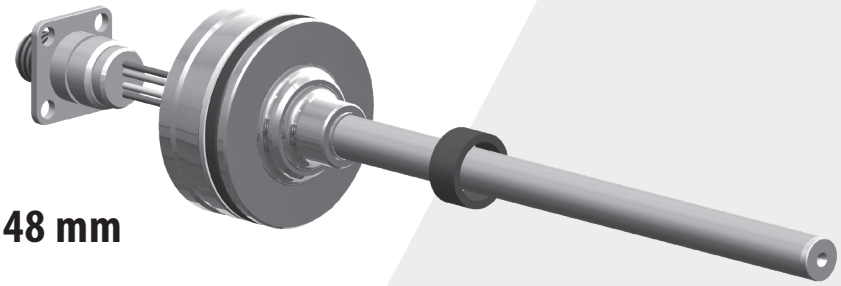
OMFB®
ELECTRONICS AND SENSORS

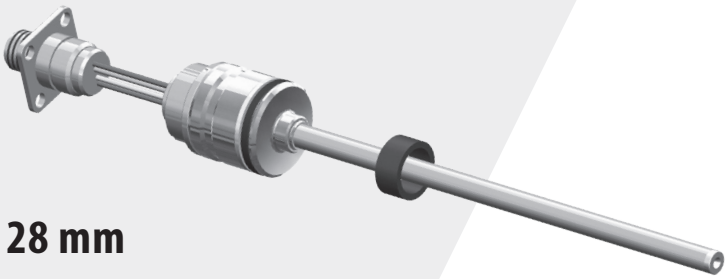
7M

Installation manual

MAGNETOSTRICTIVE LINEAR POSITION SENSORS



48 mm



28 mm

99707M00020 AE 03/12/2025

Index

1. Introduction

Before placing the sensors in operation, read carefully this documentation and follow the safety instructions.
The technical documentation provided below contains information about the mechanical installation and the electrical cabling of the 7M sensors. Such operations must be carried out by qualified personnel and/or by technicians that are familiar with the management of this type of sensors.

Description

7M sensors are designed according to the latest standards of electronic and mechanical engineering.
They are therefore cutting edge products that meet the EMC requirements for noise emission and immunity of vehicles and mobile machines, according to the current standards.
However, an incorrect installation or their inappropriate use may bring danger to the user or third parties, or cause damage to the sensor and to other apparatuses.
The sensors of the 7M family are conceived to measure positions in mobile hydraulic applications. The sensors provide a measure of the position and must be connected to a suitable control unit, for ex. a PLC, IPC, ECU or indicator or other types of signal acquisition devices.
As a pre-condition to guarantee the correct operation of the sensor, it is mandatory to carry out its transport, storage, assembly, commissioning and operation according to the instructions of the present manual and the product specifications (datasheet). To ensure this condition and guarantee a correct operation, the installation, connection and maintenance interventions must be performed only by qualified and authorised personnel.

2. Installation and operating mode

Additional safety measures, such as plausibility checks, limit switches, stop and emergency systems, protective devices, periodic checks of functionality etc., must be planned to avoid and prevent technical issues and dangerous breakups. In case of malfunction the sensor must be switched off and disconnected from the power supplier and control unit. Failure to comply with these safety procedures exempts the manufacturer from any liability arising from the incorrect use of the product.
To guarantee the functioning of the sensor it is indispensable to comply with the following provisions:

- Protect the sensor against mechanical damages during transport, installation and operation.
- Do not open or disassemble the sensor.
- Connect the sensor correctly and make sure that the polarity of the connections, the operation voltage and the supply current comply with the indications in the specification.
- The electrical connection must be performed according to the safety instructions for electrical equipment and only carried out by trained personnel.
- Use adequate cables, possibly shielded, directly connected to the sensor. Avoiding series connection of several sensors (loop connection).
- A checking procedure of the correct operation of the sensor must be carried out periodically (ex. by checking known positions).
- Before placing the apparatuses in operation, make sure that the safety of anyone will not be impaired by the starting of the machines.
- Tests of insulation, welding or painting the machine or parts of the machine (cylinder, work machine, etc.) may damage or destroy the position sensor. In these cases, all connector pins, or wires of the sensor, must be connected each others and to the ground (machine frame).

- The mating connector to be hooked to the sensor must guarantee an adequate degree of protection IP (>=67), to avoid the penetration of any external agent (water, dust, moisture etc).
- Avoid the presence of strong electrical or magnetic fields in the proximity of the position magnet.
- Do not connect or disconnect the sensor when powered.
- Do not expose the sensor to mechanical shocks.
- Do not use screws or magnetic parts near the sensor or to fix the cursor.
- Respect the specified temperature range.
- The sensor performance, as specified in the catalogue, is guaranteed with the use of OMFB magnets and under the specified environmental conditions.

3. Repairs

Repairs on the sensor can only be carried out by OMFB or by an entity expressly authorized by OMFB.

4. Warranty

Please refer to the general warranty conditions on web site www.OMFB.com, section “Sales Conditions”.

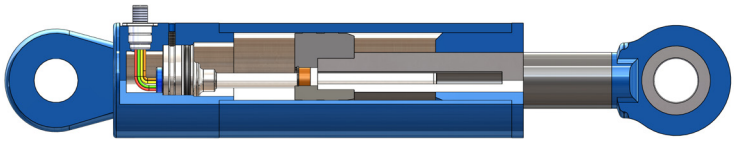
5. Description and technology of the product

The 7M sensors are designed for use in mobile hydraulic cylinders for accurate position measurement of the piston and are the ideal replacement for linear resistive sensors (potentiometers), offering better performance and unlimited life compared to these thanks to the absence of friction elements. The 7M sensors are resistant to vibrations, shocks, dust, weather and electromagnetic disturbances and are therefore successfully used in hydraulic cylinders to be intalled on agricultural machinery, construction machinery, earthmoving equipment, steering systems, lifting systems, etc.

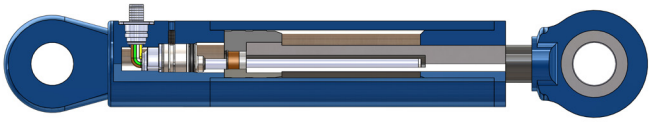
Magnetostriction

The 7M linear sensors are based on the magnetostrictive technology: a position magnet placed close to the sensor but without direct contact, provides the absolute position of the element connected to it. The electronics installed on the sensor head determines the operation of the sensor every thousandth of a second (for a stroke of 300 mm.) A current pulse is launched at the speed of light into the waveguide generating a magnetic field. When the magnetic cursor meets the magnetic field around the waveguide it creates a micro-physical deformation of the waveguide. When the mentioned current pulse meets the micro-deformation it generates a returning sound wave, which propagates at a speed of about 2800 m/s, and it is intercepted by the sensor electronics The time elapsed between the launch of the impulse and the interception of the sonic wave, combined with the typical sonic speed of the wave guide, will provide the exact position that the electronics will convert into an output signal.

Vers. 7MA / 7MB / 7MC (48 mm)



Vers. 7MD / 7MF (28 mm)



The sensor is composed by the following principal parts:

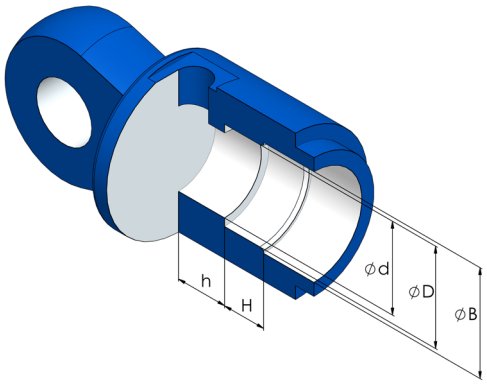
- Connection system composed by the Snap-in type connector (M12 4 or 5 poles) that can be easily installed in a few seconds, avoids any kind of welding or crimping. It is sealed against dust and liquids up to IP69K depending on the type of connector.
- Stainless steel housing with built-in electronics for the signal conditioning.
- The magnetic cursor must be fixed on the piston to detect its position in the cylinder.
- The sensor rod contains the magnetostrictive sensitive element (waveguide).

6. Mechanical installation

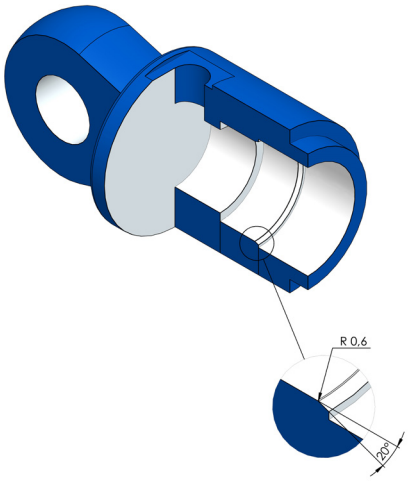
The sensor has been designed to be installed inside hydraulic cylinders which have the following mechanical characteristics:

Model	B Ø cylinder	D Ø min.	H depth	d Ø min.	h depth
7MA 7MA 7MC	52 mm	48H8 screw fixing 48G7 welded	21.2 mm + 0.2	32.5 mm < d < 40 mm	>18 mm (cable) >15 mm (connector)
7MD 7MF	> 32 mm	28H7 screw fixing 28G7 welded	26.8 mm + 0.2	23.5 mm < d < 25.5 mm	>30 mm (cable) >25 mm (connector)

6.1 Overall dimensions

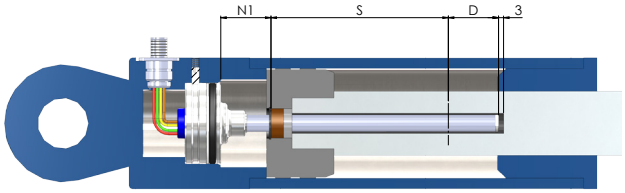


To allow a correct and easy mounting of the sensor in the cylinder it is necessary a chamfered edge as shown in the drawing. To avoid damaging the O-ring during the installation, the radius in the passage from the hole to the chamfered edge must be R0.6 - R1. Without this radius, there will be a sharp edge that can damage the O-ring.

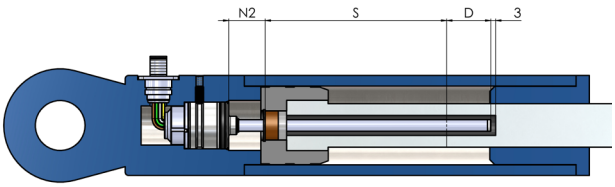


Diameter and depth of the hole in the piston rod

Vers. 7MA / 7MB / 7MC (48 mm)



Vers. 7MD / 7MF (28 mm)



The depth of the hole in the rod is given by the following sum: measuring range (S), chamfer (D) and a 3 mm backlash (depth = S + D + 3 mm).

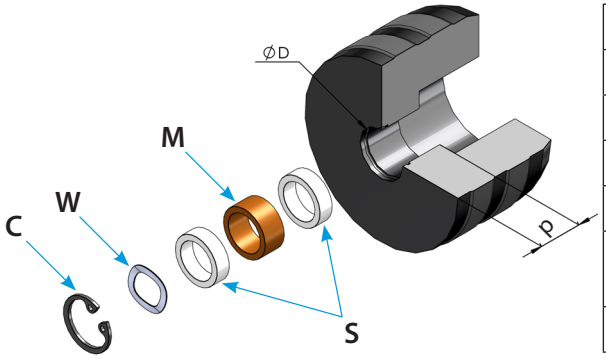
N1 = null zone	30 mm (Vers. 7MA / 7MB / 7MC)
N2 = null zone	22 mm (Vers. 7MD / 7MF)
S = measuring range	see ordered model
D = chamfer	see model

Attention:
- The position magnet must not touch the sensor rod
- Do not exceed the operating pressure indicated in the technical data sheet.

6.1 Installation of the magnet

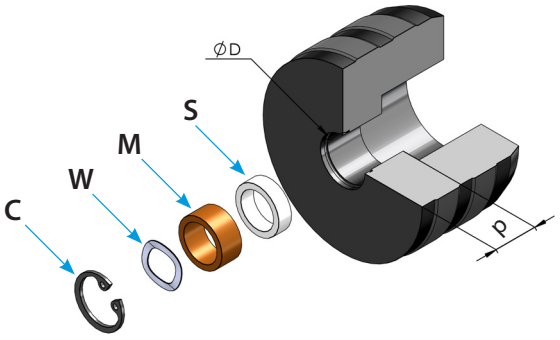
Use only spacer rings of non-magnetic materials as polyamide or non-magnetic aluminium. We recommend fixing the magnet with an elastic ring and a stop ring. If these parts are in non-magnetic stainless steel, the second spacer ring is not necessary.

Magnet with 2 spacers



	Description	Dimensions	
M	magnet	17.4 x 13.5 x 7.9	25.4 x 13.5 x 7.9
D	Ø hole diameter	17.5 + 0.1	25.5 +0.1
p	Seat depth 2 spacers	18.0 + 0.1	18.0 + 0.1
S	spacer OD x 13.5 x 5	17.4 + 0.1	25.4 +0.1
W	wave washer	OD: 16.5 - 17.4 ID: 13.5 - 14	OD: 23.5 - 25.4 ID: 13.5 - 14
C	safety ring	DIN 472 - 18 x 1	DIN 472 - 26 x 1,5

Magnet with 1 spacer

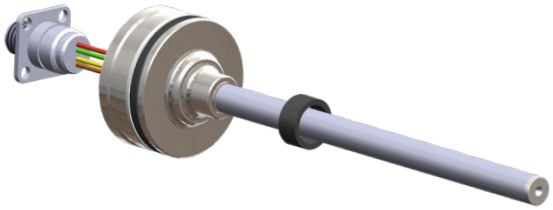


	Description	Dimensions	
M	magnet	17.4 x 13.5 x 7.9	25.4 x 13.5 x 7.9
D	Ø hole diameter	17.5 + 0.1	25.5 +0.1
p	Seat depth 1 spacer	13.0 + 0.1	13.0 + 0.1
S	spacer OD x 13.5 x 5	17.4 + 0.1	25.4 +0.1
W	wave washer	OD: 16.5 - 17.4 ID: 13.5 - 14	OD: 23.5 - 25.4 ID: 13.5 - 14
C	safety ring	DIN 472 - 18 x 1	DIN 472 - 26 x 1,5

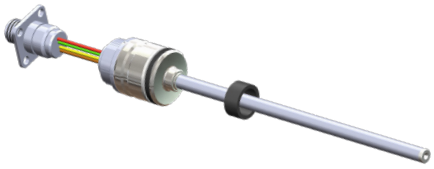
6.2 Sensor installation

The O-ring and the anti-extrusion ring are mounted in the factory as shown in the figure.

Vers. 7MA / 7MB / 7MC (48 mm)

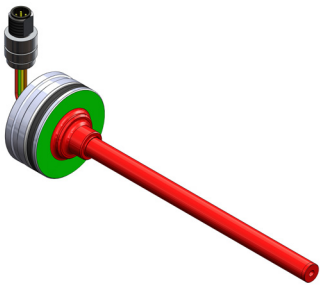


Vers. 7MD / 7MF (28 mm)

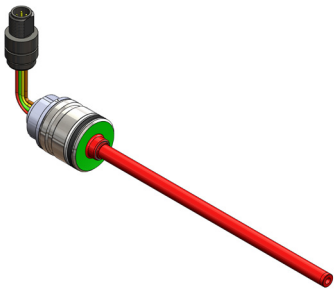


During the mounting of the sensor in the cylinder only the surfaces marked in green can be loaded.
The surfaces marked in red must not be submitted to mechanical stress or hammered.

Vers. 7MA / 7MB / 7MC (48 mm)

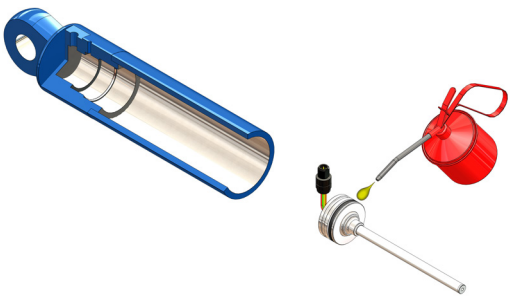


Vers. 7MD / 7MF (28 mm)

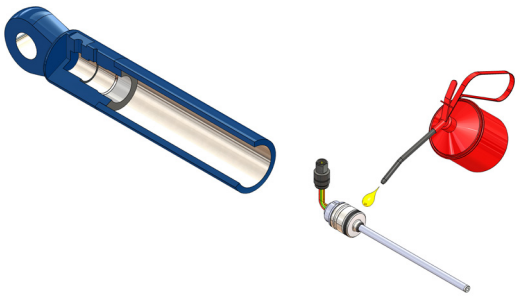


Lubricate the O-ring and the anti-extrusion ring before mounting them in the cylinder.

Vers. 7MA / 7MB / 7MC (48 mm)

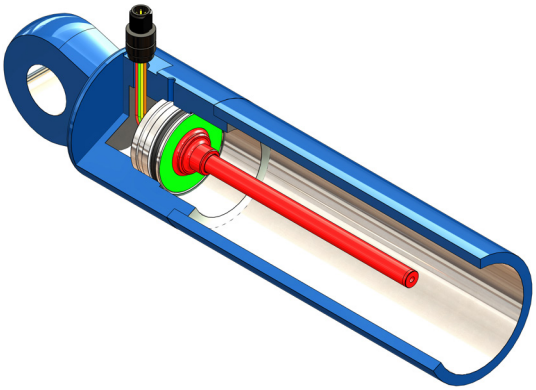


Vers. 7MD / 7MF (28 mm)

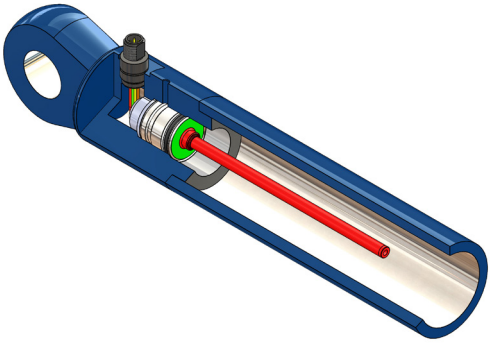


Insert carefully the contact holder piece (piece in black plastic) through the cylinder wall. Make sure to keep the conductors away from sharp or pointed edges. Avoid traction efforts on the connection cable. It is recommended to use a system that pulls delicately the wires out of the final seat of the connector.

Vers. 7MA / 7MB / 7MC (48 mm)

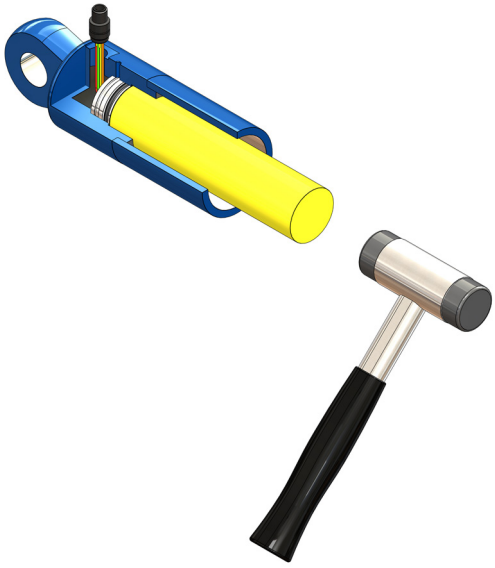


Vers. 7MD / 7MF (28 mm)



Push the sensor carefully into its seat. Make sure the conductors or cables do not remain under mechanical stress. Use a specially prepared bushing (for ex. polyamide) to press the sensor. If necessary, use a rubber hammer to carefully push the sensor to its position against a mechanical stop. Never use a metallic hammer.

Vers. 7MA / 7MB / 7MC (48 mm)



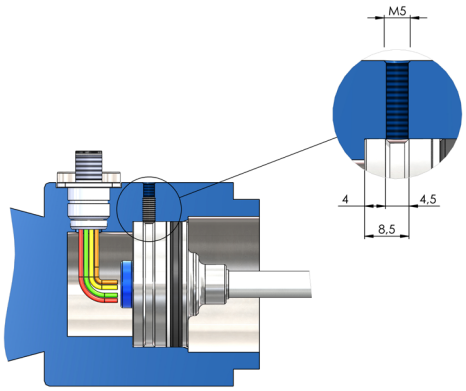
Vers. 7MD / 7MF (28 mm)

After the installation in the cylinder and the insertion of the connector into its flange, the sensor fulfils the protection requirements of IP68 or IP69K according to the protection degree of the mating connector.

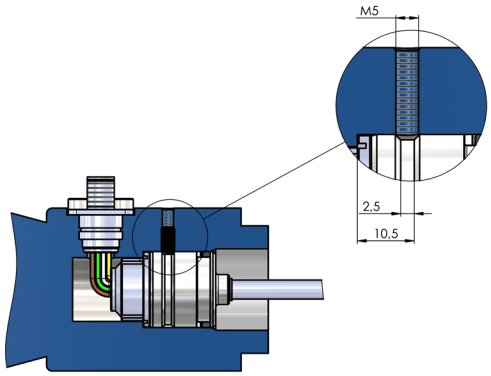
Safety screw according to DIN 913

The grub screw M5x10 according to DIN 913 with flat end can be used for the sensors. This safety screw is required to lock the sensor housing in the axial direction and simply screw it in until it stops against the groove in the sensor head. Therefore a max. torque of 0.5 Nm is recommended to avoid damage to the sensor. The grub screw must be locked with threadlocker.

Vers. 7MA / 7MB / 7MC (48 mm)



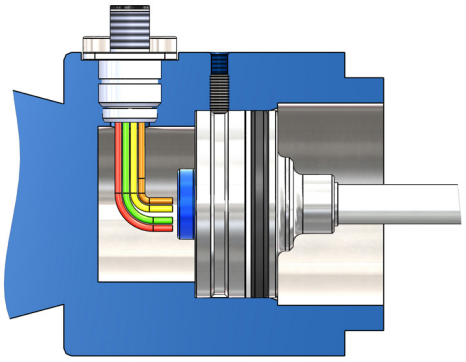
Vers. 7MD / 7MF (28 mm)



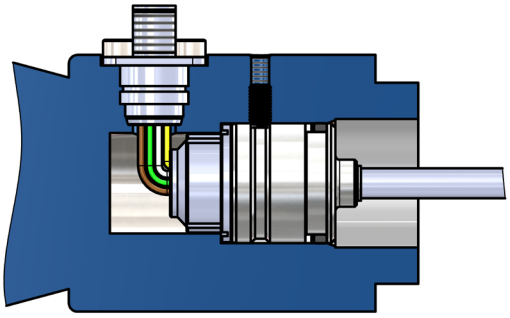
Fixing of the safety connector flange according to DIN 913

The use of a cylindrical head screw with internal hexagon M4 DIN 912 or DIN 7984 is recommended.

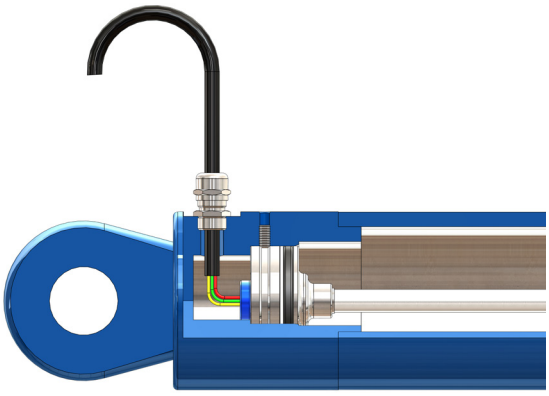
Vers. 7MA / 7MB / 7MC (48 mm)



Vers. 7MD / 7MF (28 mm)



Mounting of the sensors with cable and cable clamp connection



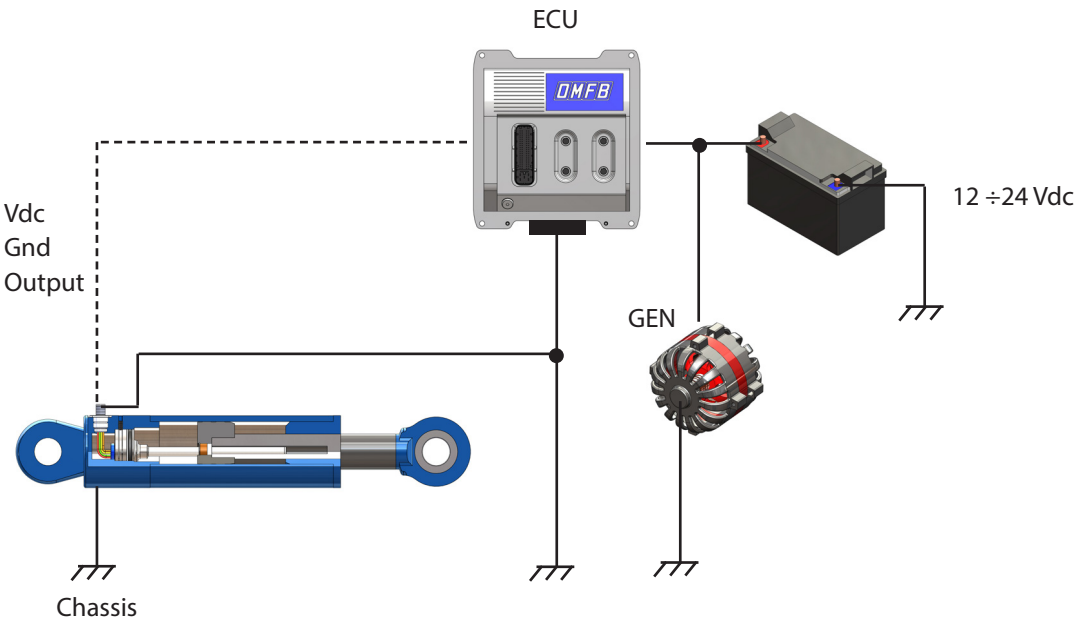
The output cable must be secured with an IP68 cable gland (preferably metal).

7. Electrical connection

- The cable between the sensor and the electronics must be separated from the network and power supply cables. A minimum clearance of 500 mm is necessary.
- A low-pass filter with a cut-off frequency of 5 kHz at the input of the electronics, which acquires the analogical signal of the sensor, is recommended to minimise the effect of possible disturbances.
- To prevent potential equalisation currents through the cable shield, the connection of all components to the equipotential lines is recommended.
- The electric connection cable has a strong influence on the electromagnetic compatibility of the position sensors. Therefore it is recommended to:
  - Use a shielded cable with pairs of twisted wires for the power supply and outputs.
  - Connect the shielded cables to the ground on the electrical panel side.
  - Avoid installing the sensor cable close to high-voltage power sources, such as high-power motors (use separated and shielded cables for each device).
- If an application includes equipment that emits strong electromagnetic interferences, such as inverters or motors, it is necessary to take the following precautions:
  - Use a shielded cable with twisted wires and insulated pairs.
  - Position the cable inside a metallic shield that will be connected to the ground

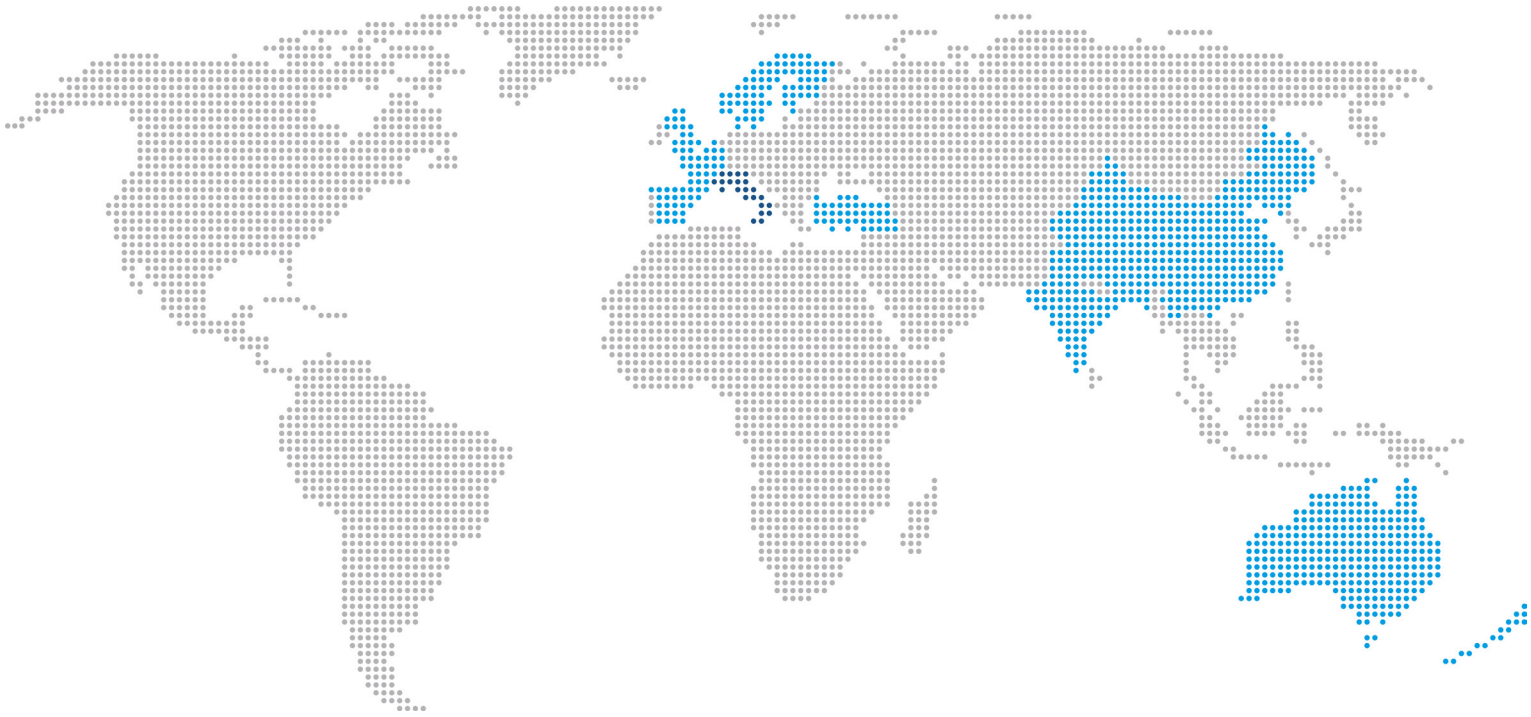
7.1 Connection of the control unit

The connection of the control unit (ECU) must follow the diagram indicated below.



OMFB reserves the right to make functional or aesthetic changes at any time and without notice.

Group Synergy



Headquarters:

COMPANY WITH MANAGEMENT SYSTEM CERTIFIED BY DNV
ISO 9001 • ISO 14001
IATF 16949

O.M.F.B. S.p.A. Hydraulic Components

Via Cave, 7/9 - 25050 Provaglio d'Iseo (BS) - ITALY
Tel.: (+39) 030 9830611

e-mail: contatti@omfb.it
www.omfb.com

linkedin.com/company/omfbhydraulics
instagram.com/omfbhydraulics
facebook.com/omfbhydraulics
youtube.com/@omfbhydraulics

Member of OMFB group:

VBR Srl

Via Masaccio, 17
42124 Reggio Emilia - ITALY
Tel.: (+39) 0522 1722340

e-mail: info@vbrhydraulics.com
www.vbrhydraulics.com

International offices:

OMFB FRANCE SAS - France
e-mail: contact@omfb.fr

OMFB IBERTEC, S.L. - España
e-mail: ibertecht@ibertecht.com

CVH - OMFB Limited - UK
e-mail: carl.hinds@cvhomfb.co.uk

OMFB NORDIC OY - Finland
e-mail: nordic.sales@omfb.com

OMFB HIDROLIK SANAYİ VE TİCARET LİMİTED ŞİRKETİ - Turkey
e-mail : sami.dibek@omfb.com.tr

OMFB INDIA PVT LTD. - India
e-mail: sales@omfbindia.com

O.M.F.B. S.p.A. Hydraulic Components - China
e-mail: aston.chen@omfb.com

OMFB PACIFIC PTY LTD - Australia
e-mail: sales@omfbpacific.com