A-GATE SIII

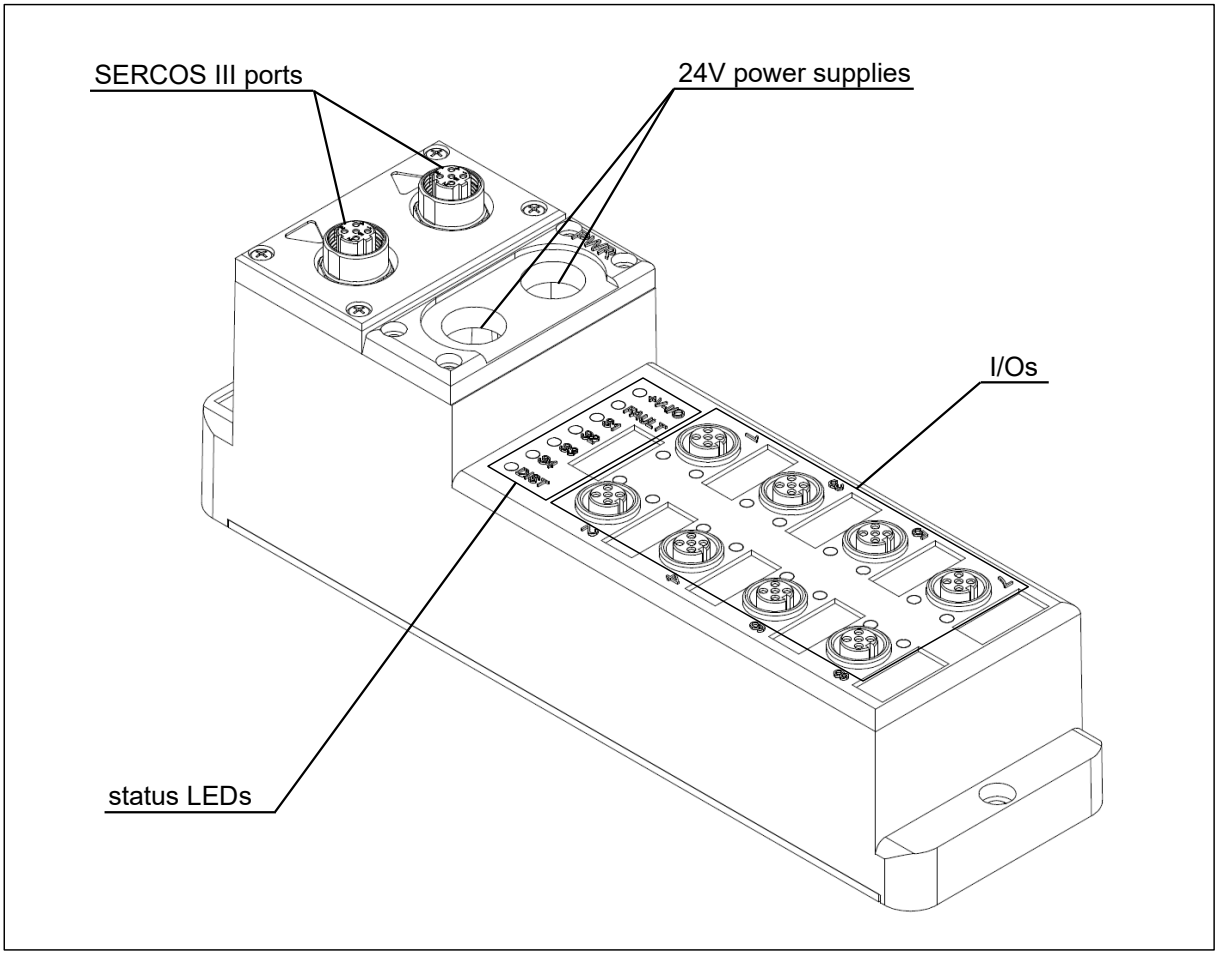
Analog I/O module

Datasheet

Description

Analog I/O module. Main characteristics:

- 16 analog 0÷10V or 4÷20mA inputs, individually configurable.
- 2 analog 0÷10V outputs.
- 12 bit resolution.
- SERCOS III interface for real-time control.
- Industry standard M12 connections.
- Compact IP65 plastic housing.



Ordering informations

Products	SMITEC part number
I/O module A-Gate SIII	KZ010340

Accessories	SMITEC part number
Power supply connector (Weidmuller 1580450000)	KF100000
M12 sealing plug	EP200068
PG-9 cable gland (for power supply connector)	EK500055
PG-9 sealing plug	EK500223

Documentation	SMITEC part number
Datasheet for KZ010340 (english)	DK400097

Technical data

General data	
Housing dimensions (length x width x height)	220 x 63 x 72 mm
Weight	0.53 kg
Permissible operating temperature	+5°C to + 55°C
Permissible storage temperature	-40°C to +70°C
Permissible humidity	5% to 95%, not condensing
Permissible air pressure (operation)	80 to 106 kPa (up to 2000 m above sea level)
Permissible air pressure (storage)	70 to 106 kPa (up to 3000 m above sea level)
Degree of protection	IP65 according to IEC 60529
Wiring method for power supply connector	Screw terminals
Conductors cross-section	0.1 to 2.5 mm^2 (27÷12 AWG), stranded wire
Functional earth connection	By supply connector

Power supplies	
Number of supplies	2
Logic power supply	20.4 ÷ 28.8 VDC according to EN 61131-2
Maximum allowed ripple on logic supply	5% of nominal voltage according to EN 61131-2
Current consumption on logic supply	400 mA max.
Overcurrent protection on logic supply	PTC resettable fuse
I/O power supply	20.4 ÷ 28.8 VDC according to EN 61131-2
Maximum allowed ripple on I/O supply	5% of nominal voltage according to EN 61131-2
Current consumption on I/O supply	Depending on external loads.
Overcurrent protection on I/O supply	5 x 20 mm fuse, 2 A max.
Main power connector current carrying capacity	12 A max.

Analog inputs	
Number of inputs	16, software configurable
Voltage inputs measuring range	0 ÷ 10 V
Voltage inputs impedance	12.5 kΩ typ.
Voltage inputs resolution	12 bit
Voltage inputs measuring error	t.b.d.
Current inputs measuring range	4 ÷ 20 mA
Current inputs impedance	< 150 Ω
Current inputs resolution	12 bit
Current inputs measuring error	t.b.d.
Isolation between channels	none
Input state visual indicators	One bi-color LED lamp for each input, shoving the configuration of the input (green= voltage, amber = current).

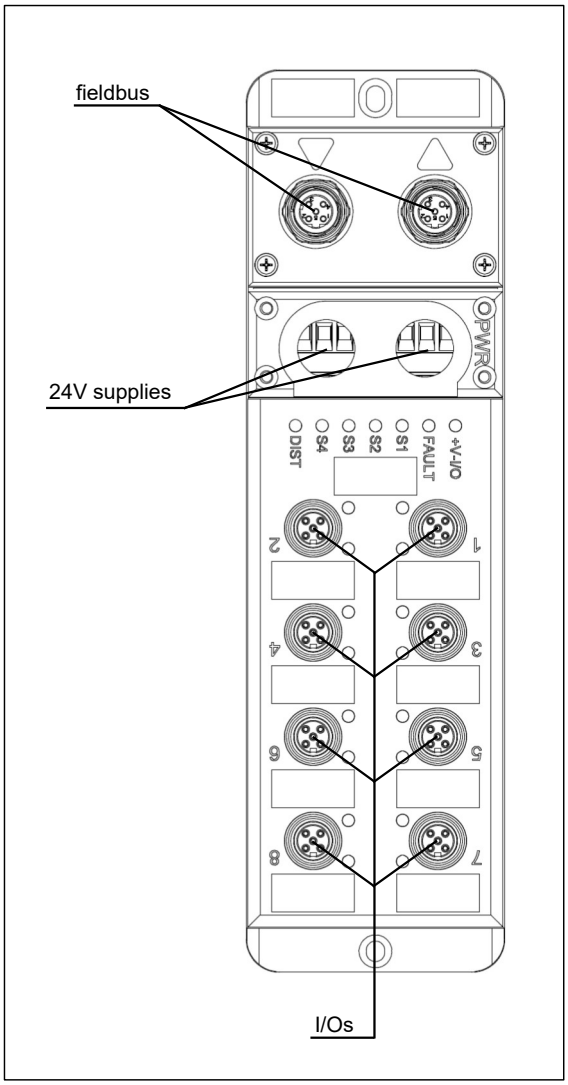
Analog outputs	
Number of outputs	2
Voltage range	0 ÷ 10 V
Resolution	12 bit
Max. sourcing current	10 mA each
Short circuit protection	Yes
Measuring error	t.b.d.

Fieldbus	
Fieldbus	SERCOS III
Module address setting	Auto assignment
Bus connections	By D-coded M12 connectors

Miscellaneous	
I/O visual indicators	Bi-color LED lamps
Module status visual indicators	6 LED lamps

Introduction

This module is a general purpose analog acquisition unit, able to acquire up to 16 signals and to provide up to 2 analog outputs. Designed in accordance to EN 61131-2 international standard, it assure compatibility with most sensors available on the market. Each input is individually configurable to acquire both $0 \div 10$ V voltage signals or $4 \div 20$ mA current signals, providing outstanding flexibility of use; two $0 \div 10$ V outputs are also available.
Robust and reliable real-time control is obtainable using Ethernet-based SERCOSIII protocol.
Small size and sealed housing render it particularly suited for a mounting on the machine's chassis, reducing the length of the cables.



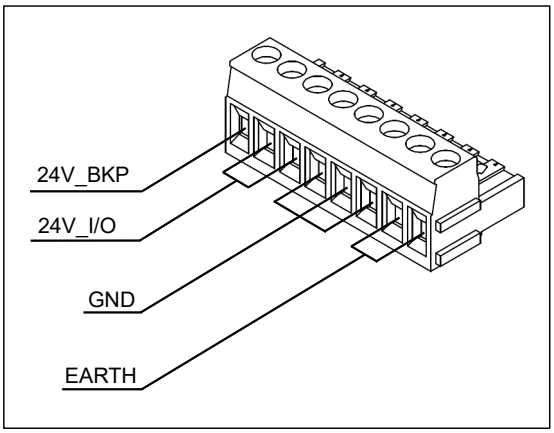
Connections

This module has several connectors for the power supplies, the I/Os and the fieldbus (depicted in the illustration). See the following chapters for a more detailed description of these.

Power supplies

The power supply connector is easily reachable removing the small plastic plate located on the upper side of the housing, secured by four M3 crosshead screws. Cable sealing is obtained using two PG-9 cable glands; whenever only one cable is used, seal the unused opening screwing in the suited sealing plug. The device needs two different power supplies: one feeds the logic section of the device, and one the external sensors/actuators; this I/O supply is provided with an internal 5 x 20 mm fuse acting as an overcurrent/overload protection. In case of replacement, never exceed the maximum rating or damage might occur. In several situations, it is customary to use an UPS to backup the logic power supply, particularly whenever the I/O supply could be interrupted by external events (e.g. an emergency button or a door switch). If the user doesn't need this feature, the two supplies can be shorted together.
If several modules should be fed by the same power supply, two different wiring topologies could be employed: a point-to-point and a daisy-chain topology. Point-to-point wiring means that each device is fed by the PSU via its own cable; all cables are tied together at the origin. Daisy-chaining stands for a series connection of the modules; each of them is fed by the

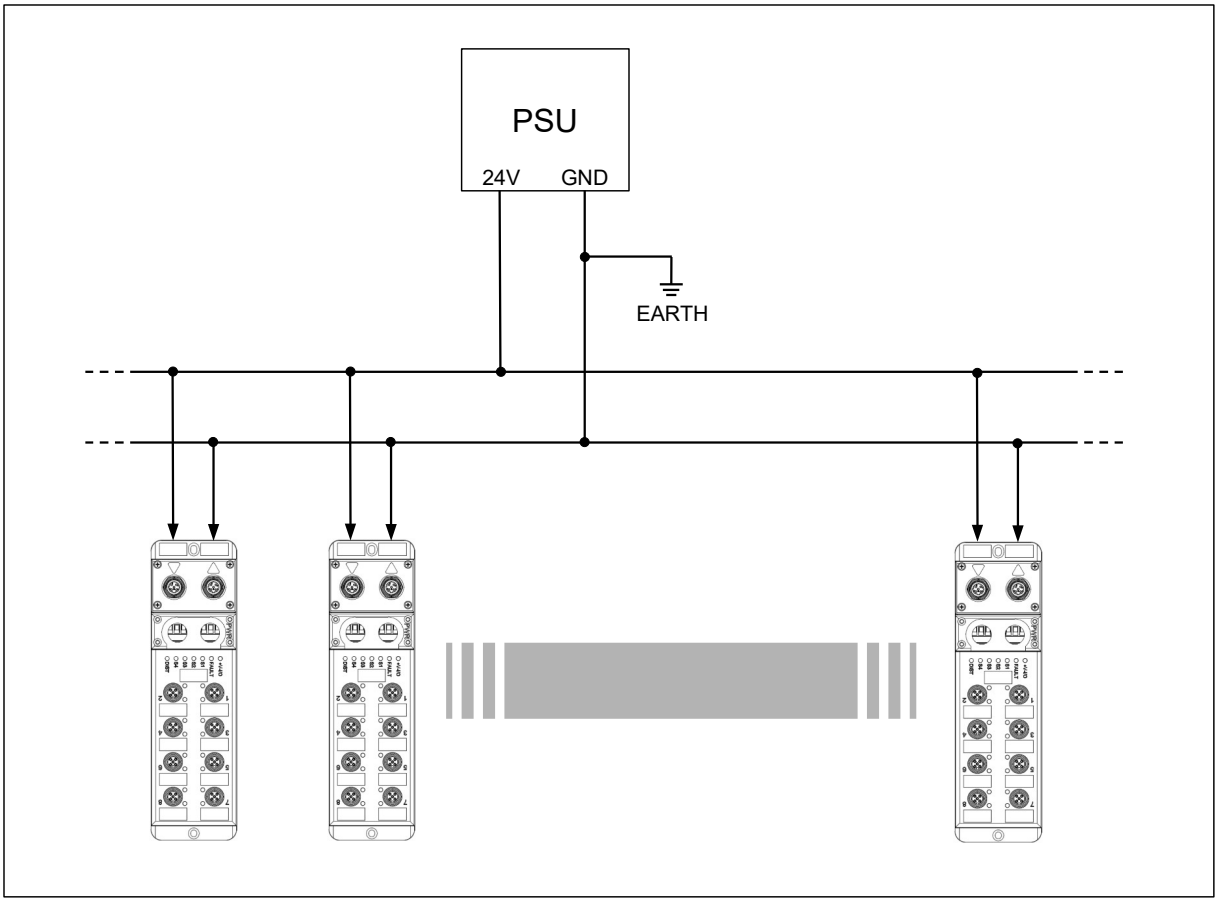
previous device and, in turn, it feeds the following one. This topology is particularly useful when there are many devices and/or they are very far from the PSU. The principal drawback of this kind of wiring is that the upstream conductor has to bear the whole current, so this topology can be used only where the total power is limited. Whenever the total current flows through a connector, special care has to be exerted to avoid damaging of this one, especially during a fault.



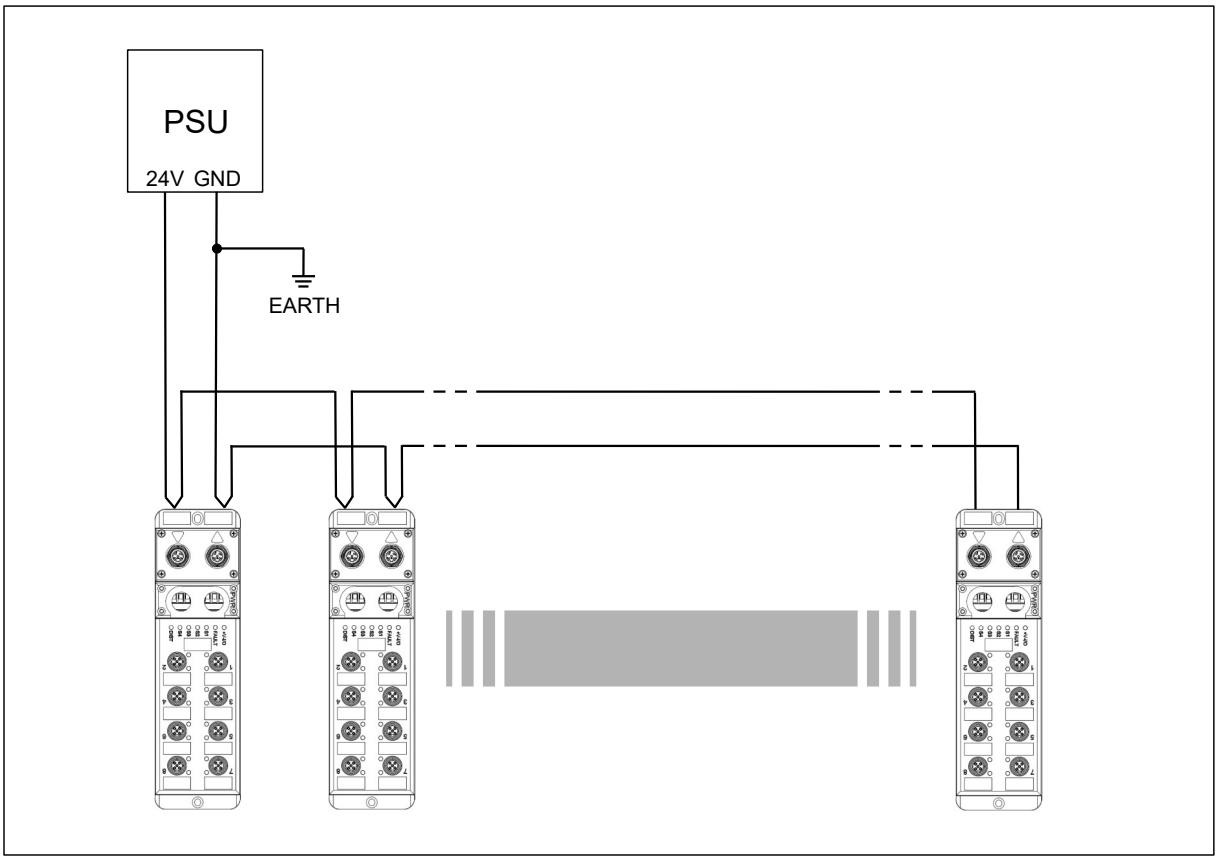
The pinout of the supply connector is depicted aside; as previously stated, power supply pins are split, so easing wiring in a daisy-chaining fashion. Please notice the presence of a separated earth contact, used to connect the shield of the I/O cables and for EMC filtering purposes.

To avoid failures or incorrect operation of the modules, the PSU ground should be equipotential with earth; to avoid the generation of detrimental ground loops, the ground contact should be earthed only once in the electrical cabinet, and the impedance of the earth connections should be kept low enough to effectively drain RF noise.

The following illustration shows the recommended wiring for point-to-point topology:



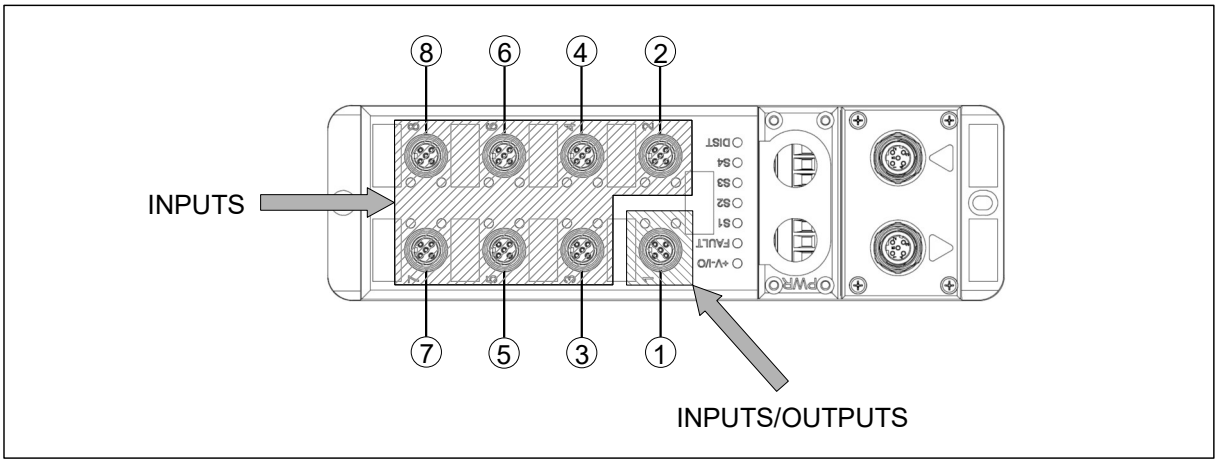
An example of daisy-chain topology is instead depicted in the following illustration; for simplicity, in each example only one PSU is shown.



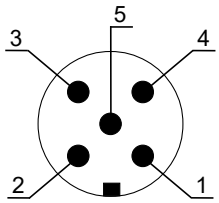
Whenever necessity of split power supplies arises (eg. when using a backup logic supply), the same wiring rules apply to each one.

Inputs/Outputs

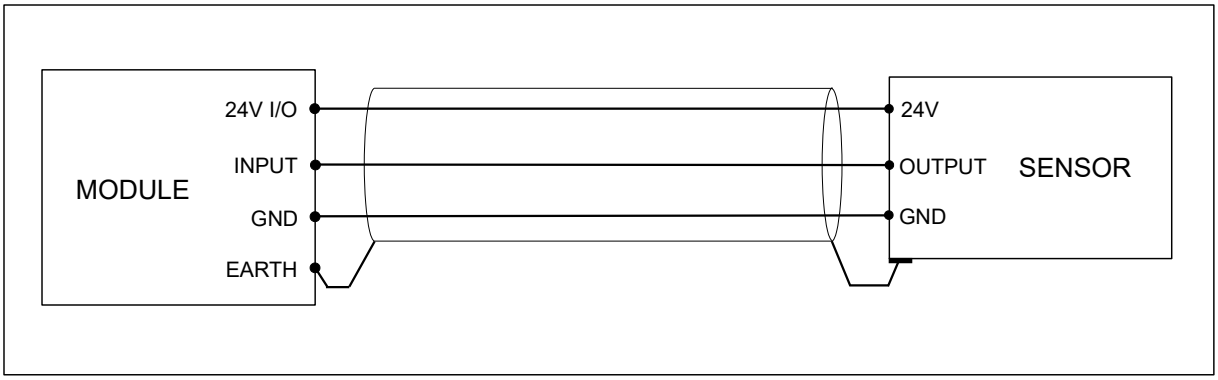
This module is provided with eight M12 connectors for analog I/Os (see illustration), a bi-color LED lamp clearly shows if the corresponding input is configured to read a voltage



(green) or a current (amber). The user can configure each I/O as current or voltage input independently; besides, the I/Os on the first M12 connector can be configured also as $0 \div 10$ V analog outputs. In this case, relevant status LEDs are always turned green.
Each connector is marked with a number molded in relief on the housing; the numbering pattern is shown in the illustration. The pinout is resumed in the following table:

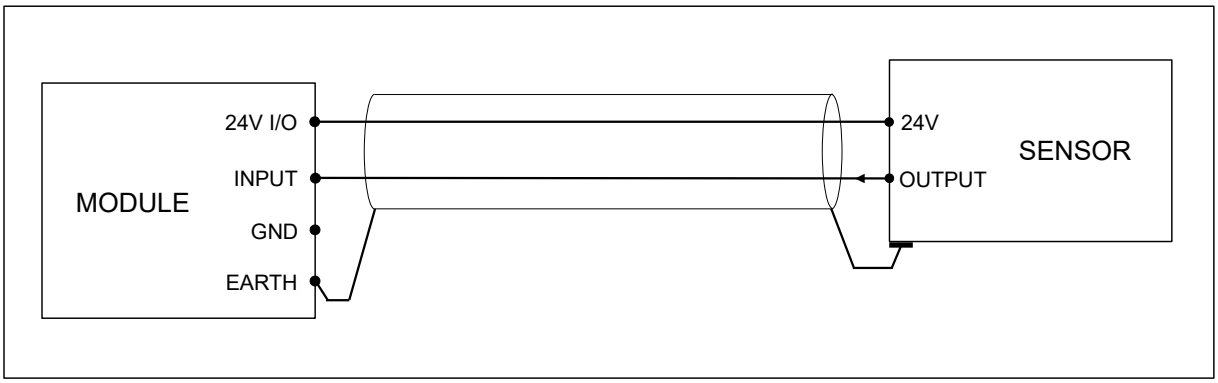
	**CONNECTOR NUMBER**	
PIN NUMBER	1	2 - 8
1	*24V*	*24V*
2	*input/output 2*	*input 2*
3	*GND*	*GND*
4	*input/output 1*	*input 1*
5	*shield*	*shield*

Because analog signals are markedly susceptible to electrical noise, particularly common in harsh industrial environment, the wiring should be done following the criteria reported in this chapter; for the same reason, the use of shielded cable is highly recommended. The cable sheath must be tied to earth using the central pin of the connector, or the shielding performance could degrade noticeably.
Whenever high noise or long wiring distances are unavoidable, keep present that $4 \div 20$ mA current signals are generally less susceptible to noise than $0 \div 10$ V.
Voltage-output sensors behave like a low impedance voltage generator, and the recommended wiring is depicted here:

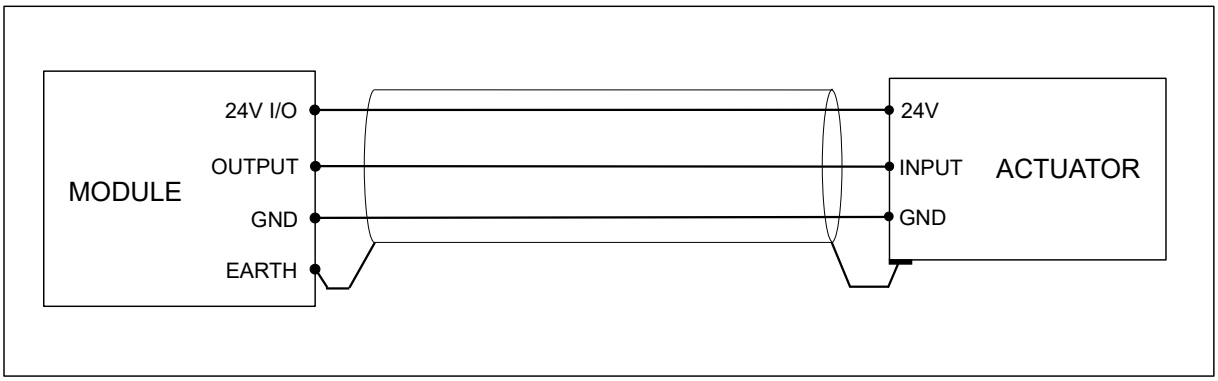


Please notice that the sensor's supply is drawn directly from the module, so avoiding highly detrimental ground loops.
Current-output sensors behave like a high impedance current generator; often they have only two contacts and are connected in series with the 24V supply. Voltage drops along the cable

are not of concern with these sensors, rendering them more robust and difficult to corrupt. The following illustration depicts the recommended wiring:



Whenever an input, configured to read currents, absorbs a current out of range, it switches in voltage mode and a warning is issued; this strategy is adopted to avoid damaging of the circuitry and also of the external devices (e.g. when 24V is shorted on an input or when connecting a $0 \div 10$ V sensor instead of the correct one).
As stated before, two analog $0 \div 10$ V outputs are available on the connector #1; please be aware that these outputs are activated at the same time, so it is impossible to have an input and an output on this connector. See the illustration for an example of wiring:

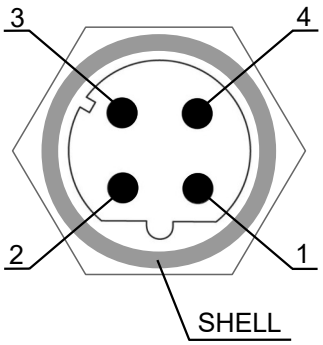


Even if in the picture the actuator is directly supplied by the module, the user could feed it with an external supply if the current needed is beyond the limits of the unit; in this case, try to connect the two grounds together, possibly avoiding ground loops.
Voltage outputs are arranged to prevent damage in case of short-circuit; nevertheless, avoid to overload them for extended periods of time, or performance degradation might occur.

Fieldbus

This module is provided with an Ethernet interface; the connections of the fieldbus are available through two purposely made D-coded M12 connectors; the pinout is depicted in the illustration. The wiring of the fieldbus network should be done with standard CAT 5E Ethernet cable. Due to the address auto-assignment system, the wiring order of the modules should be respected or an erroneous addressing will result. The two arrows etched aside the

fieldbus connectors indicate that this cable come from the preceding device or goes to the next device.



PIN	FUNCTION
1	TX DATA+
2	RX DATA+
3	TX DATA-
4	RX DATA-
SHELL	SHIELD

Module status

The status of the module is clearly shown by the status of six LED lamps; their colour and behaviour (being them turned on, turned off or blinking in a definite manner) indicate if the unit is working correctly or it is faulty and, in this case, where the problem lies.
The 24V_I/O lamp is lighted when the main power supply is delivered to the unit; if this LED is switched off, this supply is absent or the protection fuse is blown.