

Brief Instruction

E-Series

Magnetostrictive Linear Position Sensors

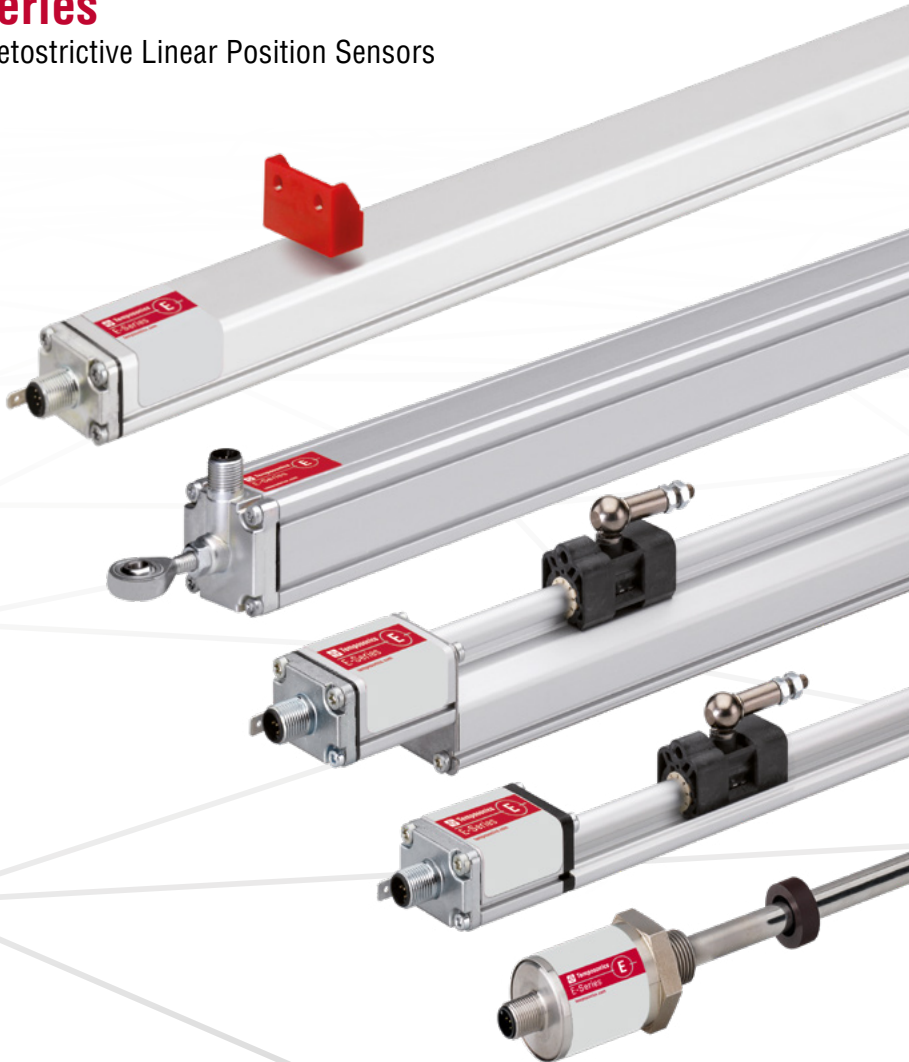


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1. Introduction

1.1 Purpose and use of this manual

Before starting the operation of Temposonics® position sensors read this documentation thoroughly and follow the safety information. Keep the manual for future reference!

The content of this technical documentation is intended to provide information on mounting, installation and commissioning by qualified automation personnel¹ or instructed service technicians, who are familiar with the project planning and dealing with Temposonics® position sensors.

1.2 Used symbols and warnings

Warnings are intended for your personal safety and for avoidance of damage to the described product or connected devices. In this documentation, safety information and warnings to avoid danger that might affect the life and health of operating or service personnel or cause material damage are highlighted by the preceding pictogram, which is defined below.

| Symbol | Meaning |
|---------------|--|
| NOTICE | This symbol is used to point to situations that may lead to material damage, but not to personal injury. |

- 1/ The term qualified technical personnel characterizes persons who:
- are familiar with the safety concepts of automation technology applicable to the particular project
 - are competent in the field of electromagnetic compatibility (EMC)
 - have received adequate training for commissioning and service operations
 - are familiar with the operation of the device and know the information required for correct operation provided in the product documentation

2. Safety instructions

2.1 Intended use

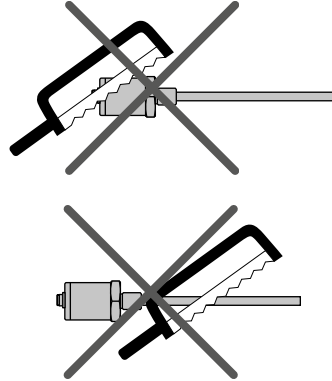
This product may be used only for the applications defined under item 1 and only in conjunction with the third-party devices and components recommended or approved by Temposonics. As a prerequisite of proper and safe operation the product requires correct transport, storage, mounting and commissioning and must be operated with utmost care.

1. The sensor systems of all Temposonics® series are intended exclusively for measurement tasks encountered in industrial, commercial and laboratory applications. The sensors are considered as system accessories and must be connected to suitable evaluation electronics, e.g. a PLC, IPC, indicator or other electronic control unit.

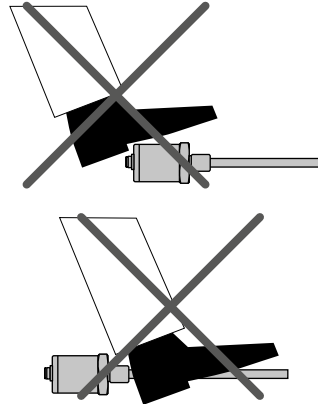
2.2 Forseeable misuse

| Forseeable misuse | Consequence |
|--|--|
| Wrong sensor connection | The sensor will not work properly or will be destroyed |
| Operate the sensor out off the operating temperature | No signal output The sensor can be damaged |
| Power supply is out of the defined range | Signal output is wrong / no signal output / the sensor will be damaged |
| Position measurement is influenced by an external magnetic field | Signal output is wrong |
| Cables are damaged | Short circuit – the sensor can be destroyed / sensor does not respond |
| Spacers are missing / are installed in a wrong order | Error in position measurement |
| Wrong connection of ground / shield | Signal output is disturbed The electronics can be damaged |
| Use of a magnet that is not certified by Temposonics | Error in position measurement |

Do not reprocess the sensor afterwards.
→ The sensor might be damaged.



Do not step on the sensor.
→ The sensor might be damaged.



2.3 Installation, commissioning and operation

The position sensors must be used only in technically safe condition. To maintain this condition and to ensure safe operation, installation, connection and service, work may be performed only by qualified technical personnel. If danger of injury to persons or of damage to operating equipment is caused by sensor failure or malfunction, additional safety measures such as plausibility checks, limit switches, EMERGENCY STOP systems, protective devices etc. are required. In the event of trouble, shut down the sensor and protect it against accidental operation.

Safety instructions for commissioning

To maintain the sensor's operability, it is mandatory to follow the instructions given below.

1. Protect the sensor against mechanical damage during installation and operation.
2. Do not open or dismantle the sensor.
3. Connect the sensor very carefully and pay attention to the polarity of connections and power supply.
4. Use only approved power supplies.
5. It is indispensable to ensure that the specified permissible limit values of the sensor for operating voltage, environmental conditions, etc. are met.
6. Check the function of the sensor regularly and provide documentation of the checks.
7. Before applying power, ensure that nobody's safety is jeopardized by starting machines.

2.4 Safety instructions for use in explosion-hazardous areas

The sensors are not suitable for operation in explosion-hazardous areas.

2.5 Warranty

Temposonics grants a warranty period for the Temposonics® position sensors and supplied accessories relating to material defects and faults that occur despite correct use in accordance with the intended application ². The Temposonics obligation is limited to repair or replacement of any defective part of the unit. No warranty can be provided for defects that are due to improper use or above average stress of the product, as well as for wear parts. Under no circumstances will Temposonics accept liability in the event of offense against the warranty rules, no matter if these have been assured or expected, even in case of fault or negligence of the company. Temposonics explicitly excludes any further warranties. Neither the company's representatives, agents, dealers nor employees are authorized to increase or change the scope of warranty.

2.6 Return

For diagnostic purposes, the sensor can be returned to Temposonics. Any shipment cost is the responsibility of the sender ². For a corresponding form, see detailed operation manual (available at: www.temposonics.com).

2.7 Maintenance & removal

Error conditions, troubleshooting

See detailed operation manual (available at: www.temposonics.com).

Maintenance

The sensor is maintenance-free.

Repair

Repairs of the sensor may only be performed by Temposonics or a repair facility explicitly authorized by Temposonics.

List of spare parts

No spare parts are available for this series.

Transport and storage

The conditions of transport and storage of the sensor match the operating conditions mentioned in this document.

Removal from service / dismantling

The product contains electronic components and must be disposed of in accordance with the local regulations.

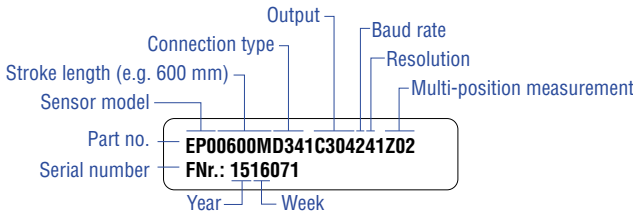
^{2/} See also applicable Temposonics terms of sales and delivery on www.temposonics.com

Temposonics® E-Series

Brief Instructions

3. Identification

Nameplate (e.g. E-Series EP CANopen)

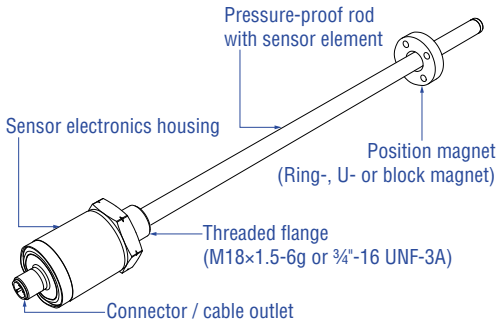


NOTICE

Approvals and certificates

You will find approvals and certificates in the sensor specific operation manuals.

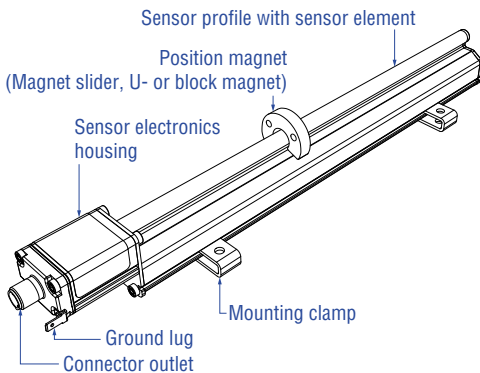
3.1 Temposonics® E-Series EH (rod sensor)



Available outputs:

- Analog
- Start / Stop
- SSI
- CANopen
- IO-Link

3.2 Temposonics® E-Series EP (profile sensor)

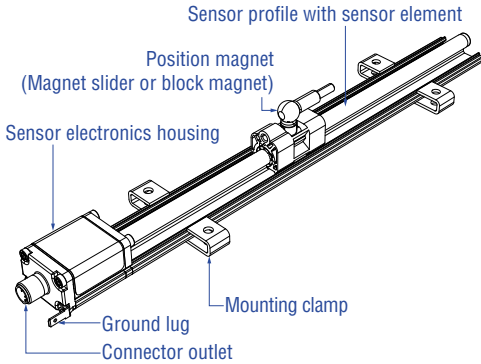


Available outputs:

- Analog
- Start / Stop
- SSI
- CANopen
- IO-Link

Manuals, Software & 3D Models
available at: www.mtssensors.com

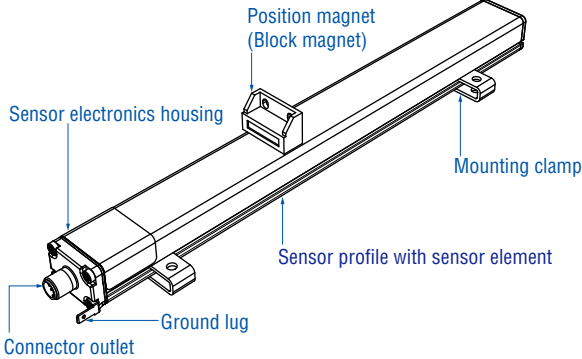
3.3 Temposonics® E-Series EL (ultra low profile sensor)



Available outputs:

- Analog
- Start / Stop
- SSI
- CANopen
- IO-Link

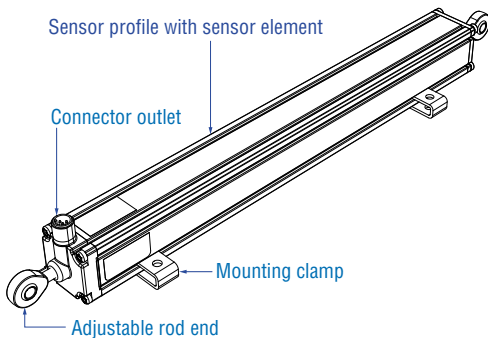
3.4 Temposonics® E-Series EP2 (smooth profile sensor)



Available outputs:

- Analog
- Start / Stop
- SSI
- CANopen
- IO-Link

3.5 Temposonics® E-Series ER (rod & cylinder housing)



Available outputs:

- Analog
- Start / Stop
- SSI
- CANopen
- IO-Link

Manuals, Software & 3D Models
available at: www.mtssensors.com

4. Installation & mounting

4.1 Sensor mounting

Rod sensors – E-Series EH

- Fix the sensor rod via threaded flange.
- Note the fastening torque of 50 Nm.
- Seat the flange contact surface completely on the cylinder mounting surface
- The cylinder manufacturer determines the pressure-resistant gasket (copper gasket, O-ring, etc.).
- The position magnet should not grind on the sensor rod.
- The piston rod drilling
(\varnothing 10 mm rod: $\geq \varnothing$ 13 mm ($\geq \varnothing$ 0.52 in.) borehole /
 \varnothing 7 mm rod: $\geq \varnothing$ 10 mm ($\geq \varnothing$ 0.4 in.) borehole)
depends on the pressure and piston speed.
- Adhere to the information relating to operating pressure.
- Protect the sensor rod against wear.

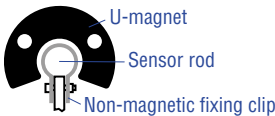
NOTICE

For detailed mounting instructions see operation manual.

Sensors with stroke lengths \geq 1 meter (\geq 3.3 ft)

Support horizontally installed sensors with a stroke length from 1 meter (3.3 ft) mechanically at the rod end. Without the use of a support, rod and position magnet may be damaged. A false measurement result is also possible. Longer rods require evenly distributed mechanical support over the entire length (e.g. part no. 561 481). Use an U-magnet for measurement.

**Sensor support
(for sensors with stroke lengths \geq 1 meter (\geq 3.3 ft))**

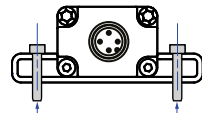


Profile sensors – E-Series EP / EL / ER / EP2

The sensor is fitted on a flat machine surface using mounting clamps. A length-dependent number of these clamps are delivered with the sensor and must be distributed over the profile at regular distances.

For fastening, we recommend using M5×20 screws (according to DIN 6912) that should be tightened with a fastening torque of 5 Nm.

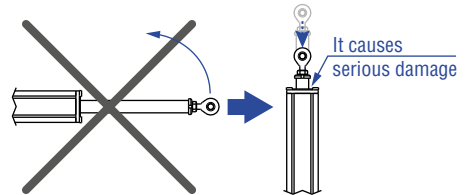
Mounting clamps



Screw: M5×20 (DIN 6912)
Fastening torque: 5 Nm

NOTICE

Do not raise up the ER sensor, if the lifting rod is extended.



4.2 Magnet installation

Typical use of magnets

Ring magnet



- For: EH**
- Rotationally symmetrical magnetic field

U-magnet



- For: EH & EP**
- Height tolerances can be compensated

Block magnet



- For: EP, EL, EP2 & EH**
- The magnet can be lifted off
 - Height tolerances can be compensated

Magnet slider



- For: EP & EL**
- The magnet is guided through the profile
 - The distance between the magnet and the waveguide is strictly defined
 - Easy coupling via the ball joint

Mounting ring magnets, U-magnets & block magnets

Install the magnet using non-magnetic material for mounting device, screws, spacers etc.. The magnet must not grind on the sensor rod. Alignment errors are compensated via the air gap.

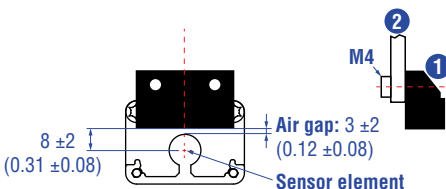
- Permissible surface pressure: Max. 40 N/mm² (only for ring magnets and U-magnets)
- Fastening torque for M4 screws: 1 Nm; use washers, if necessary
- Minimum distance between position magnet and any magnetic material has to be 15 mm (0.6 in.).
- If no other option exists and magnetic material is used, observe the specified dimensions.

NOTICE

Mount ring magnets and U-magnets concentrically. Mount block magnets centrally over the sensor rod or the sensor profile.

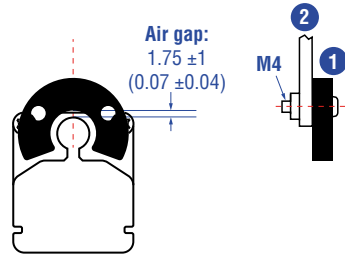
Do not exceed the maximum acceptable gap. Take care to mount the sensor in an axially parallel position to avoid damage of the carriage, magnet and sensor rod.

Centered mounting of block magnet



- 1 Block magnet
- 2 Non-magnetic mounting device and screws

Concentric mounting of U-magnet



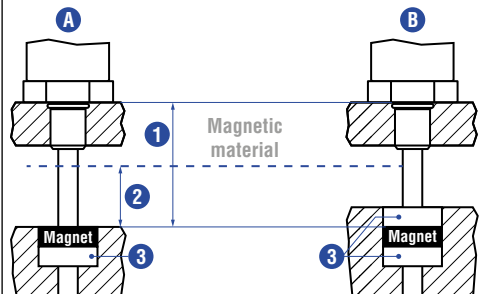
- 1 U-magnet
- 2 Non-magnetic mounting device and screws

Magnet mounting with magnetic material

When using magnetic material the dimensions must be observed.

- If the position magnet aligns with the drilled piston rod
- If the position magnet is set further into the drilled piston rod, install another non-magnetic spacer above the magnet

Magnet mounting with magnetic material



- 1 Null zone, depends on sensor model
- 2 Distance between position magnet and any magnetic material (≥ 15 mm (≥ 0.6 in.))
- 3 Non-magnetic spacer (≥ 5 mm (≥ 0.2 in.)) – Recommendation: 8 mm (0.31 in.)

Controlling design dimensions are in millimeters and measurements in () are in inches

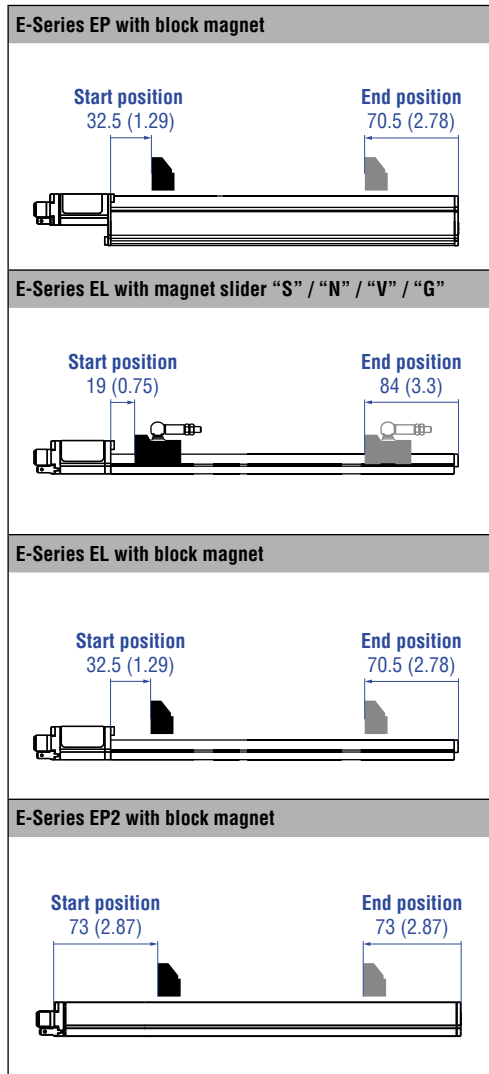
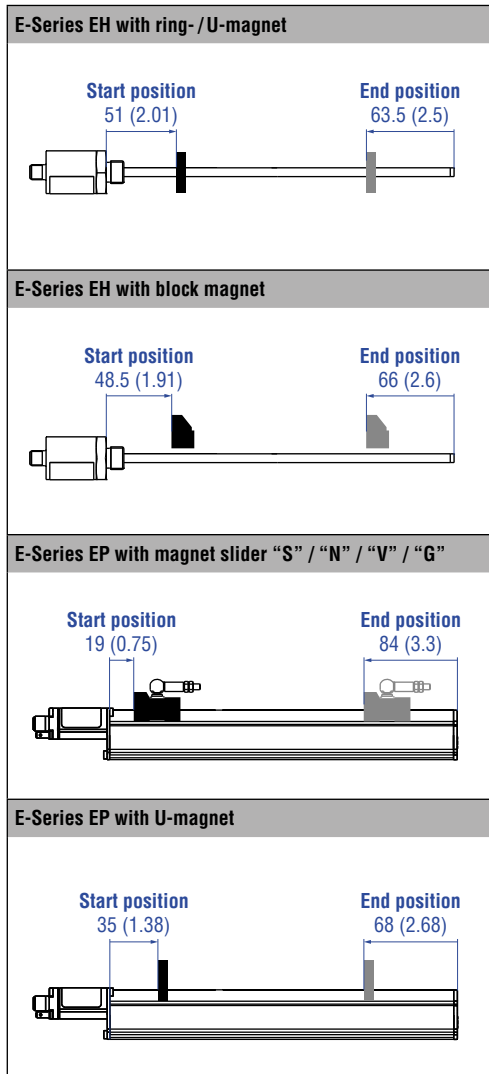
Temposonics® E-Series

Brief Instructions

4.3 Mounting dimensions of E-Series

Consider the start and end positions of the position magnets during the installation. To ensure that the entire stroke length

is electrically usable, the position magnet must be mechanically mounted as follows.



Manuals, Software & 3D Models
available at: www.mtssensors.com

NOTICE

The mounting position of the sensor is arbitrary.

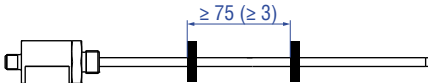
Controlling design dimensions are in millimeters and
measurements in () are in inches

4.4 Multi-position measurement distances

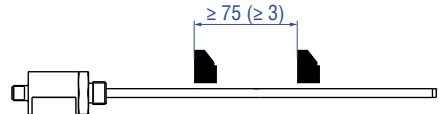
Multi-position measurement with E-Series EH, EP, EL and EP2 sensors with Analog and CANopen output is possible with a simultaneous measuring up to 2 positions.

The stroke length influences the maximum number of magnets. Note the minimum distance between the magnets.

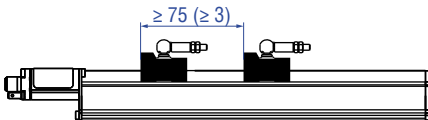
E-Series EH with ring-/U-magnet



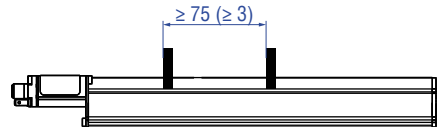
E-Series EH with block magnet



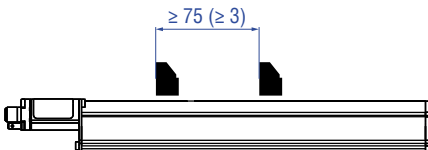
E-Series EP with magnet slider “S” / “N” / “V” / “G”



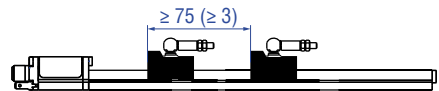
E-Series EP with U-magnet



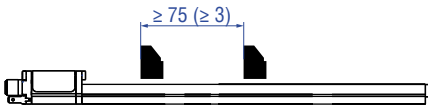
E-Series EP with block magnet



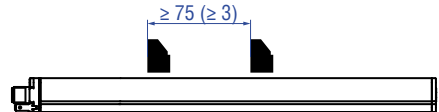
E-Series EL with magnet slider “S” / “N” / “V” / “G”



E-Series EL with block magnet



E-Series EP2 with block magnet



NOTICE

Use magnets of the same type for multi-position measurement, e.g. 2 × U-magnets (part no. 251 416-2).

Controlling design dimensions are in millimeters and measurements in () are in inches

Manuals, Software & 3D Models
available at: www.mtssensors.com

5. Electrical connections

Placement of installation and cabling have decisive influence on the sensor's electromagnetic compatibility (EMC). Hence correct installation of this active electronic system and the EMC of the entire system must be ensured by using suitable metal connectors, shielded cables and grounding. Overvoltages or faulty connections can damage its electronics despite protection against wrong polarity.

NOTICE

1. Do not mount the sensors in the area of strong magnetic or electric noise fields.
2. Never connect / disconnect the sensor when voltage is applied.

Instructions for connection

- Use low-resistant twisted pair and shielded cables. Connect the shield to ground externally via the controller equipment.
- Keep control and sign leads separate from power cables and sufficiently far away from motor cables, frequency inverters, valve lines, relays, etc..
- Use only connectors with metal housing and connect the shielding to the connector housing. Connect the cable clamps to function as a ground.
- Keep the connection surface at both shielding ends as large as possible.
- Keep all non-shielded leads as short as possible.
- Keep the earth connection as short as possible with a large cross section. Avoid ground loops.
- With potential differences between machine and electronics earth connections, no compensating currents are allowed to flow across the cable shielding.

Recommendation:

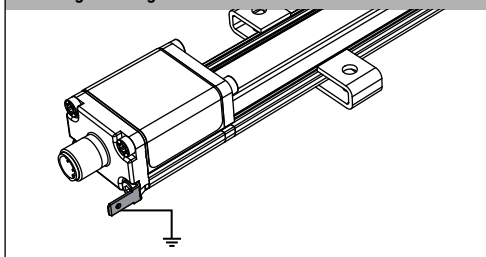
Install potential compensating leads with large cross section, or use cables with separate double shielding, and connect only one end of the shield.

- Use only stabilized power supplies in compliance with the specified connecting values.

NOTICE

Connect the sensor electronics housing to machine ground. Ground sensor types EP, EL, ER and EP2 via ground lug as shown. Ground the sensor type EH via thread.

Sensor grounding



5.1 Analog

D34

Signal + power supply

M12 male connector
(A-coded)



| Pin | Function |
|-----|-----------------------|
| 1 | +24 VDC (-15 / +20 %) |
| 2 | Output 1 |
| 3 | DC Ground (0 V) |
| 4 | Output 2 |
| 5 | DC Ground |

EH with cable outlet (EHX / ETX)

Signal + power supply

Cable

Color

Function

| | | |
|--|----|-----------------------|
| | GY | Output 1 |
| | PK | GND (Signal) |
| | YE | Output 2 |
| | GN | Not connected |
| | BN | +24 VDC (-15 / +20 %) |
| | WH | DC Ground (0 V) |

5.2 Start/Stop

D84

Signal + power supply

M12 male connector
(A-coded)



| Pin | Function |
|-----|-----------------------|
| 1 | Start (+) |
| 2 | Start (-) |
| 3 | Stop (+) |
| 4 | Stop (-) |
| 5 | Not connected |
| 6 | Not connected |
| 7 | +24 VDC (-15 / +20 %) |
| 8 | DC Ground (0 V) |

EH with cable outlet (EHX / ETX)

Signal + power supply

Cable

Color

Function

| | | |
|--|----|-----------------------|
| | GY | Stop (-) |
| | PK | Stop (+) |
| | YE | Start (+) |
| | GN | Start (-) |
| | BN | +24 VDC (-15 / +20 %) |
| | WH | DC Ground (0 V) |

5.3 SSI

D84

Signal + power supply

M12 male connector (A-coded)



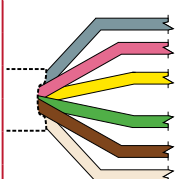
View on sensor

| Pin | Function |
|-----|-----------------------|
| 1 | Clock (+) |
| 2 | Clock (-) |
| 3 | Data (+) |
| 4 | Data (-) |
| 5 | Not connected |
| 6 | Not connected |
| 7 | +24 VDC (-15 / +20 %) |
| 8 | DC Ground (0 V) |

EH with cable outlet (EHX / ETX)

Signal + power supply

Cable



| Color | Function |
|-------|-----------------------|
| GY | Data (-) |
| PK | Data (+) |
| YE | Clock (+) |
| GN | Clock (-) |
| BN | +24 VDC (-15 / +20 %) |
| WH | DC Ground (0 V) |

5.4 CANopen

D34

Signal + power supply

M12 male connector (A-coded)



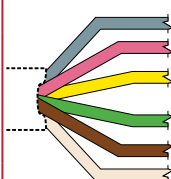
View on sensor

| Pin | Function |
|-----|-----------------------|
| 1 | Shield |
| 2 | +24 VDC (-15 / +20 %) |
| 3 | DC Ground (0 V) |
| 4 | CAN_H |
| 5 | CAN_L |

EH with cable outlet (EHX / ETX)

Signal + power supply

Cable



| Color | Function |
|-------|-----------------------|
| GY | CAN_L |
| PK | CAN_H |
| YE | Not connected |
| GN | Not connected |
| BN | +24 VDC (-15 / +20 %) |
| WH | DC Ground (0 V) |

5.5 IO-Link

D44

Signal + power supply

M12 male connector (A-coded)



View on sensor

| Pin | Function |
|-----|-----------------|
| 1 | +24 VDC (+25 %) |
| 2 | DI / DQ |
| 3 | DC Ground (0 V) |
| 4 | C / Q |

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