D-GATE SIII

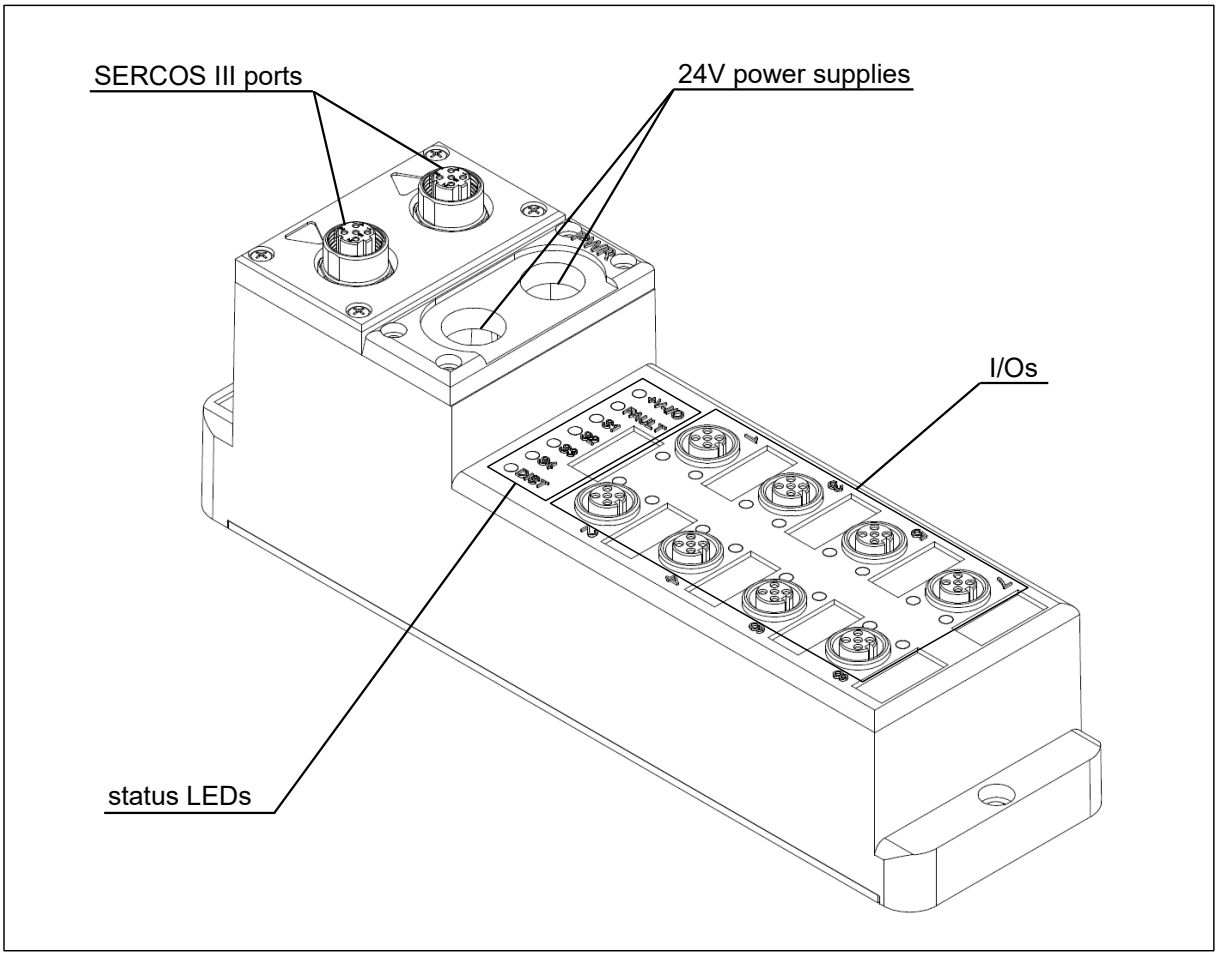
Digital I/O module

Datasheet

Description

Digital I/O module. Main characteristics:

- 16 digital 24V I/O individually configurable.
- Industry standard M12 connections.
- Type 1 and Type 3 compatible inputs.
- Outputs current 500 mA max.
- SERCOS III interface for real-time control.
- Compact IP65 plastic housing.



Ordering informations

Products	SMITEC part number
I/O module D-Gate SIII	KZ010326

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 KZ010326 (english)	DK400095

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	8 A max.
Overcurrent protection on I/O supply	5 x 20 mm fuse, 10 A max.
Main power connector current carrying capacity	12 A max.

Digital inputs	
Number of inputs	16
Nominal input voltage	24 VDC
Nominal input current	4.0 mA
Inputs design	According to EN 61131-2 Type 1 and Type 3 (also Type 2 with external resistor)
Maximum low level threshold	5 V
Minimum high-level threshold	11 V

Digital outputs	
Number of outputs	16
Type of outputs	Digital 24 V
Outputs design	High-side MOSFET with integrated Zener clamp
Outputs rated current	500 mA max.
Protections	Overload, short circuit and overtemperature
Inductive loads special functions	Fast demagnetization

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

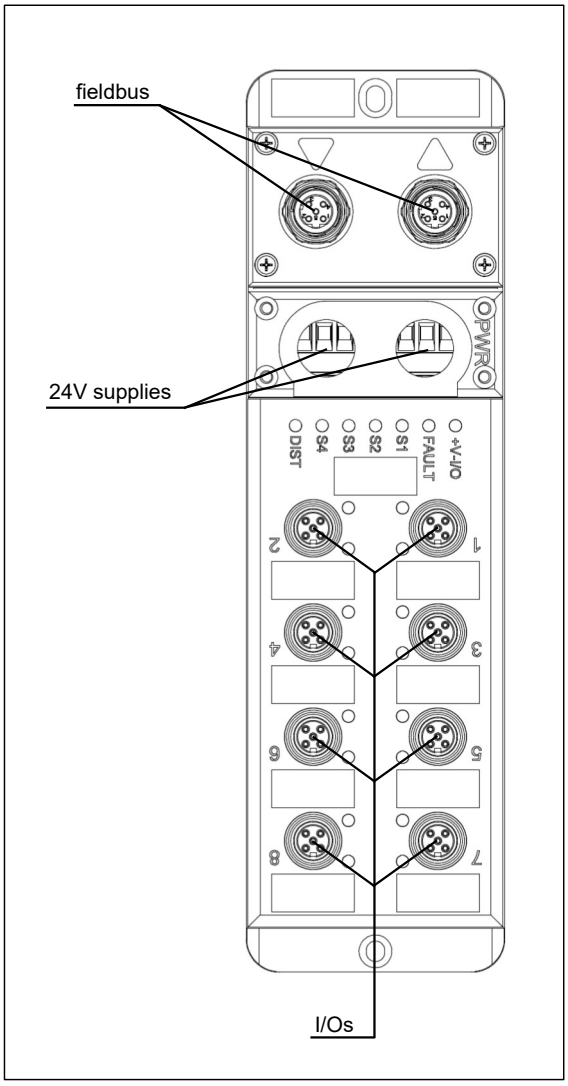
Miscellaneous	
I/O visual indicators	Amber LED lamps, lighted if corresponding I/O is on
Module status visual indicators	6 LED lamps

Introduction

This module integrates 16 digital 24 V I/Os, individually configurable as inputs or outputs by software. Small size and sealed housing render it particularly suited for a mounting on the machine's chassis, reducing the length of the cables. Normalized inputs and outputs assure compatibility with most sensors and actuators available on the market.
Robust and reliable real-time control is obtainable using Ethernet-based SERCOSIII protocol.

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.

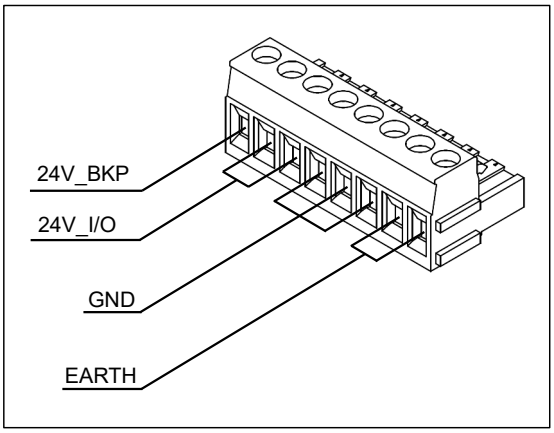


Power supplies

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 power stages and the sensors; the greater amount of power is usually drawn by the I/O supply, and an internal 5 x 20 mm fuse acts as an overcurrent/overload protection. 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 (eg. 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

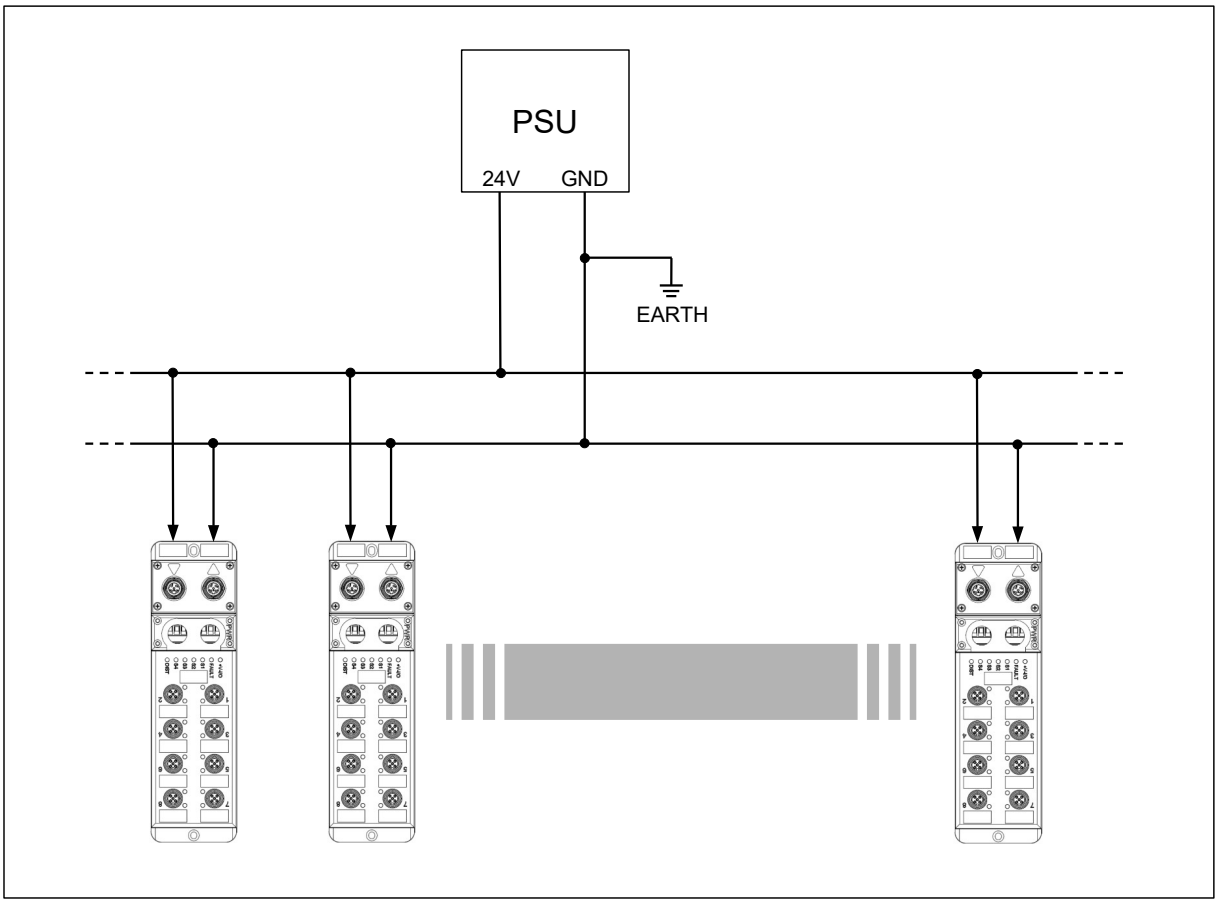
power is limited. Whenever the total current passes through a connector, special care has to be exerted to avoid damaging of this one, especially during a fault.

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.



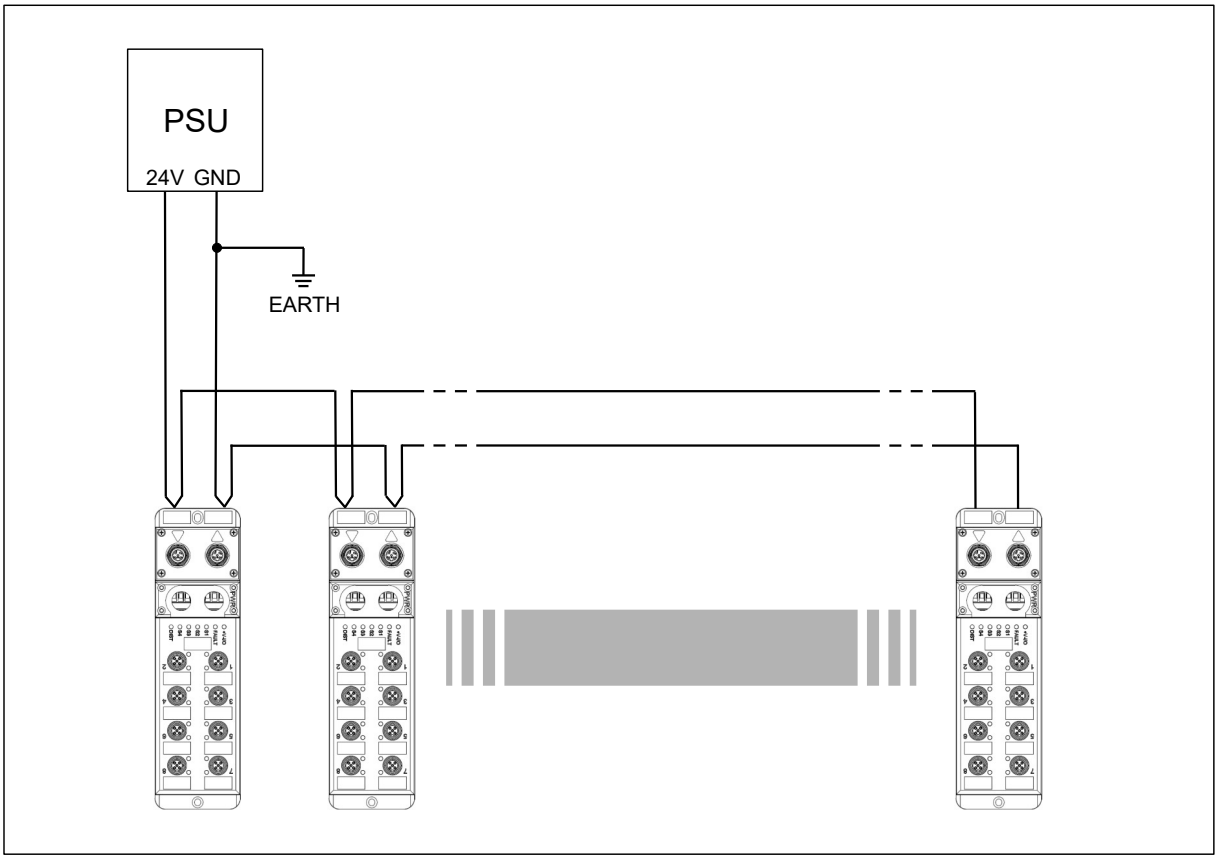
To avoid failures or incorrect operation of the modules, the PSU ground should be equipotential with earth; to avoid the generation of detrimental ground loops, the ground contact should be earthed only once in the electrical cabinet, and the impedance of the earth connections should be kept low enough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

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



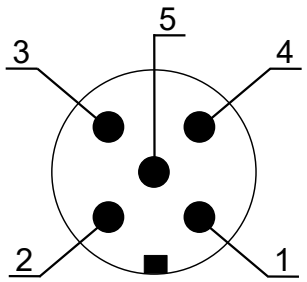
An example of daisy-chain topology is instead depicted in the following illustration; for simplicity, in each example only one PSU is shown. Whenever necessity of split power

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

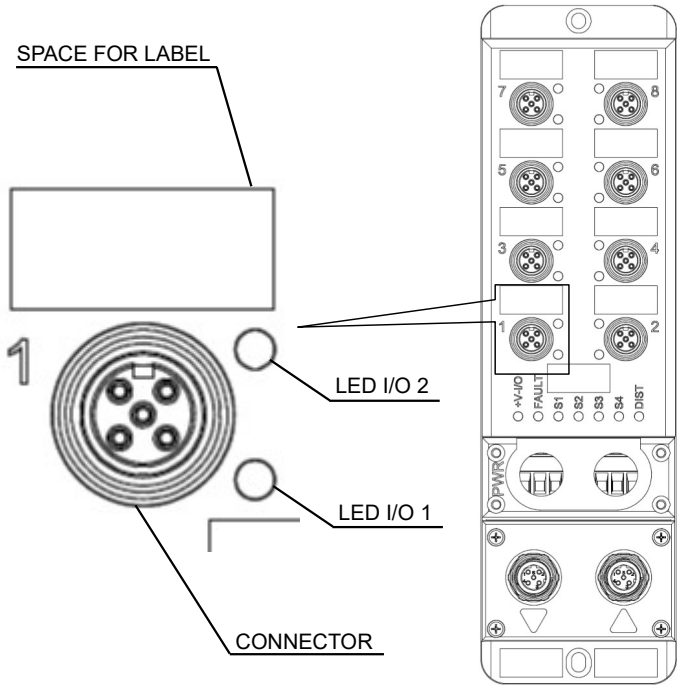


Inputs/Outputs

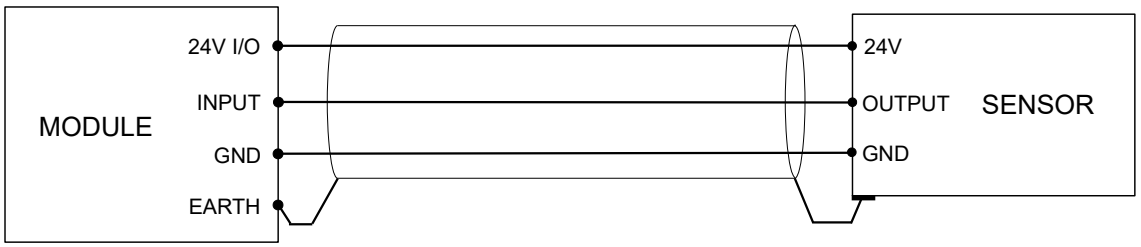
This module is provided with eight M12 connectors for digital I/Os (see illustration). Each I/O is provided with a status LED, which is lighted when the corresponding input/output is at logic level “1”. As previously stated, the user can configure each I/O independently as digital input or digital output.
Digital inputs, in an effort to render them compatible with the great majority of sensors available on the market, are compliant with Type 1 and Type 3 inputs, as defined in EN 61131-2. Type 1 characteristics are thought primarily for mechanical contact switches (such as contact relays, push buttons, switches, etc..), whilst Type 3 characteristics are mostly suited for solid state switching devices (i.e. devices with semiconductor-driven output).
Digital outputs are made with a p-channel MOSFET, so they are unable to sink current from the load. This particular arrangement is used to allow the implementation of a fast-demagnetization feature, which speeds up the decay of the current in an inductive load (such as relay coils, valves, etc..). This mode of operation, however, provokes a power dissipation in the output stages, so great care should be used whenever a high commutation speed and/or highly inductive loads are concerned. If the amount of power inside the housing becomes unbearable, an external freewheeling diode should be paralleled across the output; therefore, the load recirculating current flows in the external diode. Due to the limited voltage across the diode, the turn-off time could lengthen excessively, so an accurate examination is needed.



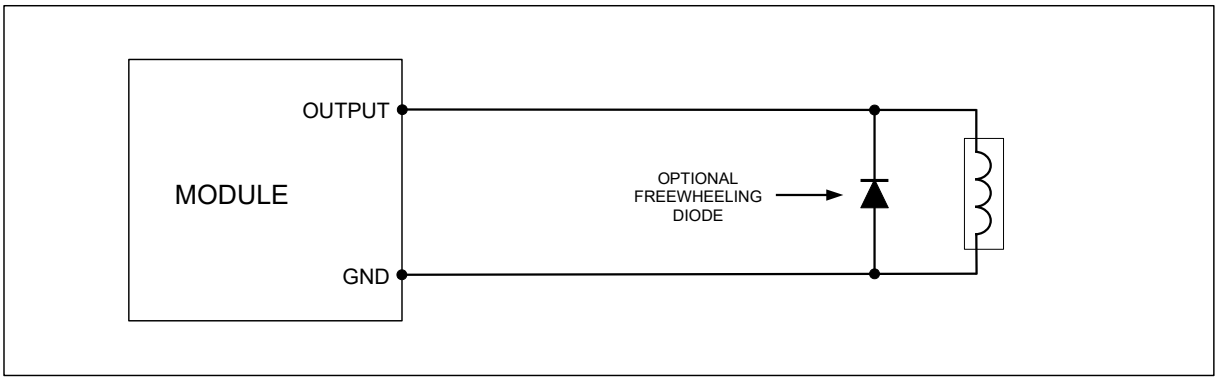
PIN	FUNCTION
1	24V I/O
2	I/O 2
3	GND
4	I/O 1
5	EARTH



Each connector, of the widely-known industry standard M12 type, carries two I/Os, their ground and a 24V I/O power supply (used to eventually feed sensors). In case of an overload or a short circuit, an internal 5 x 20 mm fuse protects the cables and the electronics. The center pin is tied to earth, and is used to connect the outer sheath of shielded cables.
A recommended wiring schematic for digital inputs is shown in the following illustration:

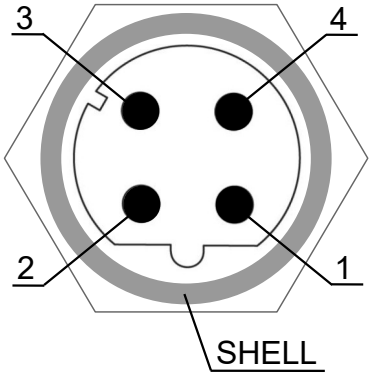


In this example, a shielded cable is used for the wiring. Even if not absolutely necessary in many applications, the use of shielded cable is very effective in reducing electrical noise picking up, especially in harsh industrial environments. The sheath should be grounded at the module side, and also at the sensor side whenever possible.
The following illustration shows a recommended wiring schematic for a typical actuator. In this case, unless the risk of disturbing noise-sensitive nearby devices is substantial, the wiring could be made with ordinary non shielded cable.



Fieldbus

This module is provided with an Ethernet based SERCOS III interface; this permits the implementation of a robust real-time control on the machine. The connections of the fieldbus are available through two purposely made D-coded M12 connectors; the pinout is depicted in the illustration at side.
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

Status indications

The status of the module is visually shown by a series of six of LED lamps, aligned on a row.