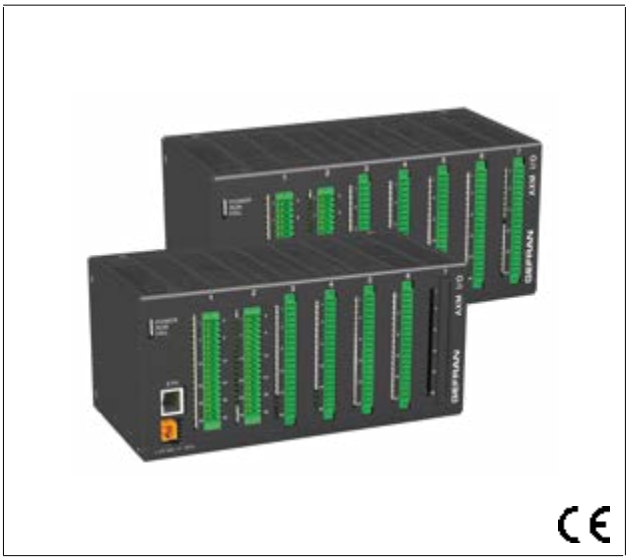
GEFRAN

AXM IO
High speed remote IO



INSTALLATION AND USER MANUAL

code: **80577 _ 04-2018 - ENG**

ATTENTION!

This manual must always be available to operators of the devices described here.
Always make sure that you have the latest version of the manual, which is available for free download from the GEFRAN website (www.gefran.com).
Installers and/or maintenance personnel are required to read this manual and to precisely follow the instructions contained in it and in its attachments.
GEFRAN will not be liable for any damage to persons and/or property, or to the product itself, caused by failure to follow the instructions and observe the warnings given below.

REVISION DOCUMENTS

DATE	CODE	UPDATE	N. pages of the document
04-2018	80577	First emission	24

SUMMARIES AND TABLES OF CONTENTS

PREFACE

Warnings and safety

While all the information contained in this manual has been carefully checked, Gefran S.p.A. accepts no responsibility for the possible presence of errors or for damage to persons and/or property caused by the improper use of the manual.
Gefran S.p.A. also reserves the right to make changes to the contents and form of this manual and to the characteristics of the devices illustrated at any time and without prior warning.

The installation of the devices illustrated in the manual must be carried out by qualified technicians in compliance with the laws and standards in force and in agreement with the instructions contained in the manual.
If the AXM IO is used in applications with the risk of damages to persons, machinery or materials, its use in conjunction with alarms is essential.
It is advisable to envisage the possibility of checking the intervention of the alarms during regular operation.

Before interacting with the board, the operator must receive full training in the procedures of operation, emergency, diagnosis and maintenance of the system.

Printing conventions used in the manual

Pay attention to the use of the following symbols.

Highlights particularly important information which influences the correct operation of the product or of safety or an instruction which must absolutely be followed.

Highlights a risk condition for the safety of the installer or the user, due to the presence of dangerous levels of voltage.

Overview of the solution and functionalities

AXM IO is IO module for the management of remote inputs and outputs which adapting perfectly to the machine or system to control.
Thanks to its flexibility and ease of use, AXM IO can be used in a variety of sectors and for numerous process and automation process controls, such as:

- the wood industry (gluing, etc.);
- packaging (packing, labelling, etc.);
- food industry (pasteurisers, etc.);
- chemical industry (autoclaves, etc.);
- metal working (washing, etc.);
- plastic working (dryers, coolers, etc.).

Architecture

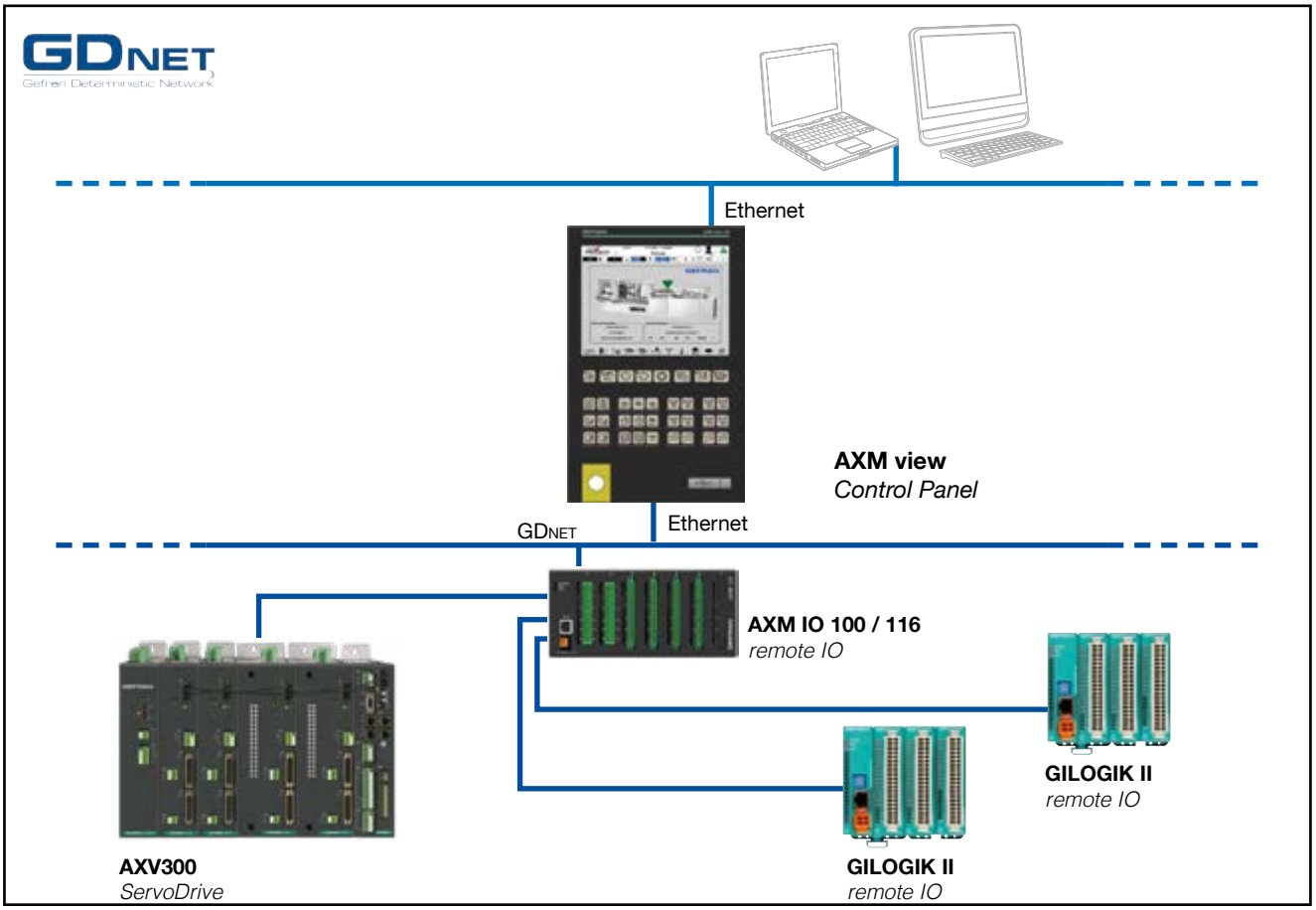


Figure 1 - System architecture

AXM IO

The remote input and output module (I/O) allows:

- acquisition of multiple information for the appliances controlled and from the environment, via signals and sensors;
- control and regulate appliances through different types of signals and commands.

The modules are available in two models: AXM IO 100 with 100 IO and AXM IO 116 with 116 IO, organized as described below:

- digital inputs: 32 for AXM IO 100, 40 for AXM IO 116;
- digital outputs: 48 for AXM IO 100, 56 for AXM IO 116;
- Temperature inputs: 8 thermocouples of which 2 configurable in RTD 2 and 3/4 wires
- analogue inputs: 6 configurable
- analogue outputs: 6 configurable

The modules are prepared for assembly on 35 mm DIN runner.

Technical data

POWER	Operating voltage	24 Vdc ±25%
	Absorbed current (at 24 Vdc)	400 mA max
	Dissipated power	9.6 W max
	Connections	PUSH-IN terminals, max wire section 1 mm^2
CONNECTIONS	GDNET Port	Ethernet HARD real time Connector: RJ45 with led
	I/O Ports	Connectors: 36 poles PUSH-IN, max wire section 1 mm^2. 20 poles PUSH-IN, max wire section 1 mm^2.
COMMUNICATION PROTOCOLS	GDNET	Gefran HARD REAL TIME protocol on ethernet network.

DISPLAY LED	Slot 1..7	1 yellow “Power” LED 1 green “Run” LED 1 red “Alarm” LED
	Bus GDNET	1 yellow “Power” LED 1 green “Run” LED 1 red “Fail” LED
	Digital input	1 green “Status” LED
	Digital output	1 green “Status” LED
DIGITAL INPUT (Position 3-4-7)	Max number	40
	Type	Absorption of current (PNP)
	Rated voltage	24 Vdc
	Max input voltage	32 Vdc
	Max input current	25 mA @ 32 Vdc
	Switch threshold	Low level: ≤ 12 Vdc High level: ≥ 15 Vdc
	Input filter	100 Hz / 5 KHz
	Protections	Polarity inversion Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 3 kV
FAST DIGITAL INPUT (Position 1)	Max number	1
	Type	Absorption of current (PNP)
	Rated voltage	24 Vdc
	Max input voltage	32 Vdc
	Max input current	25 mA @ 32 Vdc
	Switch threshold	Low level: ≤ 12 Vdc High level: ≥ 15 Vdc
	Hardware filter	1.5 kHz
	Output format	Type: RPM
	Protections	Polarity inversion Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 3 kV
THERMOCOUPLE TEMPERATURE INPUT (Position 1)	Max number	8
	Type	Thermocouple J, K, R, S, T, E, L, N
	Type of connection	2 wires (insulated and non-insulated)
	Through band	20 Hz
	Input impedance	> 1 MΩ
	Sampling time (for all channels)	200 ms
	Resolution	0.1 °C / °F
	Max error @ 25 °C	±0.5% scale bottom
	Thermocouple use interval (scale)	J: 0 .. 1000 °C / 32 .. 1830 °F K: 0 .. 1300 °C / 32 .. 2372 °F R: 0 .. 1750 °C / 32 .. 3182 °F S: 0 .. 1750 °C / 32 .. 3182 °F T: -200 .. 400 °C / -392 .. 752 °F E: 0 .. 750 °C / 32 .. 1382 °F L: 0 .. 800 °C / 32 .. 1472 °F N: 0 .. 1300 °C / 32 .. 2372 °F
	Protections	Polarity inversion: yes Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 3 kV

THERMO RESISTANCE TEMPERATURE INPUT (Position 1)	Max number	2 (in alternativa alle termocoppie)
	Type	Thermo resistance PT100
	Type of connection	2 or 3/4 wires
	Through band	20 Hz
	Sampling time (for all channels)	200 ms
	Resolution	0.1 °C / °F
	Max Error @ 25 °C	±0.5% scale bottom
	Use interval (scale)	-200 .. 850 °C / -392 .. 1562 °F
	Protections	Polarity inversion: yes Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 2 kV
ANALOGUE INPUT IN VOLTAGE .. 10 V (Position 2)	Max number	6
	Type	Single-ended voltage 0 .. 10 V
	Input filter	Low-pass: 2.5 kHz analog / 300 Hz digital. SW selectable
	Input impedance	> 1 MΩ
	Sampling time (for all channels)	200 µs
	Output format	Type: UINT Resolution: 16 bit (0 .. 65535) LSB: 15.25 µV
	Max error @ 25 °C	±0.5% scale bottom
	Protections	Polarity inversion: yes Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 2 kV
ANALOGUE INPUT IN CURRENT 0/4 .. 20 mA (Position 2)	Max number	4
	Type	Current 0 .. 20 mA
	Input filter	Low-pass: 2.5 kHz analog / 300 Hz digital. SW selectable
	Input impedance	100 Ω
	Sampling time (for all channels)	200 µs
	Output format	Type: UINT Resolution: 16 bit (0 .. 20 mA: 0 .. 65535) 4 .. 20 mA: 3277 .. 65535) LSB: 305 µA
	Max error @ 25 °C	±0.5% scale bottom
	Protections	Polarity inversion: yes Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 2 kV

POTENTIOMETER ANALOGUE INPUT (Position 2)	Max number	6
	Type	Potentiometer 2 kΩ min.
	Transducer power	10 V, 50 mA max
	Input filter	Low-pass: 2.5 kHz analog / 300 Hz digital. SW selectable
	Input impedance	> 1 MΩ
	Sampling time (for all channels)	200 µs
	Output format	Type: UINT Resolution: 16 bit (2K potentiometer: 2950 .. 61603; 10K potentiometer: 590 .. 64748) LSB: 15.25 µV
	Max error @ 25 °C	±0.5% scale bottom
	Protections	Polarity inversion: yes Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 2 kV
ELECTRIC RESISTANCE EXTENSOMETER ANALOGUE INPUT (“strain gauge”) (Position 2)	Max number	2
	Type	Differential, strain gauge, 2.2 & 3.3 mV/V
	Transducer power	10 V, 150 mA max
	Input filter	Low-pass: 2.5 kHz analog / 300 Hz digital. SW selectable
	Input impedance	> 1 MΩ
	Sampling time (for all channels)	200 µs
	Output format	Type: UINT Resolution: 16 bit LSB: 0.38 µV
	Max error @ 25 °C	±0.5% scale bottom
	Protections	Polarity inversion: yes Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 2 kV
DIGITAL OUTPUT 0,5 A (Position 1)	Max number	16
	Composition	1 x Group of 16 outputs with power supply wire
	Type	Current emission (PNP)
	Rated voltage	24 Vdc ±25%
	Max output current	Single output: 2 A Group of 4 outputs nearby: 4 A Full 16 outputs: 6 A
	Max output frequency	100 Hz
	Protections	Short circuit Overload : I ≥ 2.2 A (according to IEC 61131-2) Overtemperature Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 3 kV

DIGITAL OUTPUT 1 A (Position 7)	Max number	8
	Composition	2 x Group of 4 outputs with power supply wire
	Type	Current emission (PNP)
	Rated voltage	24 Vdc ±25%
	Max output current	Single output: 2 A Group of 4 outputs continue: 5 A
	Max output frequency	100 Hz
	Protections	Short circuit Overload : I ≥ 2.2 A (according to IEC 61131-2) Overtemperature Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 3 kV
DIGITAL OUTPUT 2 A (Positions 5-6)	Max number	32
	Composition	2 x Group of 8 outputs with power supply wire 4 x Group of 4 outputs with power supply wire
	Type	Current emission (PNP)
	Rated voltage	24 Vdc ±25%
	Max output current	Single output: 2 A Group of 4 outputs: 6 A Full 16 outputs: 15 A
	Max output frequency	100 Hz
	Protections	Short circuit Overload: I ≥ 2.2 A (according to IEC 61131-2) Overtemperature Overvoltage: max 1 kV per 1 ms
	Electric insulation	Channel-channel: no Channel-bus: 3 kV
ANALOGUE OUTPUT VOLTAGE ±10 V (Position 1)	Max number	6
	Type	Single ended voltage ±10 V
	Max output current	20 mA
	Settling time (“settling time”)	100 µs
	Output format	Type: INT Resolution: 16 bit (-32768 .. +32768) LSB: 305 µV
	Max error @ 25 °C	±0.5% scale bottom
	Protections	Short circuit ±10V: yes Overpressure: max 1 kV per 1 ms
	Electric insulation	Channel-Channel: no Channel-CPU: 2 kV
ENVIRONMENTAL CONDITIONS	Operating temperature	0 .. +50 °C (according to IEC 68-2-14)
	Storage temperature	-20 .. +70 °C (according to IEC 68-2-14)
	Relative humidity	5 .. 90% RH non-condensing (in according to IEC 68-2-3)
MECHANICAL CHARACTERISTICS	**Assembly**	Direct on plate, with spacers On 35 mm DIN bar, horizontal
	Degree of protection	IP 20
	Dimensions	210 x 98 x 102 mm
	Weight	AXM IO 100: 1380 gr. AXM IO 116: 1440 gr.
CERTIFICATION	CE	Observance of Directive 2014/30/EU EN61131-2: Programmable Controllers Part 2: Equipment requirements and test. specific request

Dimensions

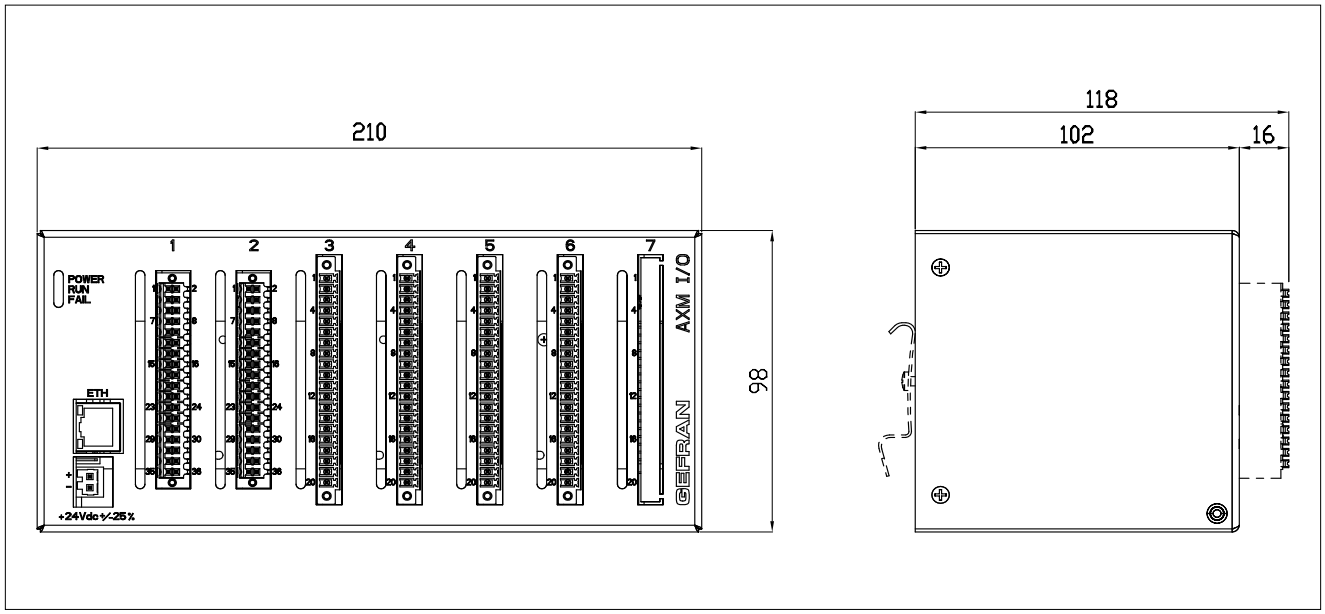


Figure 4 - Mechanical Dimensions

NOTE: the dimensions of the AXM IO 100 and AXM IO 116 models are the same.

AXM IO assembly

Attention: AXM IO modules are supplied in the version for assembly onto 35 mm DIN runner.
For assembly, follow the instructions relating.

Assembly on DIN runner

To fasten the AXM IO module in place, insert the upper part of the hook over the runner, rotate downwards and press it until it clicks into place, hooking also under the runner, figure 5 on the left.

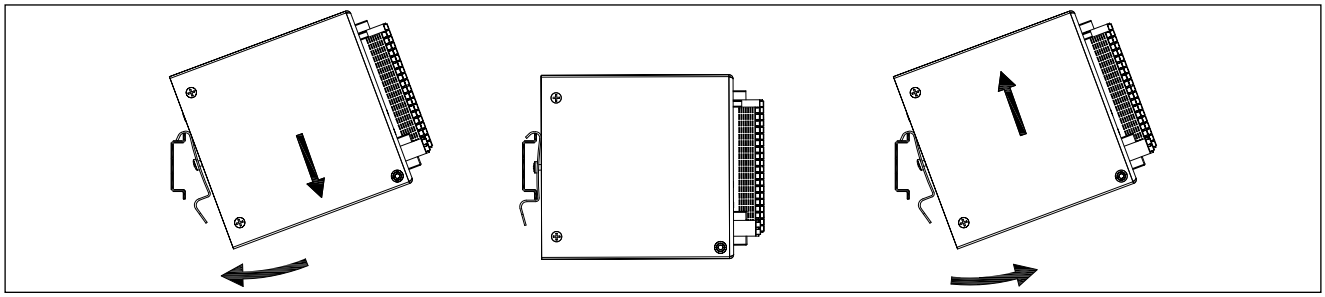


Figure 5 - Assembly and disassembly from DIN rail 35 mm

To remove an AXM module fastened to a DIN runner, release the 2 lower hook, levering slightly with a screwdriver and rotate upwards to release it, figure 5 on the right.

Positioning

AXM IO MUST be installed horizontally and must respect the ventilation zones as shown in figure 6.

MUST NOT be installed vertically, figure 7.

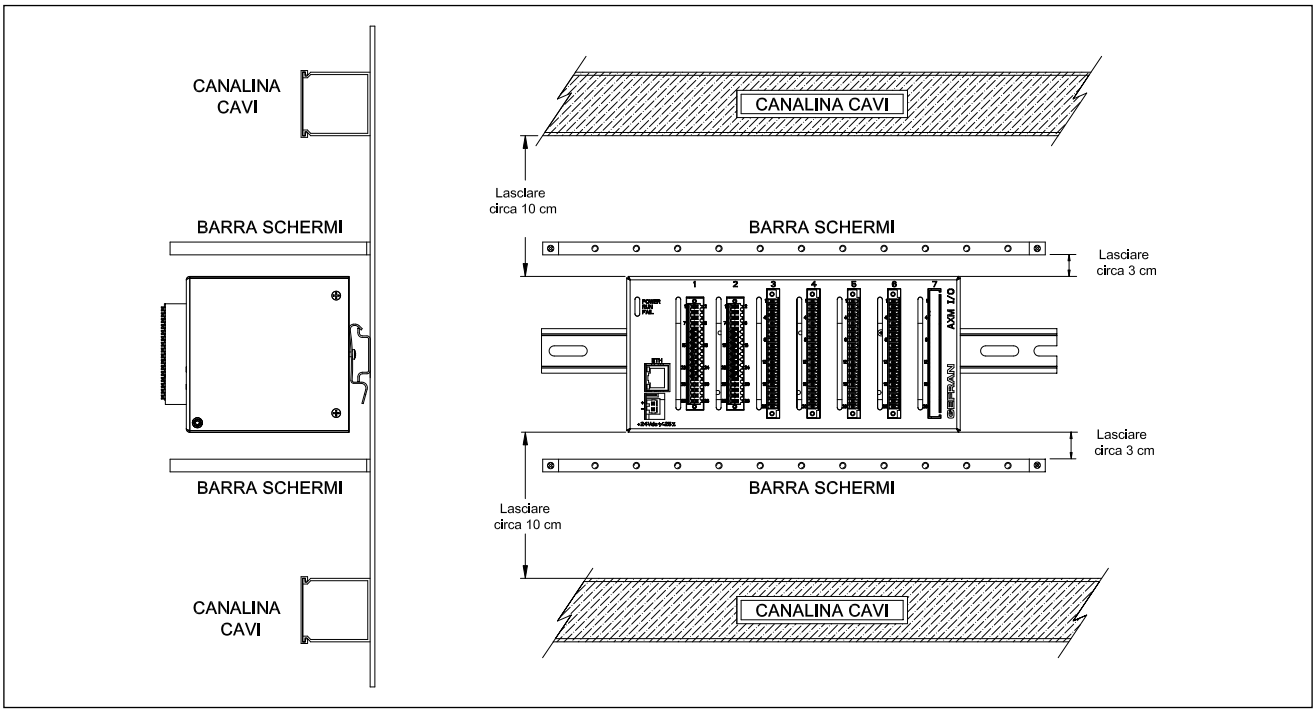


Figure 6 - Installation area

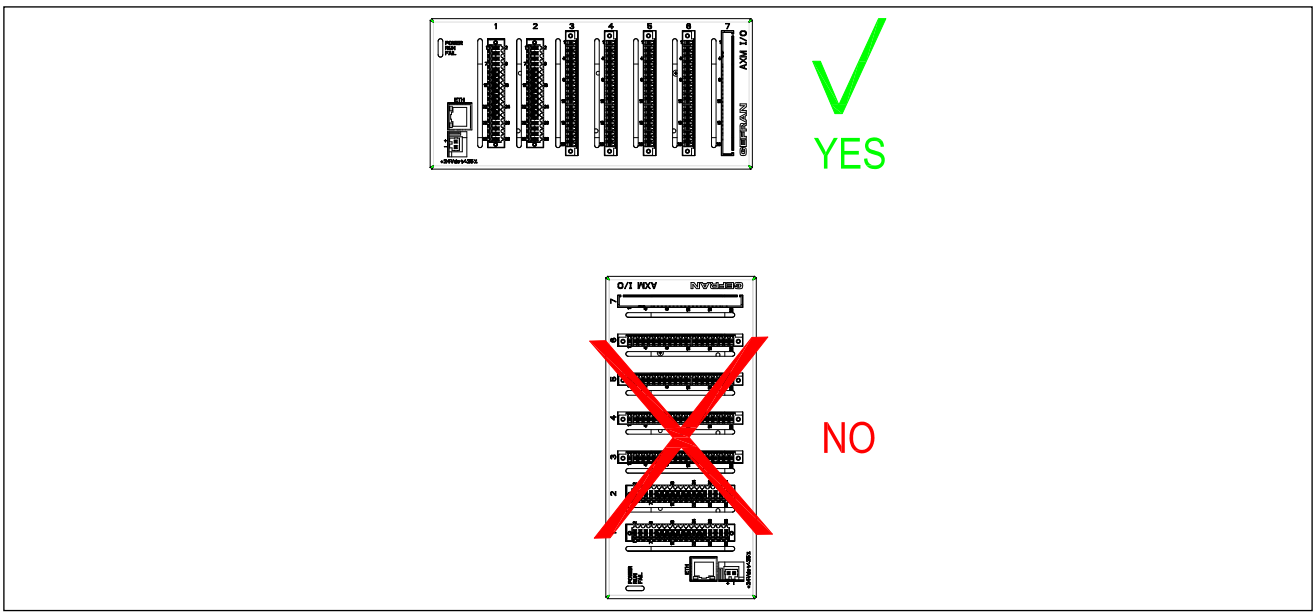


Figure 7 - Assembly direction

AXM IO connections

Inputs, ports and signals

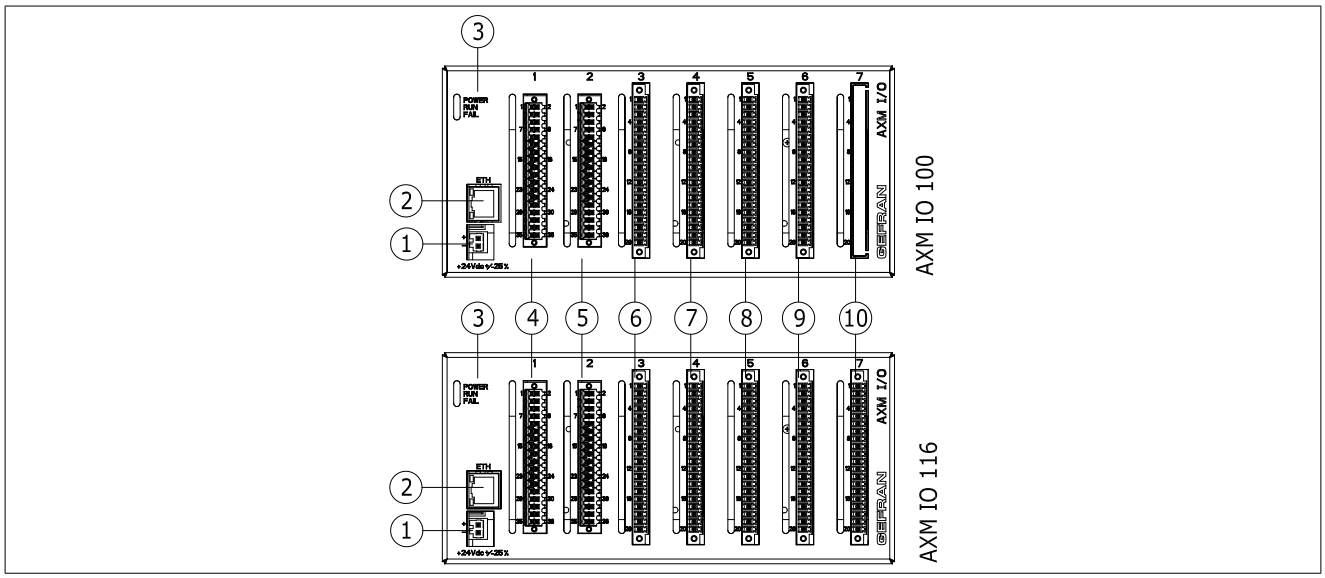


Figure 8 - AXM IO element position

N.	Description	Connector / indicator	Note
1	Power connector (2-clamp)	2 clamp - 24VDC ±25%	
2	GDNET network connection	RJ45	use a crossed network cable
3	Status led	Power supply: yellow. run: green. fail: red.	
4	Position 1 connector: temperatures	36 clamp push-in	
5	Position 2 connector: analog inputs and outputs	36 clamp push-in	
6	Position 3 connector: digital inputs	20 clamp push-in	
7	Position 4 connector: digital inputs	20 clamp push-in	
8	Position 6 connector: digital outputs	20 clamp push-in	
9	Position 5 connector: digital outputs	20 clamp push-in	
10	Position 7 connector: digital inputs and outputs	20 clamp push-in	available only for model AXM IO 116

Figure 9 shows the AXM IO system connectors. The use of the single connector is identified by the following diagrams.

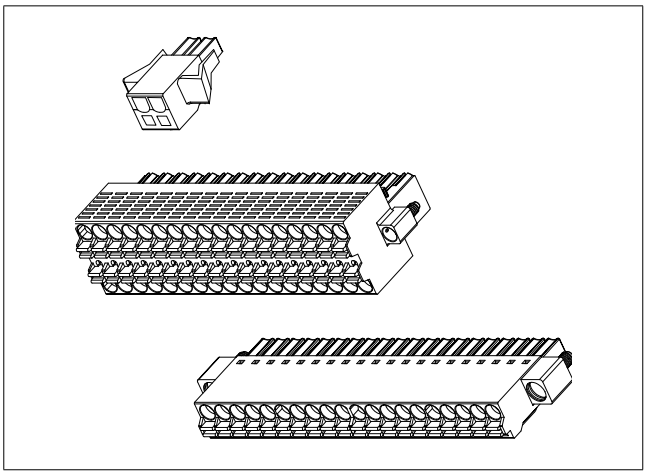


Figure 9 - Types of I/O connector

Power

The AXM IO module must be connected to a 24 Vdc power supply unit. The same 24 Vdc power supply can feed several devices.
Make sure that the current issued by the power supply is higher than the total maximum current absorbed by all the devices connected.

Considering that the device has no switch, it is necessary to install one before it, with a protective fuse.
The switch has to be positioned in the immediate vicinity of the device and be easy for the operator to reach.

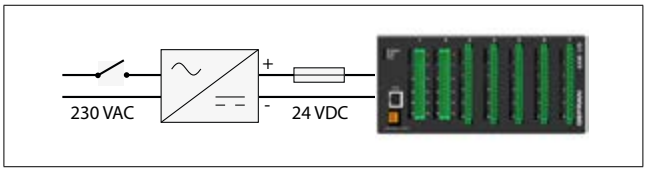


Figure 10 - Power sectioning

For the 24 Vdc power supply unit, use a separate line from that used for electromechanical power devices such as relays, contactors, solenoids, etc.
If there are considerable changes in the mains voltage, use a voltage stabiliser.
Near to high frequency generators or arc welders, use adequate grid filters.

Connect the power cables to the power connector.
Fit the cylindrical nucleus in ferrite, supplied with the product, as close as possible to the device to limit the susceptibility of the device to electromagnetic disturbance (figure 11).

The 24 Vdc power supply cables must follow a separate path from the power cables of the plant or machine.

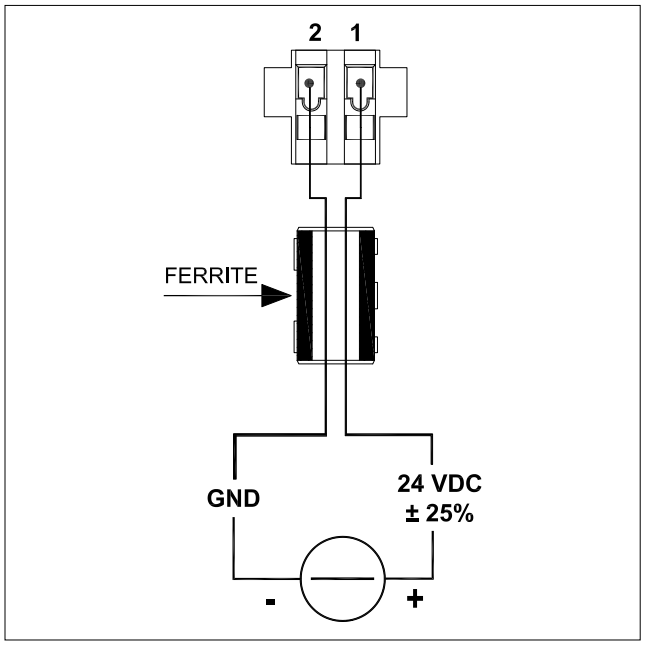


Figure 11 - AXM IO power supply

Attention: Amake sure that the earth connection is efficient. A non-existent or inefficient earth connection can make the operation of the device unstable, due to excessive environmental disturbance.
In particular, check that:

- the voltage between ground and earth is <1V;
- the ohm resistance is < 6 Ω.

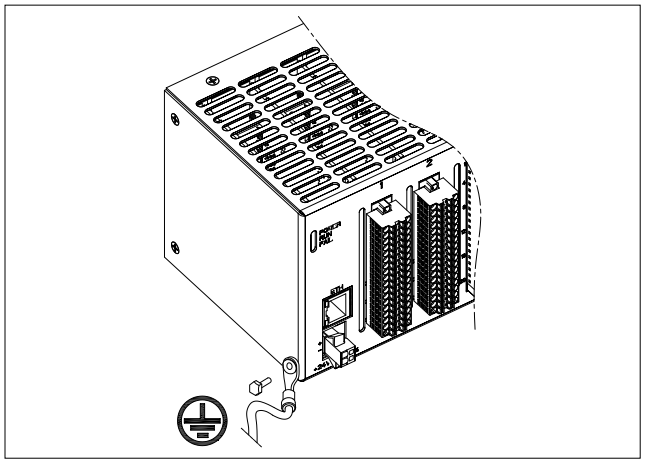
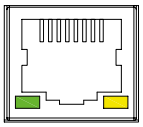


Figure 12 - Ground connection

NETWORK GDNET

The GDNET real-time protocol is a protocol that exploits the ethernet connection. The Ethernet port allows you to connect AXM IO to a Control Panel that supports the GDNET protocol.



Pin	Name	Description
1	TX+	Data transmission +
2	TX-	Data transmission -
3	RX+	Data receiving +
4		
5		
6	RX-	Data receiving -
7		
8		

The connection cable to be used must be a CROSSED one (cross).

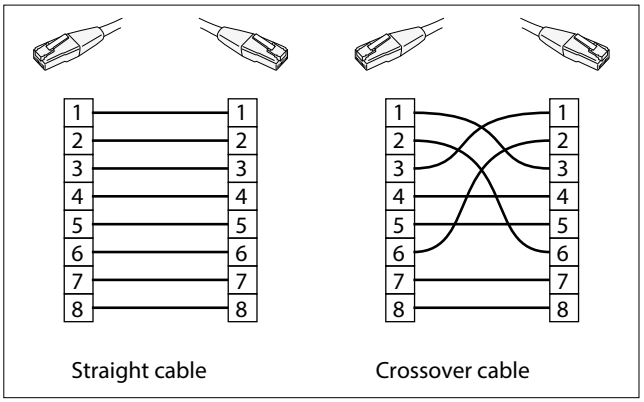


Figure 13 - Straight and crossover Ethernet cables

Use a UTP CAT6 cable or higher for connection.
The maximum length of the Ethernet cable is 100 meters.
Do not run the Ethernet cable near the power cables of the machine, to avoid interference in data transmission.
The RJ45 socket is equipped with two LEDs.
When the ethernet connection is active the green LED remains fixed ON; when there is data transmission the yellow LED is BLINKING.

Heading the wires

It is possible to use cables with an appropriate tip.

The AXM IO system uses 3 types of connectors: 2 clamp power connector; 20 clamp IO connector; 36 clamp IO connector.

- 2 clamp power connector: the connector is NOT push-in. For the wiring open the spring with a small and thin screwdriver and insert the electric cable.

  Use 1.5 mmq maximum cable.

  To remove the wiring open the spring with a small and thin screwdriver.
- 20 clamp and 36 clamp IO connector: the connectors are push-in connector. For wiring without the header open the spring by pressing the orange button and insert the electric cable, for the wiring with header insert the electric cable directly.

  Use 1.5 mmq maximum cable.

  To remove the wiring open the spring by pressing the orange button.

Wiring

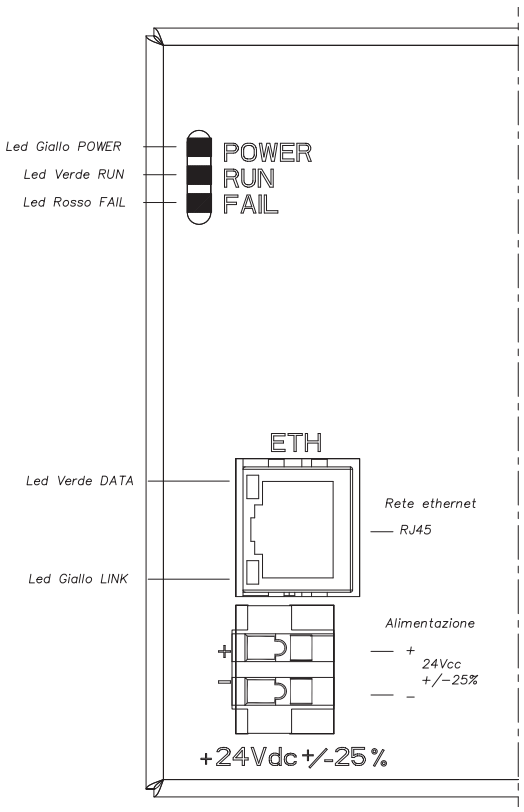
The table below defines the guidelines for wiring the IOs.

Signal	Type and electric wire section	Description
+24Vin	Unshielded cable, 1 mm^2	Power supply 24 VDC
GNDin	Unshielded cable, 1 mm^2	0V, 24 VDC power supply reference
I+ / I- / I(x)	Unshielded cable, 0.5 mm^2	Digital input
GNDI	Unshielded cable, 0.5 mm^2	Digital input, reference
+24V	Unshielded cable, 1.5 mm^2	Power supply 24 VDC for outputs
U(x)	Unshielded cable, 0.75 mm^2	Digital output
GNDU	Unshielded cable, 0.5 mm^2	Digital output, reference
+24Vout(x)	Shielded cable, 0.5 mm^2	Amplified sensor power supply
VS(x)	Shielded cable, 0.5 mm^2	NOT amplified sensor power supply
VP(x)	Shielded cable, 0.5 mm^2	Potentiometer power supply
IN(x)+	Shielded cable, 0.5 mm^2	Analog input +
IN(x)-	Shielded cable, 0.5 mm^2	Analog input -; strain gauge only
OUT(x)	Shielded cable, 0.5 mm^2	Analog output
GND(x)	Shielded cable, 0.5 mm^2	0V, analog input reference
GNDR(x)	Shielded cable, 0.5 mm^2	Potentiometer input -
GNDout(x)	Shielded cable, 0.5 mm^2	0V, analog output reference
TC(x)+ / TC(x)-	Compensating cable	Thermocouple input ±

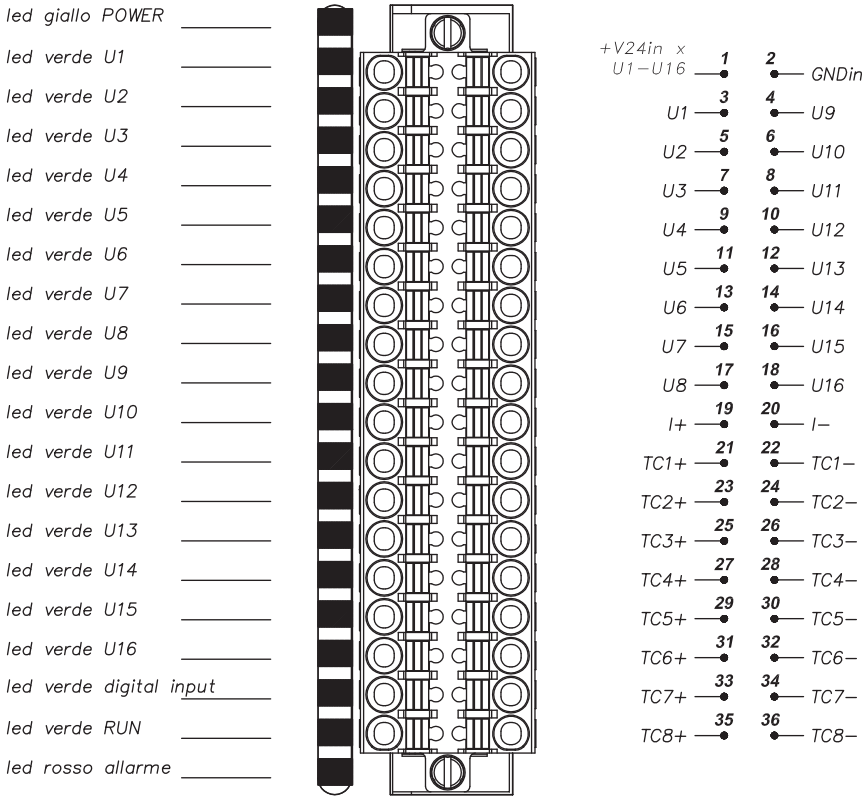
Attention:
Wire the shield braid of the shielded cables to GROUND close to the signal source.

Connection diagrams

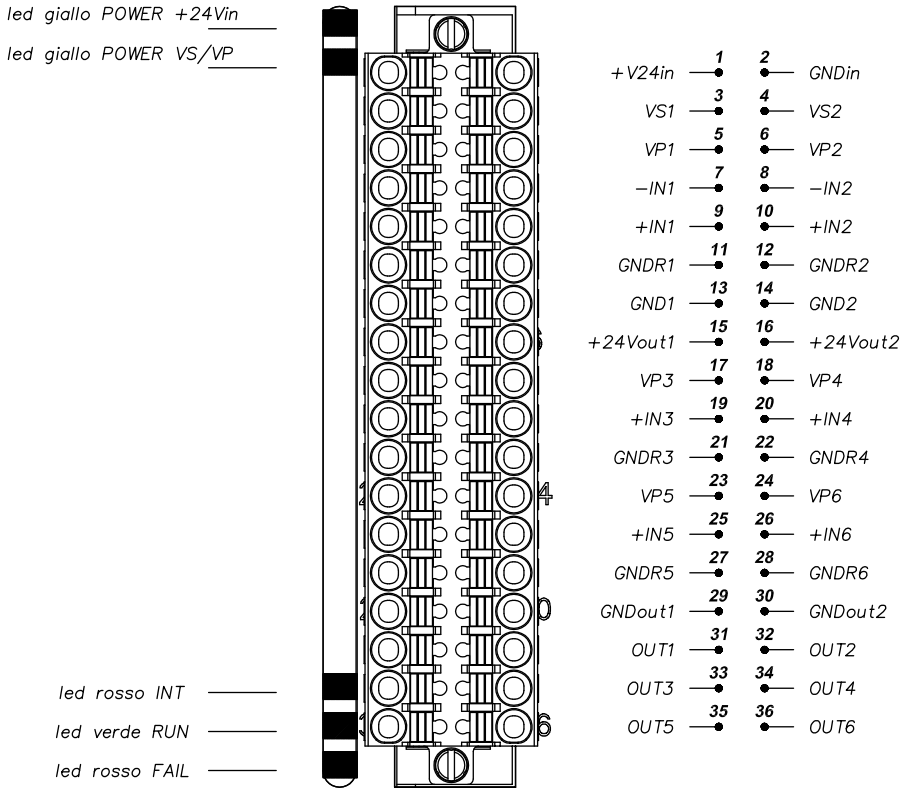
Gateway resources and connections



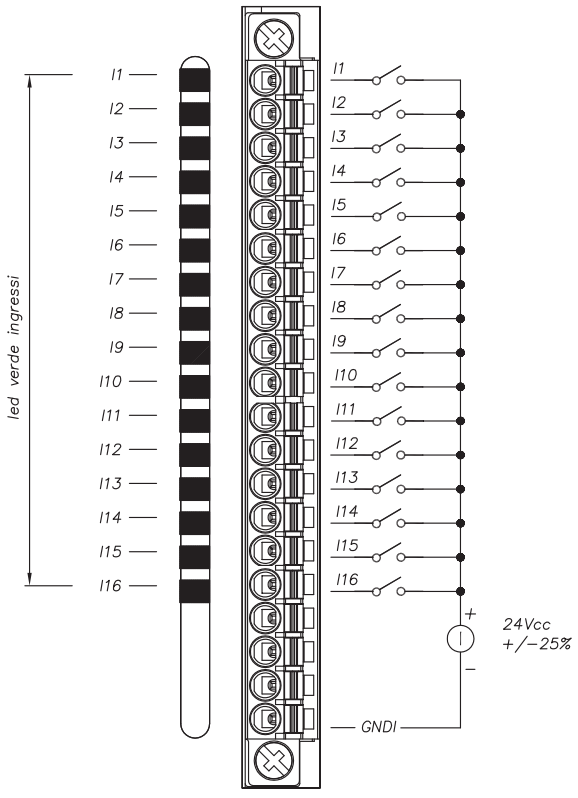
Resorces and connection position 1: Temperature



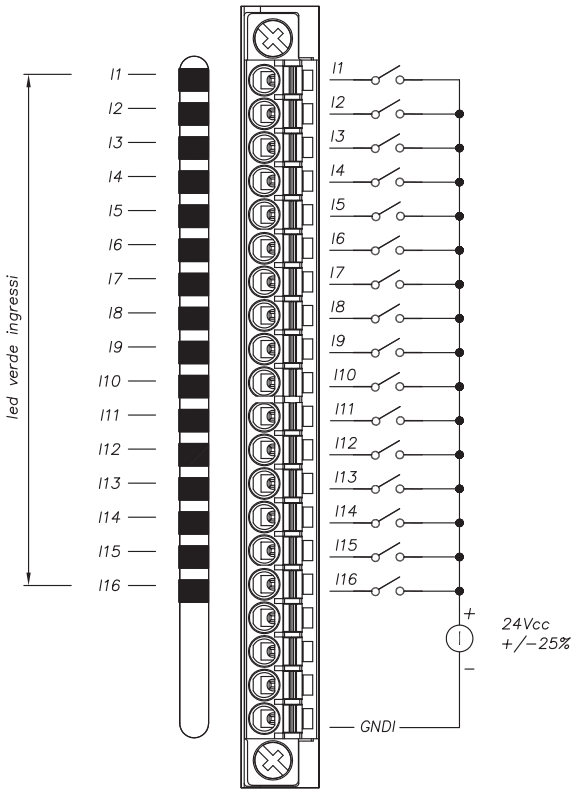
Resorces and connection position 2: Analog Input and Output



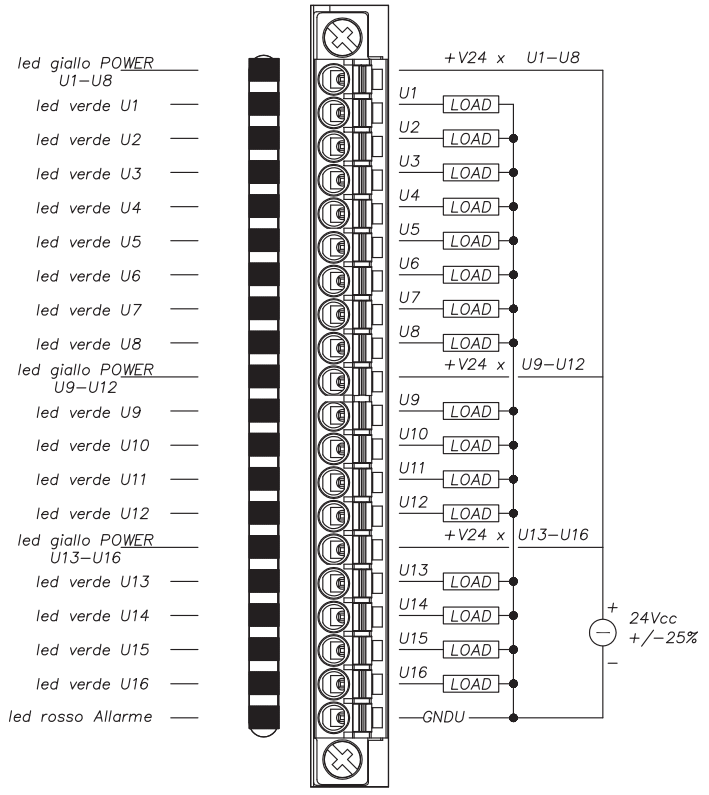
Resorces and connection position 3: Digital Input



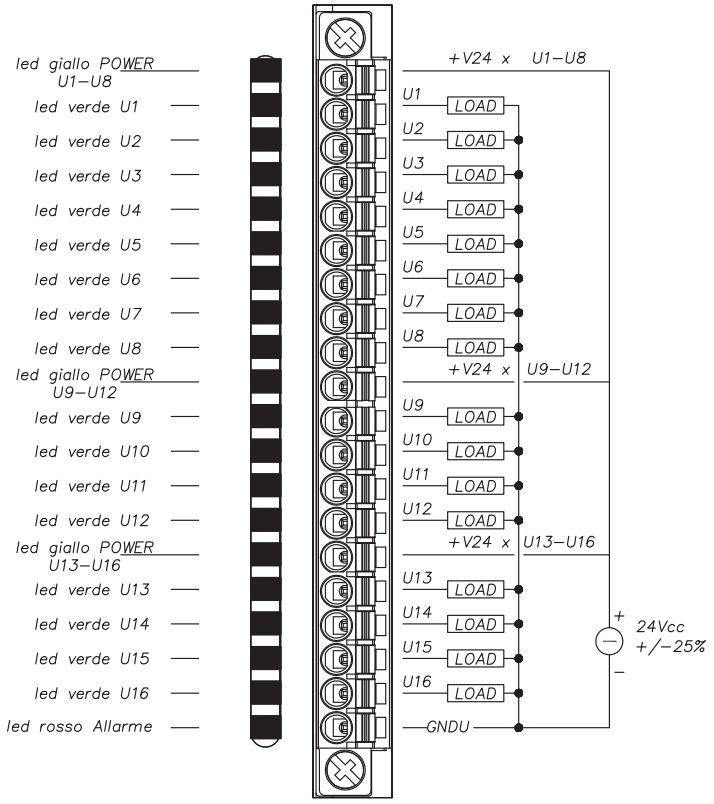
Resorces and connection position 4: Digital Input



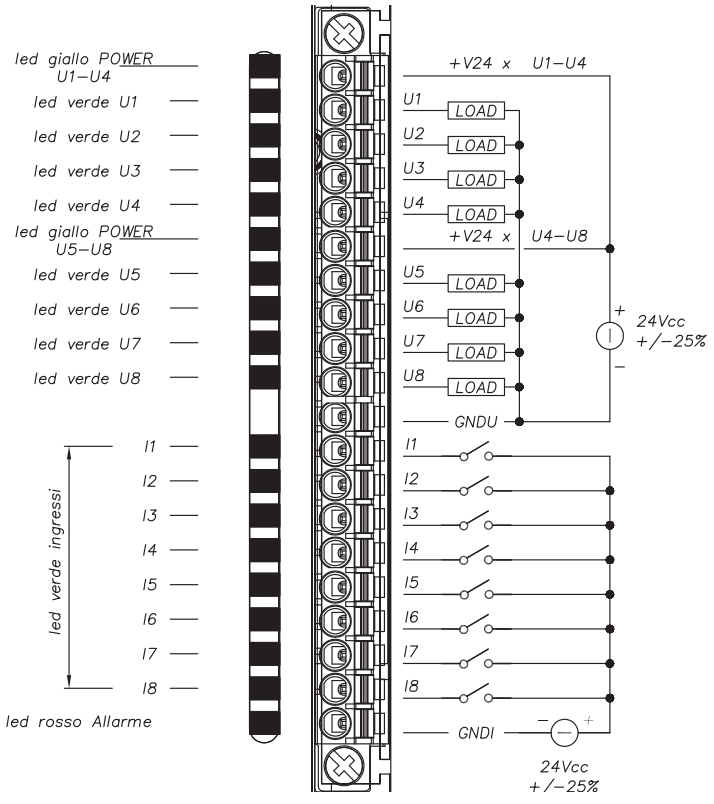
Resorces and connection position 5: Digital Output



Resorces and connection position 6: Digital Output



Resorces and connection position 7: Digital Input and Output (only AXM IO 116)



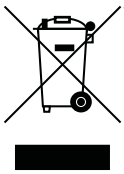
MAINTENANCE AND DIAGNOSTICS

Maintenance

AXM IO Module

The module requires no maintenance.

Disposal



The AXM IO module must be disposed of in compliance with the laws in force.
Some of the components used in the devices may damage the environment unless disposed of properly.

Diagnostics

AXM IO has many LEDs to check the status of operation and for diagnostics. See the table below for the details.

ATTENTION: the LEDs of the IO connectors, without the gateway, from 1 to 7 are numbered from 1 to 20. Some led positions they may not be installed, as they do not necessary.

POSITION	No & Led colour	Control	Meanings	Possible actions
Gateway GDNET	POWER yellow	The system power supply	The system is powered	Check that at the heads of the power supply terminal there are 24 Vdc ± 25% and that the polarities are correct
	RUN green	Program running	Off: program not running Flashing: program in execution	
	FAIL red		Off: everything is ok On: error on the card, network not connected	Check the crossover network cable
	LINK yellow	Ethernet network	On: connected network	Check the crossover network cable
	DATA green	Ethernet network	Flashing: data transfer in course	Check the crossover network cable
Position 1: Temperature	1 POWER yellow	The card power supply	The card is powered (output block)	Check that at terminals 1-2 24Vdc ± 25% are present
	2..17 green	Digital output status	Off: output is not activated On: output activated	
	18 green	Digital input status	Off: input is not activated On: input activated	
	19 RUN green	Card configuration	Slow flashing: the card works with the default configuration Fast flashing: the card works with the user configuration	
	20 ALLARME red	Card alarm	One or more digital outputs are in protection	Disconnect the load, switch off and turn on again to see if the alarm disappear, in this case check the load

POSITION	No & Led colour	Control	Meanings	Possible actions
Position 2: analog input and output	1 POWER yellow	The card power supply	The card is powered	Check that at terminals 1-2 24Vdc ± 25% are present
	2 POWER VP and VS yellow	The external transducer power supply	The power supplies for the transducers are present	If switched off, disconnect the transducers, if it lights up check the transducers
	18 INT red	Interrupt	An interrupt from card is in progress to the CPU	
	19 RUN green	Card configuration	Slow flashing: the card works with the default configuration Fast flashing: the card works with the user configuration	
	20 FAIL red	Card error	The card has a malfunction in one of its parts	Turn the card off and on again to see if the error disappears
Position 3 & 4: digital input	1..16 green	Digital input status	Off: input is not activated On: input activated	
Position 5 & 6: digital output	1-10-15 POWER yellow	The card power supply	The card is powered (output block)	Check that at terminals 1-20, 10-20 and 15-20 24Vdc ± 25% are present
	2..9-11..14-16..19 green	Digital output status	Off: output is not activated On: output activated	
	20 FAIL red	Card alarm	One or more digital outputs are in protection	Disconnect the load, switch off and turn on again to see if the alarm disappear, in this case check the load
Position 7: digital input and output (only for AXM IO 116)	1-6 POWER yellow	The card power supply	The card is powered (output block)	Check that at terminals 1-11 and 6-11 24Vdc ± 25% are present
	2..5-7..10 green	Digital output status	Off: output is not activated On: output activated	
	12..19 green	Digital input status	Off: input is not activated On: input activated	
	20 FAIL red	Card alarm	One or more digital outputs are in protection	Disconnect the load, switch off and turn on again to see if the alarm disappear, in this case check the load

Note

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