100 mm (3.93 in) distance between the cabinet door and the front face of the module(s). There are no clearances required on the left or right side of the module(s), but for XPSMCMDO0042A* module an additional distance to adjacent modules is mandatory (see *Modular Safety Controller, Hardware Guide*). Other equipment in proximity may require larger distances and those clearances must also be taken into account.







Technical Data

Cable types and wire sizes

for a 5.08 pitch removable **screw** terminal block

$\frac{\text{mm}}{\text{in.}}$ 7 0.28								
mm ²	0.2...2.5	0.2...2.5	0.25...2.5	0.25...1.5	2 x 0.2...1	2 x 0.2...1.5	2 x 0.25...1	2 x 0.5...1.5
AWG	24...14	24...14	23...14	23...16	2 x 24...18	2 x 24...16	2 x 23...18	2 x 20...16

		N•m	0.5
Ø 3.5 mm (0.14 in.)		lb•in	4.42

Cable types and wire sizes					
for a 5.08 pitch removable spring terminal block (used by XPSMCM***G).					
					
mm ²	0.2...2.5	0.2...2.5	0.25...2.5	0.25...2.5	2 x 0.5...1
AWG	24...14	24...14	23...14	23...14	2 x 20...18
<p>The following instructions concerning connection cables must be observed:</p> <ul style="list-style-type: none"> ● Use 60/75 °C copper (Cu) conductor only. Maximum cable length 100 m (328 ft). ● Cables used for connections of longer than 50 m (164 ft) must have a cross-section of at least 1 mm² (AWG 16). 					

Housing characteristics	
Housing material	Polyamide
Housing degree of protection	IP20
Terminal blocks degree of protection	IP2x
Mounting	35 mm DIN rail according to EN/IEC 60715
Mounting position	Vertical or horizontal
Dimensions (h x l x d)	<ul style="list-style-type: none"> ● with screw terminals: 108 x 22.5 x 114.5 mm (4.25 x 0.89 x 4.5 in) ● with spring terminals: 118.5 x 22.5 x 114.5 mm (4.67 x 0.89 x 4.5 in)

Module characteristics	
Rated voltage	24 Vdc ± 20 % (PELV supply)
Dissipated power	3 W maximum (per module)
Overvoltage category	II
Ambient operating temperature	-10...+55 °C (14...131 °F), for vertical or horizontal mounting position
Storage temperature	-20...+85 °C (-4...185 °F)
Relative humidity	10...95%
Maximum operation altitude	2000 m (6562 ft)
Pollution degree	2
Vibration resistance (EN 61496-1)	+/- 0.35 mm (0.014 in) 10...55 Hz
Bump resistance (EN 61496-1)	10 g (16 ms half-sine)

Module-specific characteristics	
Description	Electronic housing maximum 24-poles, with locking latch mounting
(1) When this condition is detected, the power supply of the sensor is disconnected for 1 second and then rearmed. The disconnection and rearming of the power supply continues until the over-current condition has been removed.	

Module-specific characteristics	
Mounting	DIN rail mounting with locking latch
Rated voltage	24 Vdc \pm 20 %
Channels number / description	4 / isolated (500 Vdc) between channels, and between channels and control electronics. Each channel can be configured as voltage input or current input.
Diagnostic	
Isolated sensor supply overload detection (if the sensor draws more than 30 mA)	Yes with active protection ⁽¹⁾ .
Input overvoltage / input overcurrent detection	Yes with active protection ⁽¹⁾ .
Disconnected cable detection	Yes
Overthreshold / underthreshold detection	Yes
Redundant channels mismatch detection	Yes
Probability of a dangerous failure per hour (PFHd)	1,53E-8
Mean Time to Dangerous Failure (MTTFd) in years	106
Connection to expansion modules	5-way backplane expansion
Weight	0.164 kg (5.78493 oz)
(1) When this condition is detected, the power supply of the sensor is disconnected for 1 second and then rearmed. The disconnection and rearming of the power supply continues until the over-current condition has been removed.	

Module current inputs	
Nominal range	0...20 mA / 4...20 mA
User selectable allowable current limits	0...23 mA (if 0...20 mA selected), 2.5...23 mA (if 4...20 mA is selected)
Digital resolution	16
Resolution value	381 nA
Sample rate (samples per second)	User selectable. Allowable values: 2.5, 5, 10, 16.6, 20, 50, 60, 100, 200, 400, 800, 1000, 2000, 4000
Input impedance	200 Ω
Maximum input current	23 mA

Module voltage inputs	
Range	0...10 Vdc
User selectable allowable voltage limits	0...11.5 Vdc

Module voltage inputs	
Digital resolution	16
Resolution value	152 μ V
Sample rate (samples per second)	User selectable. Allowable values: 2.5, 5, 10, 16.6, 20, 50, 60, 100, 200, 400, 800, 1000, 2000, 4000
Input impedance	250 k Ω

Checklist After Installation

The following must be verified:

Step	Action
1	Conduct a full functional test of the system (see <i>Validation</i> in the <i>Modular Safety Controller Library and Programming Guide</i> .)
2	Verify that all the cables are correctly inserted and the terminal blocks are within correct torque for screw terminals.
3	Verify that all the LED indicators are correctly illuminating for the inputs and outputs used.
4	Verify the positioning and function of all input and output sensors and actuators used with the XPSMCM•.
5	Verify the correct mounting of XPSMCM• to the DIN rail.
6	Verify that all the external indicators (lamps/beacons/sirens) are correctly functioning.