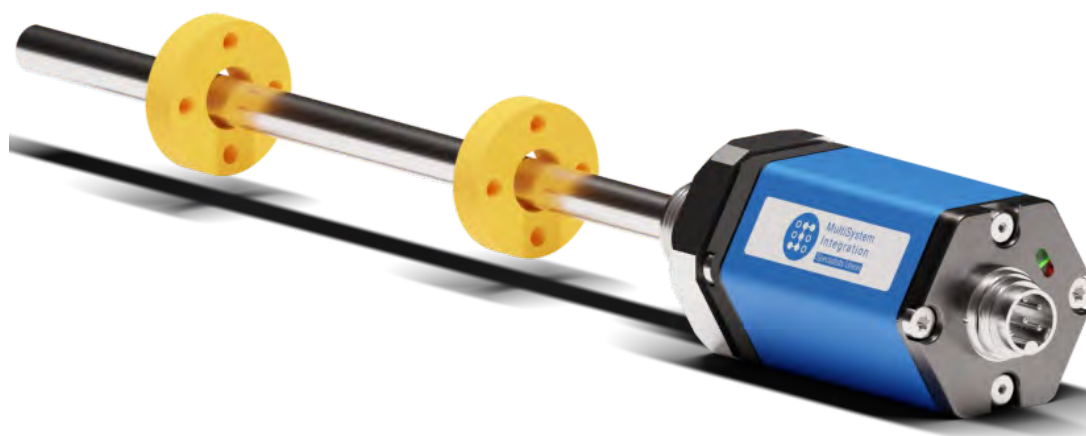




Linear position sensors Series MSI-H

v.3.0 dated 08.10.2026

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1. Introduction

Before operating MSI linear position sensors, read these operating instructions and observe the safety regulations.

These operating instructions contain the technical data, a description of the principle of operation and design, and the information required for correct operation of MSI linear position sensors (hereinafter referred to as the sensor).

2. Safety instructions

Every effort has been made in the design and manufacture of this product to ensure compliance with safety standards. Safety is built in at the design stage.

Only personnel who have studied these operating instructions and received safety training in accordance with the instructions in force at the facility are allowed to work with the product.

Maintenance, operation and troubleshooting of the sensor must be carried out in accordance with these operating instructions.

The product must be used strictly for its intended purpose with respect to operating parameters, media, operating conditions, reliability and safety characteristics.

The sensor must be installed in a location that allows convenient and safe maintenance and repair.

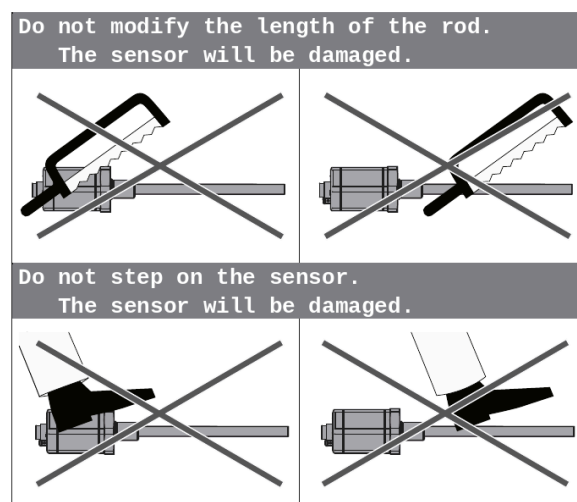
Repairs must be carried out by trained, suitably qualified personnel in accordance with the repair documentation and in compliance with occupational health and safety requirements.

Inspect the equipment for visible external damage. Before connecting the equipment, always compare the actual supply parameters with the technical data on the nameplate (protection, voltage, frequency).

If in doubt, consult a specialist. The electrical safety of this equipment is ensured only if it is connected via protective earth conductors that comply with all applicable regulations. It is essential that this fundamental safety requirement is met, verified and, if in doubt, re-checked by a specialist during installation. The manufacturer accepts no liability for damage caused by an incorrect (non-compliant) or damaged protective earth conductor.

Do not modify the length of the rod. The sensor will be damaged.

Do not step on the sensor. The sensor will be damaged.



Prohibited actions with the sensor

3. Intended use

The sensor is designed for continuous monitoring, measurement or recording of process parameters in automation systems.

Areas of application:

- mechanical engineering;
- plastic injection molding;
- textile manufacturing;
- packaging;
- sheet metal processing;
- woodworking;
- automation equipment.

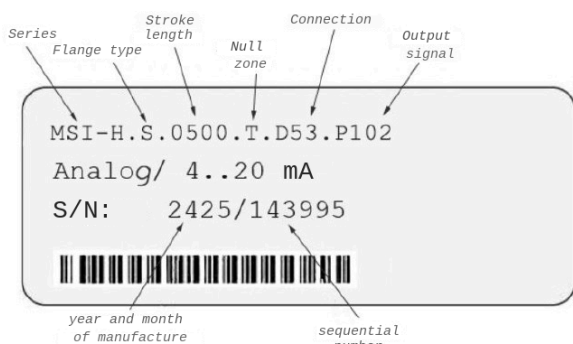
These operating instructions apply to MSI-H series sensors.

4. Scope of delivery

Item	Qty
Sensor	1
Data sheet	1
Manual	1

5. Marking example

The sensor rod is engraved with the serial number and the product marking.



Marking example: series, flange type, stroke length, null zone, connection, output signal; year and month of manufacture, sequential number

6. Operating rules and conditions

Operating rules

The system may perform uncontrolled movements during initial startup, mainly when the linear position sensor is part of a control system whose parameters have not yet been set. Therefore, make sure that there is no hazard to personnel or equipment.

The sensors must be operated under conditions that do not exceed the values specified in the technical data tables of these operating instructions.

If the linear position sensor does not function properly, take it out of service and secure it against unauthorized use.

Operating conditions

Normal measurement conditions:

- ambient temperature — from +15 to +25 °C;
- relative air humidity, non-condensing — from 30 to 80 %;
- atmospheric pressure — from 84.0 to 106.7 kPa.

Operating measurement conditions:

- ambient temperature: industrial standard version — from -40 to +80 °C; explosion-proof version — according to the limit state parameters;
- relative air humidity, non-condensing — max. 80 % at an ambient temperature of +35 °C and below;
- atmospheric pressure — from 84.0 to 106.7 kPa.

In terms of resistance to sinusoidal vibration, the sensor complies with Group V3 according to GOST R 52931-2008.

In terms of immunity to electromagnetic interference, the sensor meets the requirements of GOST 30804.6.1-2013 and GOST 30804.6.2-2013. In terms of radio interference emission, the sensor meets the requirements of GOST IEC 61000-6-3-2016 and GOST IEC 61000-6-4-2016.

The process medium must be non-aggressive to the sensor materials in contact with it.

7. Principle of operation and design

The linear position and velocity sensor operates on the basis of the magnetostrictive effect occurring in a special waveguide.

1. The position magnet, moving along the sensor rod (or profile), creates a magnetic field in the section of the waveguide corresponding to its position.
2. To determine the magnet position, the sensor electronics sends a current pulse into the waveguide.
3. The current pulse generates a radial magnetic field along the entire length of the waveguide.
4. At the point where the magnetic field of the waveguide interacts with the field of the position magnet, a torsional strain pulse (twisting of the waveguide) is generated. As a result, an ultrasonic wave propagates along the waveguide.
5. When the wave reaches the sensing element (ultrasonic detector) at the end of the waveguide, it is converted into an electrical signal. The sensor electronics determines the position by measuring the time from the emission of the current pulse to the return of the ultrasonic signal to the detector.

This technology offers a number of significant advantages.

Non-contact measurement eliminates mechanical wear, which ensures a long service life. In addition, the system does not require strict parallelism between the sensor and the monitored assembly: a misalignment of up to 10 mm is permissible without affecting accuracy.

The absolute measurement principle ensures that the position of the magnet is always available and is determined regardless of the moment of the data request.

High resolution is achieved thanks to the sensing element inside the sensor: it acts as a highly sensitive detector and reliably registers the returning ultrasonic wave.

The sensing element responds only to ultrasonic vibrations of a specific wavelength, which effectively protects the measurement against external mechanical influences such as shock and vibration.

Measurement accuracy is ensured by the constant propagation speed of the ultrasonic wave and by processing of a clean analog signal.



Prolonged exposure to high temperatures may demagnetize the position magnets.

External magnetic fields generated by high-power inductive loads near the waveguide may cause false torsional pulses and distort the sensor readings.

8. Technical data

8.1. Technical specifications

Table 1 — Technical data of MSI-H sensors with analog output

Parameter	Value
Output parameters	
Measured value	Position, velocity
Magnet movement velocity	Any
Status diagnostics	LED indication next to the connector
Interface	
Interface type	Analog: voltage / current
Output signal	Voltage: 0...10, 10...0, -10...10, 10...-10, 0...5, 5...0, -5...5 V; current: 4...20, 20...4, 0...20, 20...0, 0...24, 24...0 mA
Number of outputs	1 or 2 (position / position + velocity)
Analog output load	Voltage: min. controller load > 5 k Ω ; current: min./max. load 0/500 Ω
Number of position magnets	1-2
Recommended cable length	max. 35 m
Position measurement	
Stroke length L	25...8000 mm
Stroke length increment	1 mm
Update time	0.5 ms — up to 1200 mm; 1.0 ms — up to 2400 mm; 2.0 ms — up to 3800 mm
Resolution	16-bit DAC, 0.0015 % (min. 1 μ m)
Accuracy	L $\leq$ 500 mm: $\pm$ 50 μ m; L > 500 mm: $\pm$ 0.01 % F.S.
Repeatability	$\leq \pm$ 0.001 % F.S. (minimum $\pm$ 2.5 μ m)
Temperature coefficient	< 30 ppm/ $^{\circ}$ C
Velocity measurement	
Velocity range	0.025...10 m/s
Velocity resolution	0.1 mm/s
Velocity deviation	< 0.5 %
Operating conditions	
Operating temperature	-40...+85 $^{\circ}$ C
Operating pressure	350 bar; peak 600 bar (optionally 800 bar)
Relative humidity	$\leq$ 90 %, no condensation
Ingress protection	IP65; IP67 with cable outlet
Materials	
Electronics housing material	Aluminum, plastic
Sensor rod (waveguide)	Stainless steel ASTM A269-13 / TP304L, 10 $\times$ 1.5 mm
Flange	Stainless steel 08Kh18N10 (AISI 304)
Mounting	
Mounting position	Any. For horizontal mounting of sensors with a stroke length over 1000 mm, the rod must be supported or fixed at the end
Flange thread	M18 $\times$ 1.5; 3/4"-16 UNF; M22 $\times$ 1.5 (800 bar)
Position magnet mounting	Mounting hardware and screws made of non-magnetic material
Power supply and connection	
Operating voltage (DC)	L < 2500 mm: +12/24 V (-10/+20 %); L > 2500 mm: +24 V (-15/+20 %)
Current consumption	50...140 mA (depending on sensor length)
Reverse polarity protection	Up to -30 VDC
Overvoltage protection	Up to 36 VDC
Dielectric strength	500 VDC (between 0 VDC and sensor housing)

Parameter	Value
Electrical connection	D34, D60, D84, S32, S115; R, H, T, S, W — cable outlet 1...20 m
Mechanical stress and EMC	
Shock test	100 g, single shock, IEC 60068-2-7
Vibration test	15 g, 10...2000 Hz, IEC 60068-2-6
Electromagnetic compatibility	GOST R IEC 61326-1-2014

Note — F.S. — full scale; L — stroke length.

Table 2 — Electrical connection codes

Code	Connector type
D34	M12 A-coded male connector (5 pin)
D60	M16 male connector (6 pin)
D84	M12 male connector (8 pin)
S32	M16 male connector (8 pin)
S115	M12 male connector (8 pin)
R01...R20	Cable outlet, PVC, length 1...20 m (standard 2 m)
H01...H20	Cable outlet, PUR, length 1...20 m (standard 2 m)
T01...T20	Cable outlet, PTFE, length 1...20 m (standard 2 m)
S01...S20	Cable outlet, silicone, length 1...20 m (standard 2 m)
W01...W20	Cable outlet, moisture-resistant, length 1...20 m (standard 2 m)

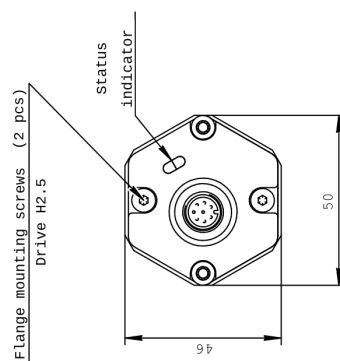
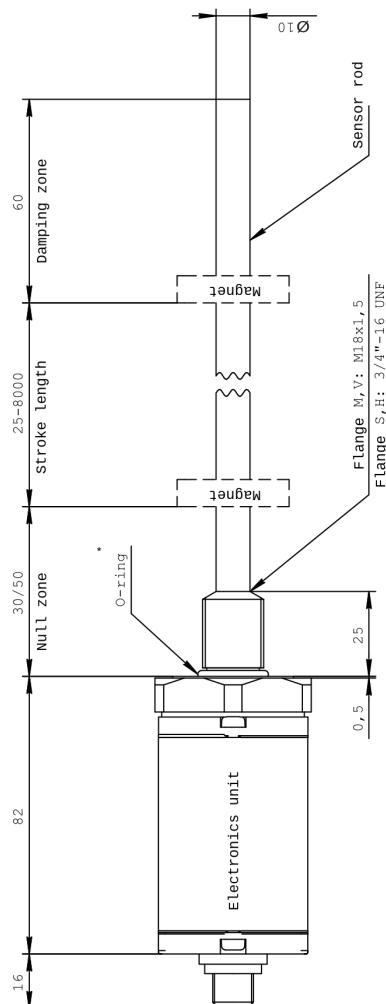


Dimensional drawing of MSI-H linear position sensor with analog output

Flanges M, V, S, H

M12 connector: D34, D84, S115

M, V — M18×1.5; S, H — 3/4"-16 UNF; rod Ø 10 mm

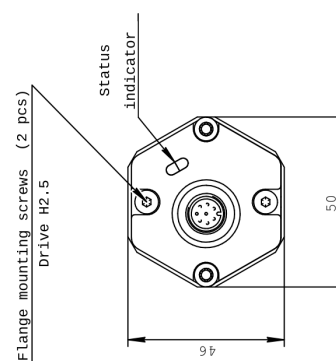
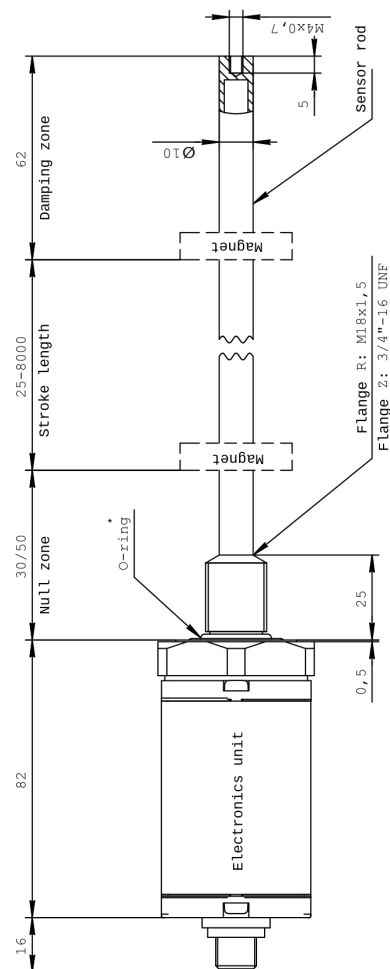


* - O-ring

Flanges R, Z

M12 connector: D34, D84, S115

R — M18×1.5; Z — 3/4"-16 UNF; M4 thread at rod end



* - O-ring

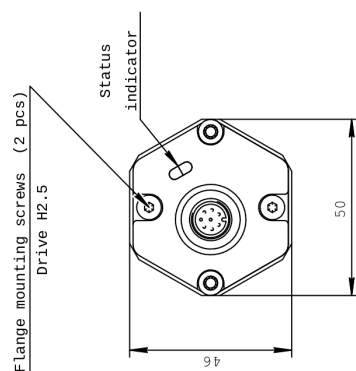
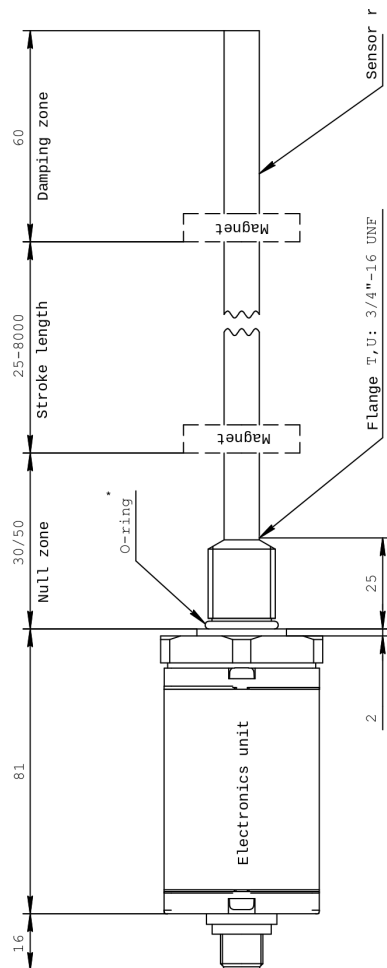


Dimensional drawing of MSI-H linear position sensor with analog output

Flanges T, U

M12 connector: D34, D84, S115

3/4"-16 UNF with raised face; rod $\varnothing$ 10 mm

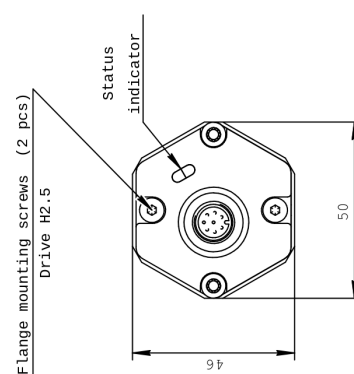
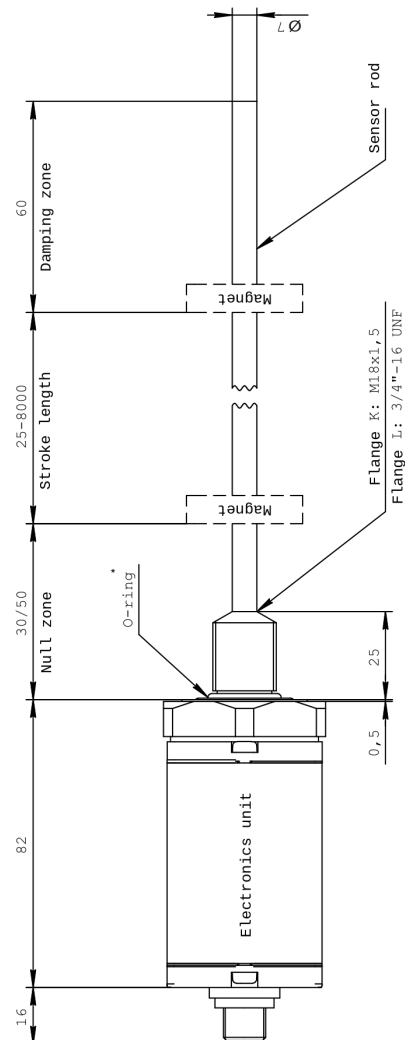


* - O-ring

Flanges K, L

M12 connector: D34, D84, S115

K — M18x1,5; L — 3/4"-16 UNF; rod $\varnothing$ 7 mm



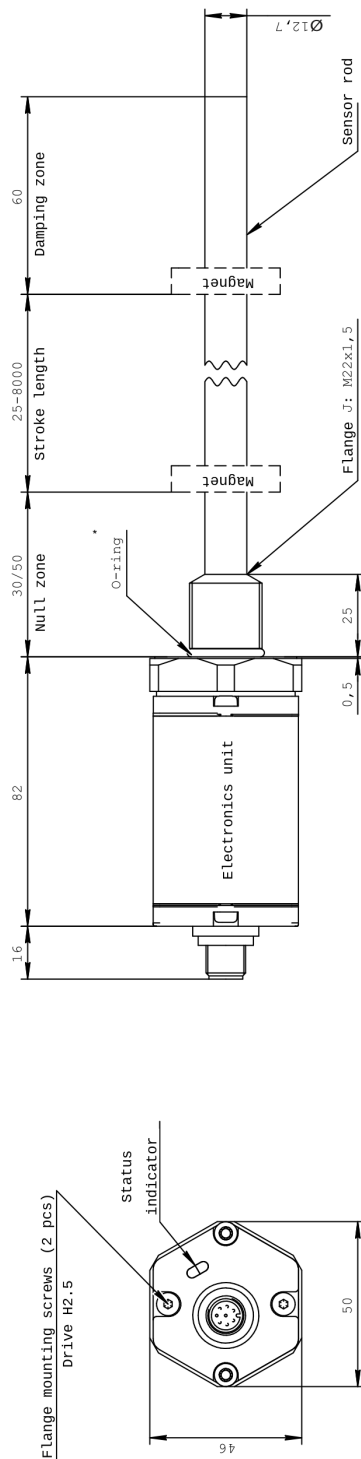
* - O-ring

Dimensional drawing of MSI-H linear position sensor with analog output

Flange J

M12 connector: D34, D84, S115

M22×1.5; rod Ø 12.7 mm; 800 bar

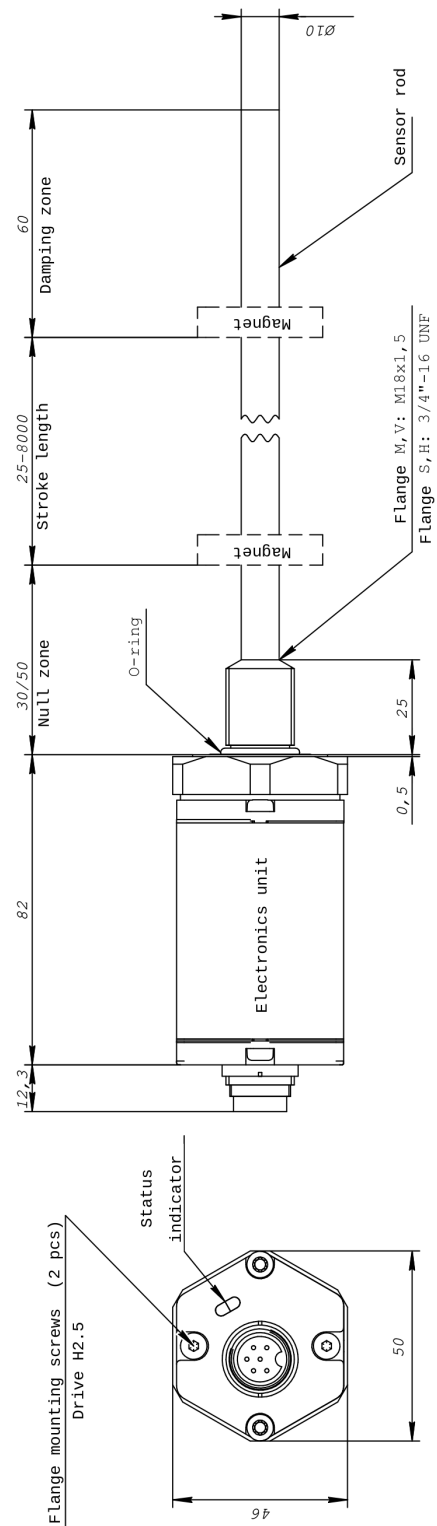


* - O-ring

Flanges M, V, S, H

M16 connector: D60, S32

M, V — M18×1.5; S, H — 3/4"-16 UNF; rod Ø 10 mm



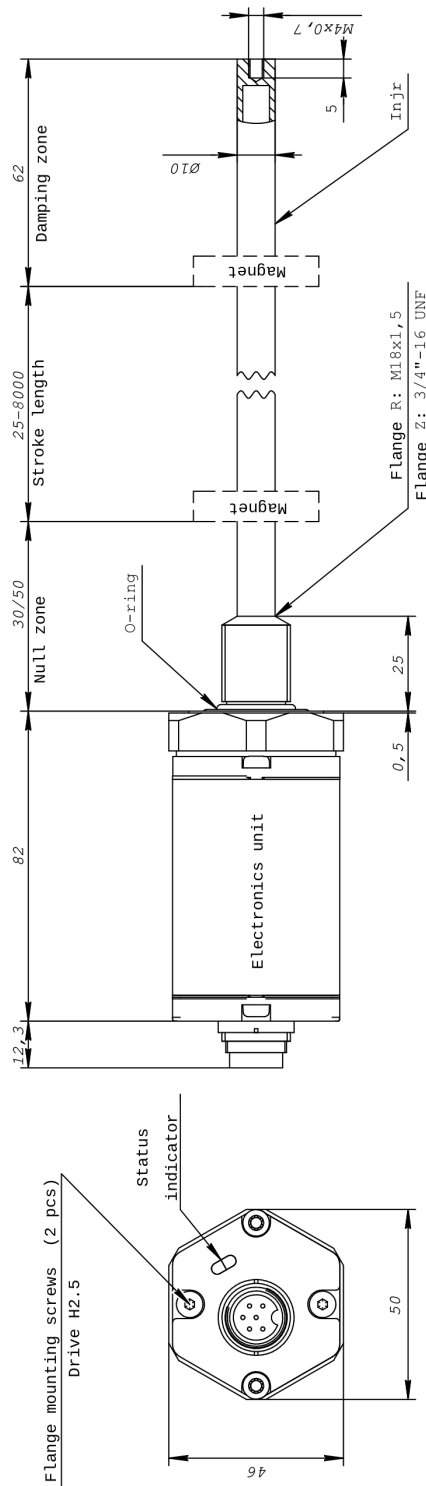


Dimensional drawing of MSI-H linear position sensor with analog output

Flanges R, Z

M16 connector: D60, S32

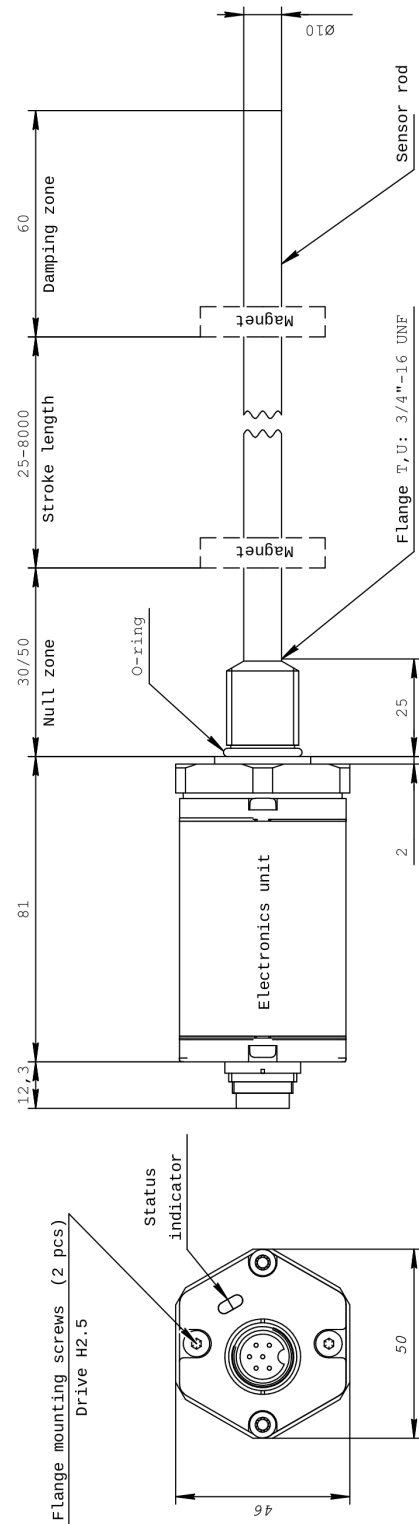
R — M18x1,5; Z — 3/4"-16 UNF; M4 thread at rod end



Flanges T, U

M16 connector: D60, S32

3/4"-16 UNF with raised face; rod Ø 10 mm

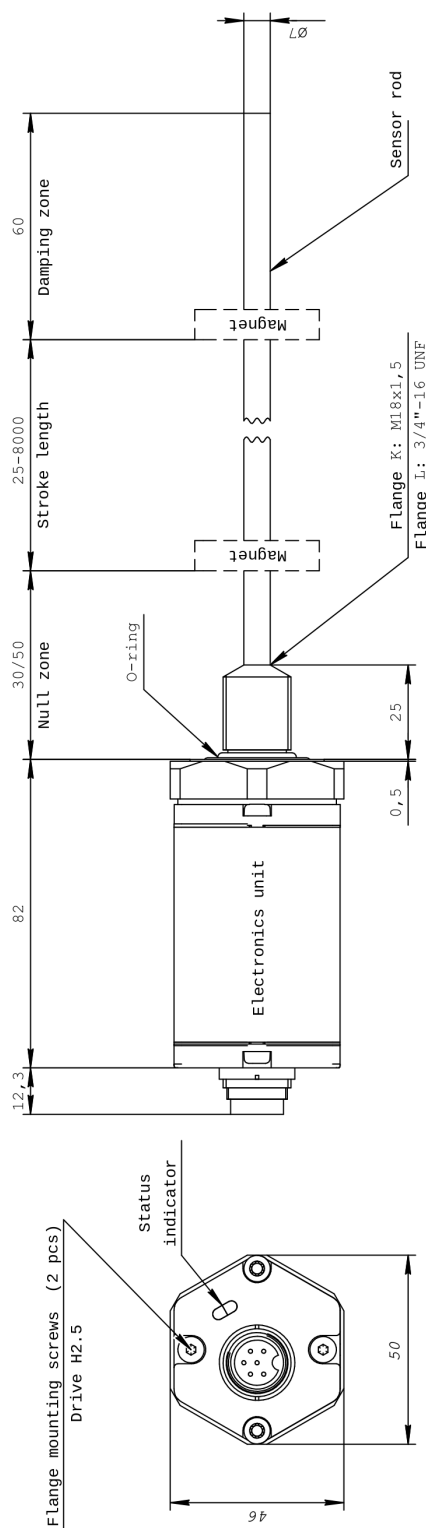


Dimensional drawing of MSI-H linear position sensor with analog output

Flanges K, L

M16 connector: D60, S32

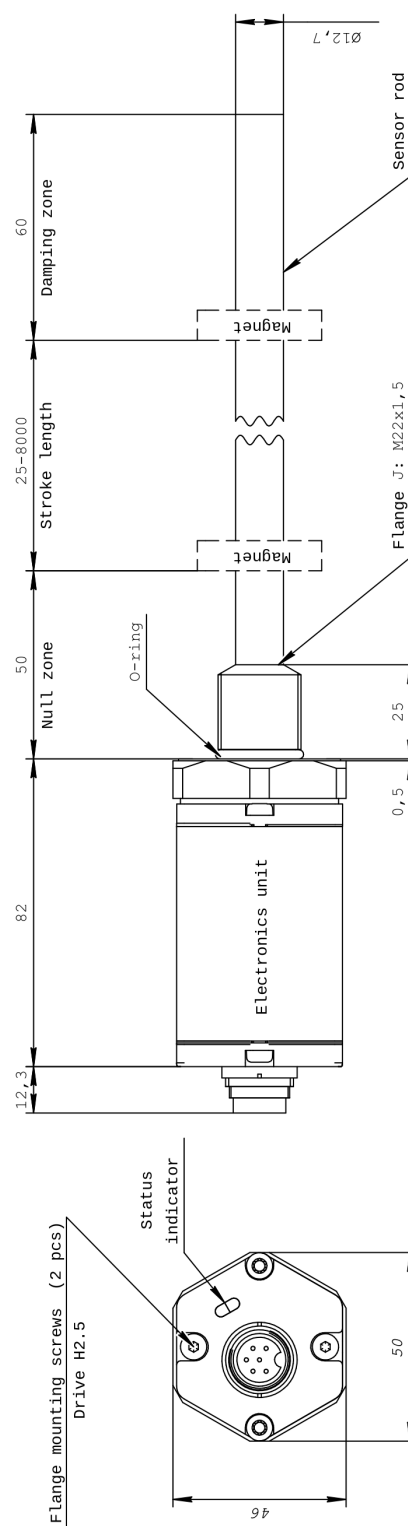
K — M18x1,5; L — 3/4"-16 UNF; rod Ø 7 mm



Flange J

M16 connector: D60, S32

M22x1,5; rod Ø 12,7 mm; 800 bar



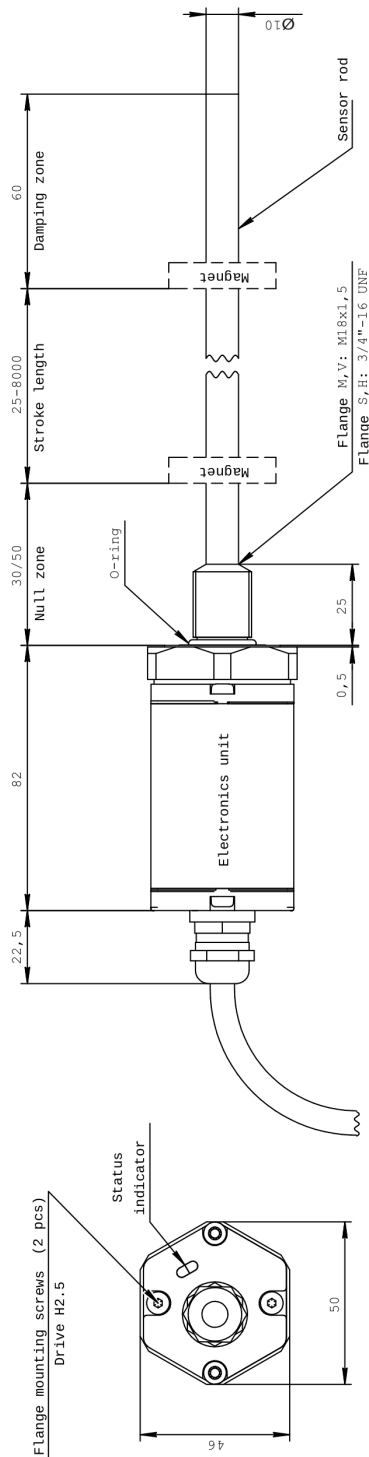


Dimensional drawing of MSI-H linear position sensor with analog output

Flanges M, V, S, H

Cable outlet: R, H, T, S, W (1...20 m)

M, V — M18×1,5; S, H — 3/4"-16 UNF; rod Ø 10 mm

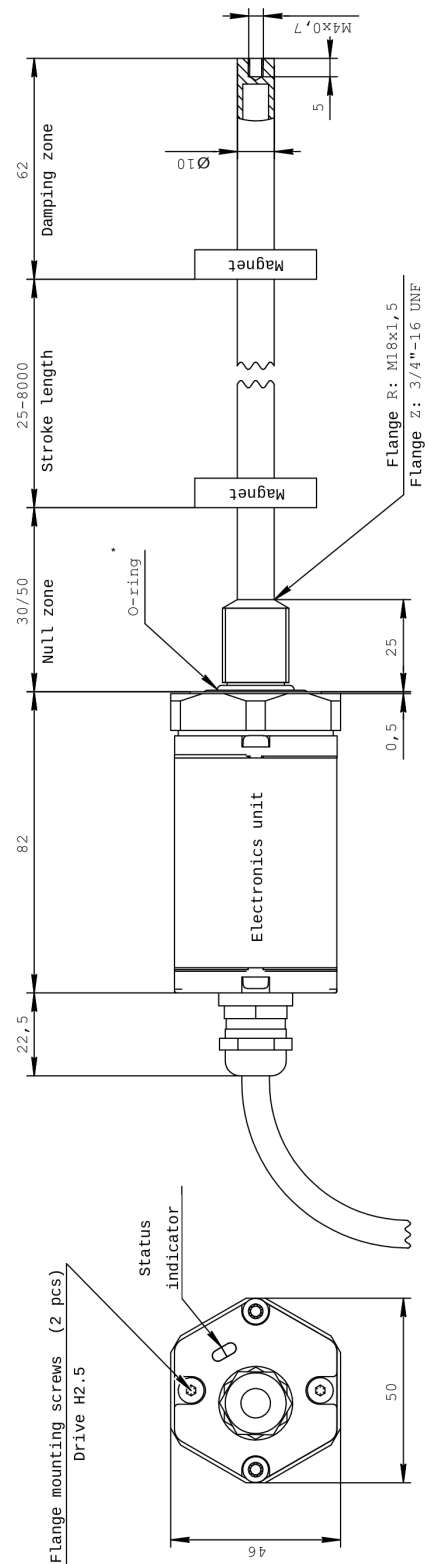


* - O-ring

Flanges R, Z

Cable outlet: R, H, T, S, W (1...20 m)

R — M18×1,5; Z — 3/4"-16 UNF; M4 thread at rod end



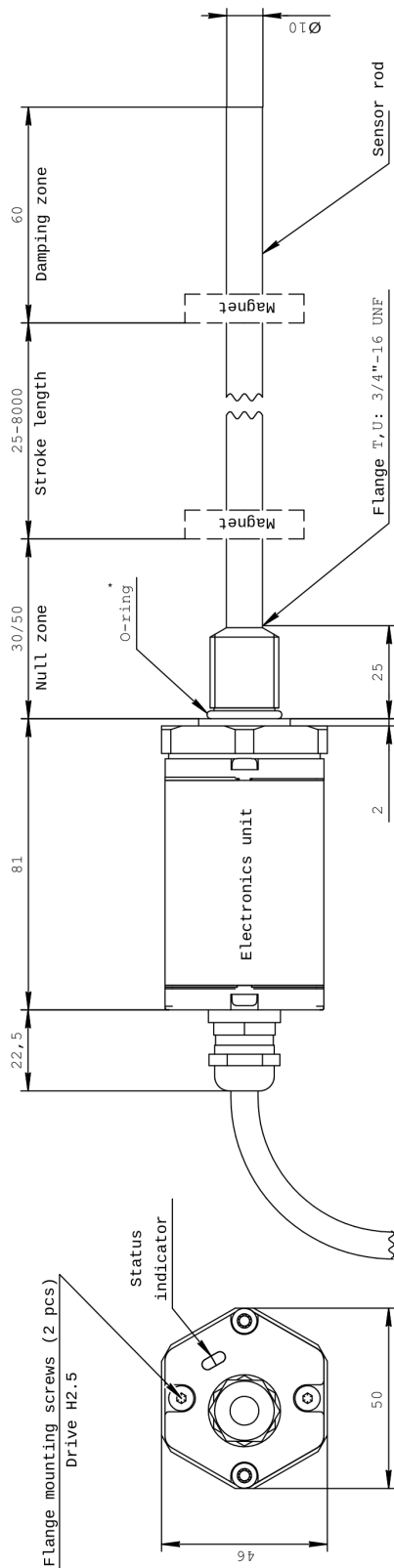


Dimensional drawing of MSI-H linear position sensor with analog output

Flanges T, U

Cable outlet: R, H, T, S, W (1...20 m)

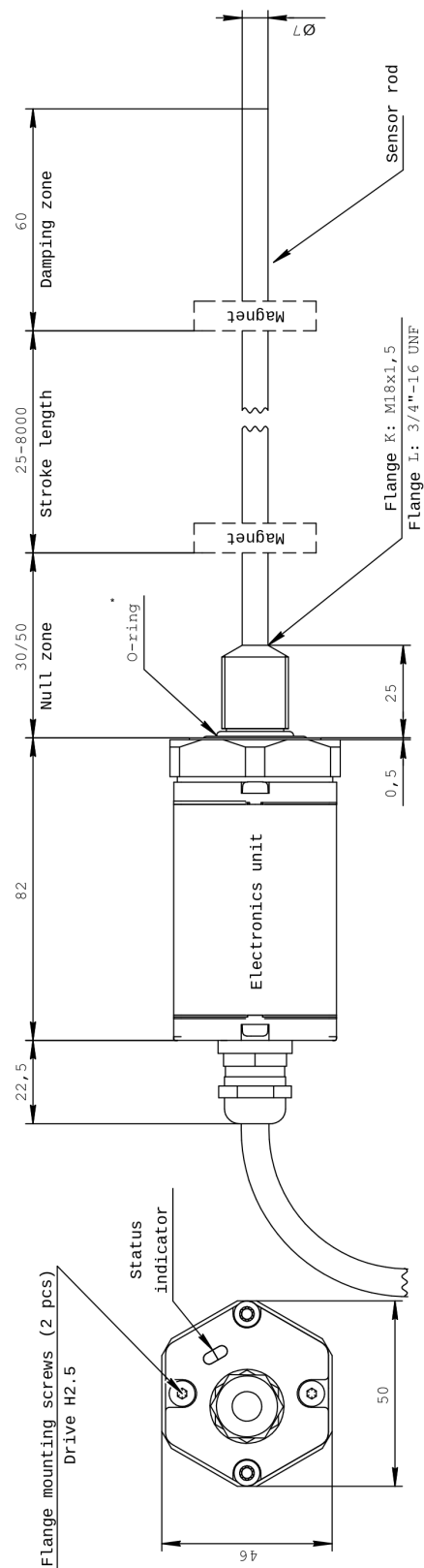
3/4"-16 UNF with raised face; rod $\varnothing$ 10 mm



Flanges K, L

Cable outlet: R, H, T, S, W (1...20 m)

K — M18x1.5; L — 3/4"-16 UNF; rod $\varnothing$ 7 mm

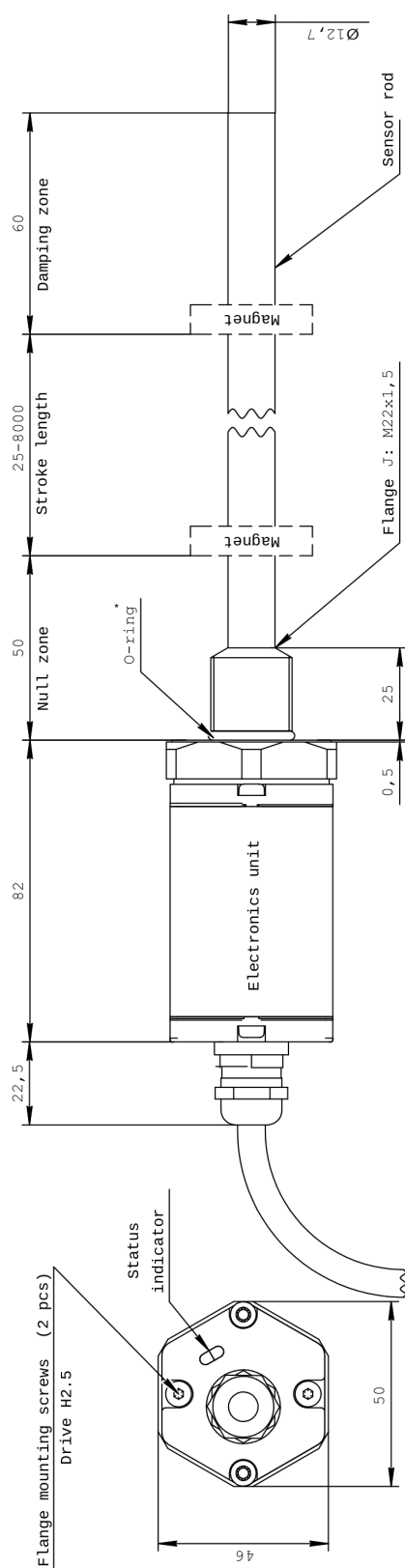


Dimensional drawing of MSI-H linear position sensor with analog output

Flange J

Cable outlet: R, H, T, S, W (1...20 m)

M22x1,5; rod Ø 12,7 mm; 800 bar



Product ordering code: analog output																			
1	2		3				4		5		6								
MSI-H	.	S	.	0	5	0	0	.	T	.	D60	.	A	0	1	X	X	X	X
1	Series: MSI-H — rod-type																		
2	Flange type: M - M18×1.5, rod Ø 10 mm S - 3/4"-16 UNF, rod Ø 10 mm R - M18×1.5, M4 thread at rod end, rod Ø 10 mm Z - 3/4"-16 UNF, M4 thread at rod end, rod Ø 10 mm T - 3/4"-16 UNF with raised face, rod Ø 10 mm V - M18×1.5, fluoroelastomer seals for the sensor electronics housing, rod Ø 10 mm U - 3/4"-16 UNF with raised face, fluoroelastomer seals for the sensor electronics housing, rod Ø 10 mm H - 3/4"-16 UNF, fluoroelastomer seals for the sensor electronics housing, rod Ø 10 mm L - 3/4"-16 UNF, rod Ø 7 mm K - M18×1.5, rod Ø 7 mm J - M22×1.5, rod Ø 12.7 mm, 800 bar																		
3	Stroke length: 0025...8000 mm, 1 mm increments Other lengths available on request																		
4	Null zone: T - 50 mm B - 30 mm																		
5	Electrical connection: D34 - M12 male connector (5 pin) D60 - M16 male connector (6 pin) S32 - M16 male connector (8 pin) S115 - M12 male connector (8 pin) D84 - M12 male connector (8 pin) R02 - PVC cable outlet, 2 m; option: R01...R20 (1...20 m) H02 - PUR cable outlet, 2 m; option: H01...H20 (1...20 m) T02 - PTFE cable outlet, 2 m; option: T01...T20 (1...20 m) S02 - silicone cable outlet, 2 m; option: S01...S20 (1...20 m) W02 - moisture-resistant cable outlet, 2 m; option: W01...W20 (1...20 m)																		
6	Output signal: 1 output with 1 position magnet V01 - output 1: 0...10 V V11 - output 1: 10...0 V V21 - output 1: -10...10 V V31 - output 1: 10...-10 V V41 - output 1: 0...5 V V51 - output 1: 5...0 V V61 - output 1: -5...5 V A01 - output 1: 4...20 mA A11 - output 1: 20...4 mA A21 - output 1: 10...20 mA A31 - output 1: 20...0 mA A41 - output 1: 0...24 mA A51 - output 1: 24...0 mA 2 outputs with 2 position magnets V02 - output 1: 0...10 V; output 2: 0...10 V V12 - output 1: 10...0 V; output 2: 10...0 V V22 - output 1: -10...10 V; output 2: -10...10 V V32 - output 1: 10...-10 V; output 2: 10...-10 V V42 - output 1: 0...5 V; output 2: 0...5 V V52 - output 1: 5...0 V; output 2: 5...0 V V62 - output 1: -5...5 V; output 2: -5...5 V A02 - output 1: 4...20 mA; output 2: 4...20 mA A12 - output 1: 20...4 mA; output 2: 20...4 mA A22 - output 1: 0...20 mA; output 2: 0...20 mA A32 - output 1: 20...0 mA; output 2: 20...0 mA A42 - output 1: 0...24 mA; output 2: 0...24 mA A52 - output 1: 24...0 mA; output 2: 24...0 mA 2 outputs with 1 position magnet V03 - output 1: 0...10 V; output 2: 10...0 V V04 - output 1: 10...-10 V; output 2: -10...10 V A03 - output 1: 4...20 mA; output 2: 20...4 mA A04 - output 1: 4...20 mA; output 2: 0...10 V A24 - output 1: 4...20 mA; output 2: 10...0 V 2 outputs with 1 position magnet (position + velocity*) V01 xxxx - output 1: 0...10 V; output 2 (velocity): 0...10 V V11 xxxx - output 1: 10...0 V; output 2 (velocity): 10...0 V A01 xxxx - output 1: 4...20 mA; output 2 (velocity): 4...20 mA A11 xxxx - output 1: 20...4 mA; output 2 (velocity): 20...4 mA																		
* Velocity range 1: 0.1...10 m/s (0001...0100) Example 1: (-5.5...0...5.5 m/s = 10...0...10 V) = V01 0055 Velocity range 2: 25...90 mm/s (1025...1090) Example 2: (-50...0...50 mm/s = 4...12...20 mA) = A41 1050																			

Connecting a sensor with analog output signal

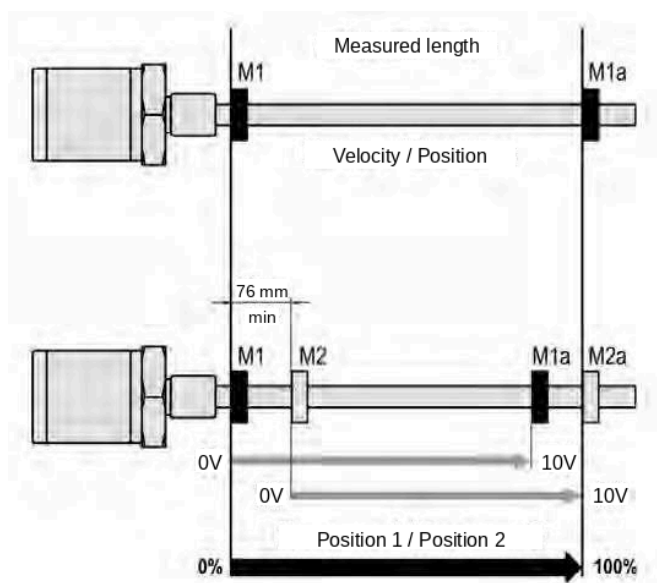
Interface: analog output

An analog sensor is connected directly to a controller or display. Its microelectronics generates standardized output signals strictly proportional to the distance.

Multi-position measurement

A sensor with an analog interface can process the signal from two position magnets located on the same waveguide. To obtain position information for each magnet, two conditions must be met:

- the distance between magnets must be at least 65 mm;
- the sensor configuration (specified when ordering) must support multi-position measurement.

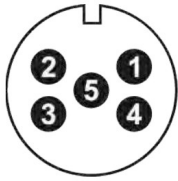


Position measurement with one and two magnets

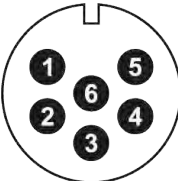
Connecting the mating cable entry

Wire		Pin				Function
		D34	D60	S115	S32	
Black		2	1	5	1	Output 1: position
White		5	2	2	2	0 VDC, output 1
Yellow		4	3	3	3	Output 2: position or velocity
Green		5	4	2	—	0 VDC, output 2
		—	—	—	5	Output 3: position
Red		1	5	7	7	+24 VDC (–15 / +20 %)
Blue		3	6	6	6	0 VDC (power supply)

Connector D34

Connector	Pin	Function
 M12 A-coded male connector (view on sensor)	1	+24 VDC (-15 / +20 %)
	2	Output 1: position
	3	0 VDC (power supply)
	4	Output 2: position
	5	0 VDC, outputs 1, 2

Connector D60

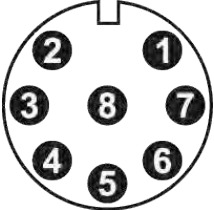
Connector	Pin	Function
 M16 male connector (view on sensor)	1	Output 1: position
	2	0 VDC, output 1
	3	Output 2: position or velocity
	4	0 VDC, output 2
	5	+24 VDC (-15 / +20 %)
	6	0 VDC (power supply)

Possible output signal combinations

Description	Interface ordering code	Output 1	Output 2
1 output with 1 position magnet	V01	0...10 V	Not applicable
	V11	10...0 V	Not applicable
	V21	-10...10 V	Not applicable
	V31	10...-10 V	Not applicable
	V41	0...5 V	Not applicable
	V51	5...0 V	Not applicable
	V61	-5...5 V	Not applicable
	A01	4...20 mA	Not applicable
	A11	20...4 mA	Not applicable
	A21	0...20 mA	Not applicable
	A31	20...0 mA	Not applicable
	A41	0...24 mA	Not applicable
	A51	24...0 mA	Not applicable
2 outputs with 2 position magnets	V02	0...10 V	0...10 V
	V12	10...0 V	10...0 V
	V22	-10...10 V	-10...10 V
	V32	10...-10 V	10...-10 V
	V42	0...5 V	0...5 V
	V52	5...0 V	5...0 V
	V62	-5...5 V	-5...5 V
	A02	4...20 mA	4...20 mA
	A12	20...4 mA	20...4 mA
	A22	0...20 mA	0...20 mA

Description	Interface ordering code	Output 1	Output 2
	A32	20...0 mA	20...0 mA
	A42	0...24 mA	0...24 mA
	A52	24...0 mA	24...0 mA
2 outputs with 1 position magnet	V03	0...10 V	10...0 V
	V04	10...-10 V	-10...10 V
	A03	4...20 mA	20...4 mA
	A04	4...20 mA	0...10 V
2 outputs with 1 position magnet (position + velocity)	V01 xxxx	0...10 V	0...10 V
	V11 xxxx	10...0 V	10...0 V
	A01 xxxx	4...20 mA	4...20 mA
	A11 xxxx	20...4 mA	20...4 mA

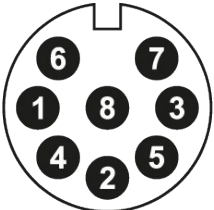
Connector S115

Connector	Pin	Function
 M12 A-coded male connector (view on sensor)	1	Not connected
	2	0 VDC, outputs 1, 2
	3	Output 2: position
	4	Not connected
	5	Output 1: position
	6	0 VDC (power supply)
	7	+24 VDC (-15 / +20 %)
	8	Not connected

Possible output signal combinations

Description	Interface ordering code	Output 1	Output 2
1 output with 1 position magnet	A01	4...20 mA	Not applicable
	A21	0...20 mA	Not applicable
	A11	20...4 mA	Not applicable
	A31	20...0 mA	Not applicable
2 outputs with 1 position magnet	V03	0...10 V	10...0 V

Connector S32

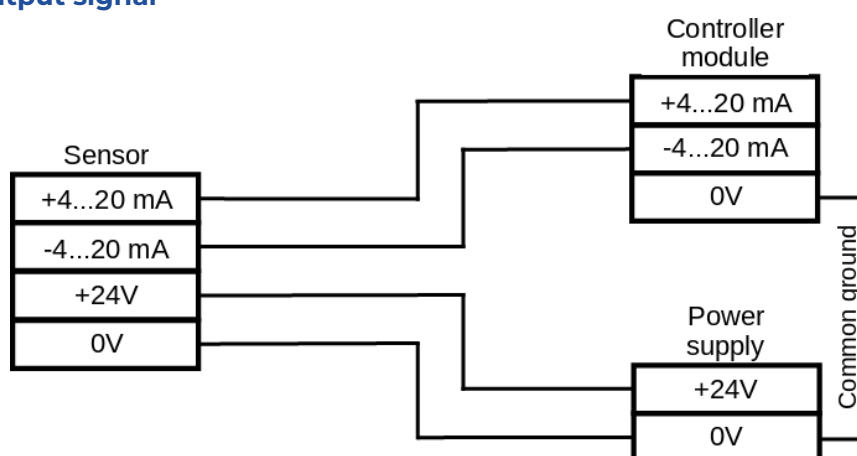
Connector	Pin	Function
 M16 male connector (view on sensor)	1	Output 1: position
	2	0 VDC, outputs 1, 2, 3
	3	Output 2: position
	4	Not connected
	5	Output 3: position
	6	0 VDC (power supply)
	7	+24 VDC (-15 / +20 %)
	8	Not connected

Possible output signal combinations

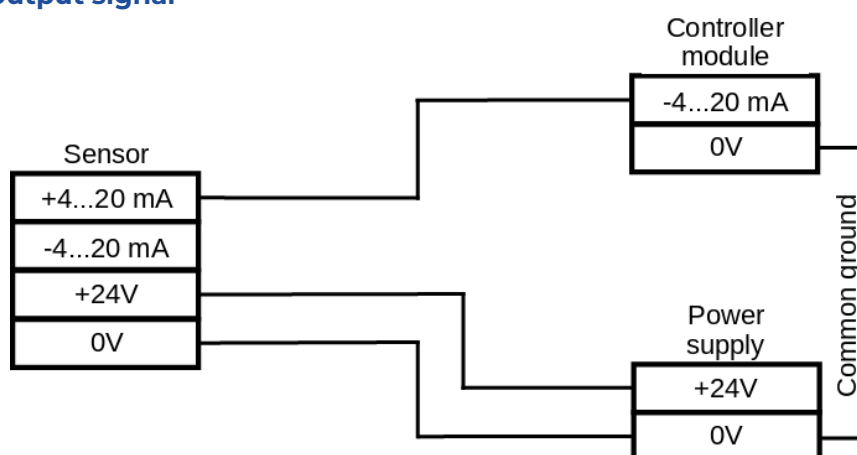
Description	Interface ordering code	Output 1	Output 2	Output 3
1 output with 1 position magnet	A01	4...20 mA	Not applicable	Not applicable
	A11	20...4 mA	Not applicable	Not applicable
	A21	0...20 mA	Not applicable	Not applicable
	A31	20...0 mA	Not applicable	Not applicable
2 outputs with 1 position magnet	A03	4...20 mA	20...4 mA	Not applicable
	A04	4...20 mA	0...10 V	Not applicable
	V03	Not applicable	10...0 V	0...10 V
	V04	Not applicable	10...-10 V	-10...10 V

Wiring diagram of a sensor with analog output signal

With active output signal



With passive output signal



Sensor setup

The main difference between an analog and a digital signal is that an analog signal has a reference point. When a faulty sensor is replaced, the equipment usually has to be recalibrated. This can be done in two ways:

- If the customer's machine has a calibration function, after the sensor is replaced it assigns the new limit positions in its control system while the mechanism is moved in manual mode.
- The new limit position values can be programmed into the sensor using the MSI-253 124 handheld programmer. The procedure is the same as the first one, but in this case the values are assigned to the sensor rather than to the customer's machine.

10. Mounting



The position sensor must only be used in technically safe conditions. To maintain this condition and to ensure safe mounting, connection and maintenance, all work must be performed by qualified technical personnel only.



Inspect the sensor before mounting. Check that there is no visible mechanical damage.

It is prohibited to use the sensor if damage is present!

10.1. Mounting location

Select the mounting location taking into account the following recommendations:

- an industrial standard version sensor must not be installed in hazardous areas;
- an explosion-proof version sensor may be installed in hazardous areas that match its Ex marking;
- the mounting location must provide convenient access for maintenance and removal.

The sensor is mounted in a position convenient for operation and maintenance.

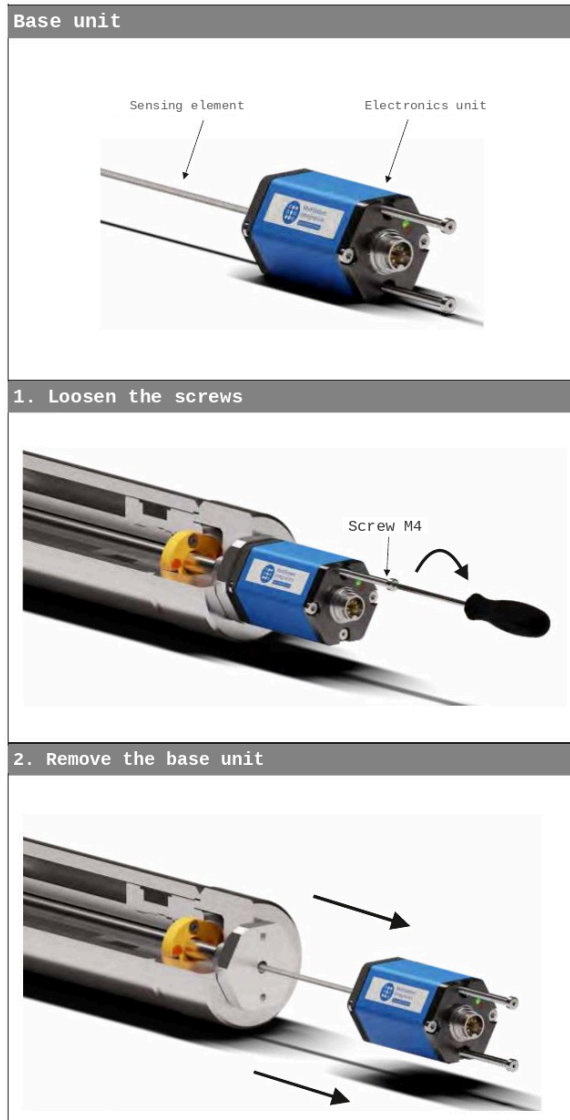
10.2. Mounting procedure

Sensor mounting consists of three main stages:

- mechanical installation;
- electrical connection;
- sensor setup / calibration.

Base unit replacement

The base unit of the MSI-H sensor can be replaced as shown in the figures below. The sensor can be replaced without opening the hydraulic circuit.



Base unit replacement (e.g. MSI-H sensor), part 1: base unit; 1 — loosen the screws; 2 — remove the base unit

3. Insert the new base unit



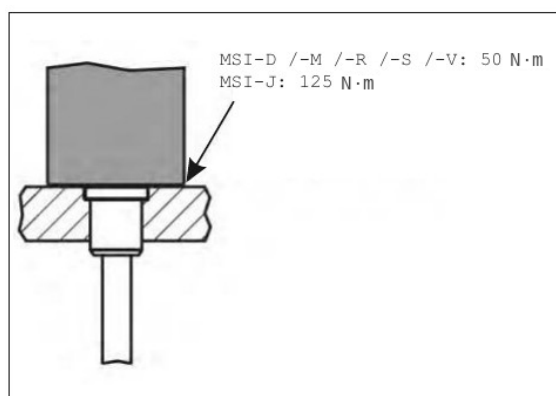
Base unit replacement (e.g. MSI-H sensor), part 2: 3 — insert the new base unit, fit the ground wire on the screw, tighten the screws



When replacing the base unit, make sure that no moisture gets into the sensor tube. This may damage the sensor.

Make sure that the O-ring is correctly fitted between the flange and the base unit.

Mounting a sensor with a threaded flange



Tightening torque: MSI-D/-M/-R/-S/-V — 50 N·m;
MSI-J — 125 N·m



A sensor with a threaded flange must be tightened by the flange only! Do not tighten it by the housing!

1. Unpack the sensor and make sure it is intact (the rod is straight).
2. When replacing a sensor, first remove the old sensor, then install the new sensor in the vacant mounting hole.

3. Tighten the flange with a 46 mm wrench. Tightening torque of the sensor — 50 N·m, for flange type J — 125 N·m.
4. When mounting an extra-long MSI-H sensor with flanges R and Z, there is a mounting hole at the end of the sensor for fixing the rod. If an extra-long sensor is installed horizontally, the rod may bend under its own weight; to prevent this, the rod must be fixed.
5. Mount the position magnet (section 10.4).
6. Connect the sensor according to the wiring diagram (section 9).

10.3. Mounting the sensor in a hydraulic cylinder

The position magnet must be fixed with two screws directly on the piston base. Mounting hardware made of non-magnetizable material is preferred for fixing the magnet.

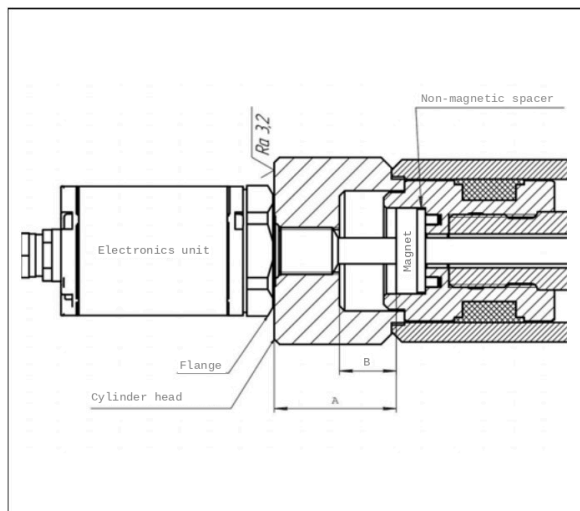
If the hydraulic cylinder is made of magnetizable material, use non-magnetic spacers at least 3 mm thick. The bore in the piston rod must be designed according to the pressure and travel speed. The O-ring included in the delivery seals the pressure area of the cylinder at the flange mounting hole. The contact surface of the flange must fully rest on the mounting surface of the cylinder.

The sensor is fixed using the hexagon of the flange on the rod side, 46 mm wrench (A/F 46). Tightening torque — max. 50 N·m (flange type J — 125 N·m).



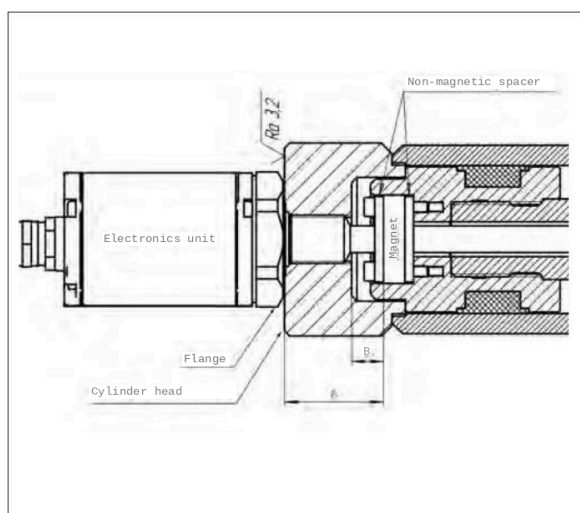
Mounting the sensor in a hydraulic cylinder: diagram No. 1

The piston is made of magnetizable material; the distance B between the magnet and the cylinder head is more than 15 mm. One non-magnetic spacer is used. Distance A is the sensor null zone.



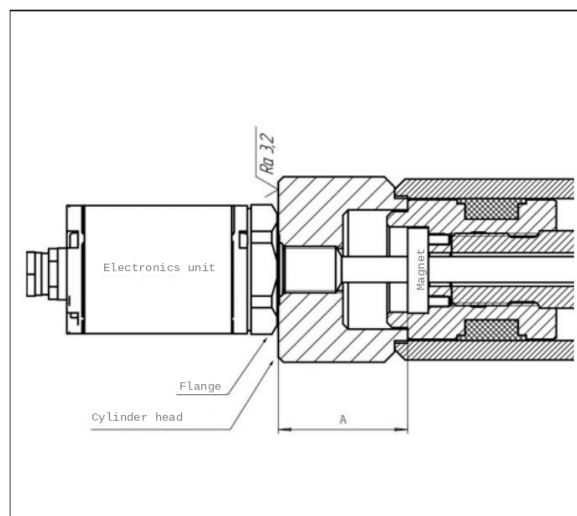
Mounting the sensor in a hydraulic cylinder: diagram No. 2

The piston is made of magnetizable material; the distance B between the magnet and the cylinder head is less than 15 mm. Two non-magnetic spacers are used. Distance A is the sensor null zone.



Mounting the sensor in a hydraulic cylinder: diagram No. 3

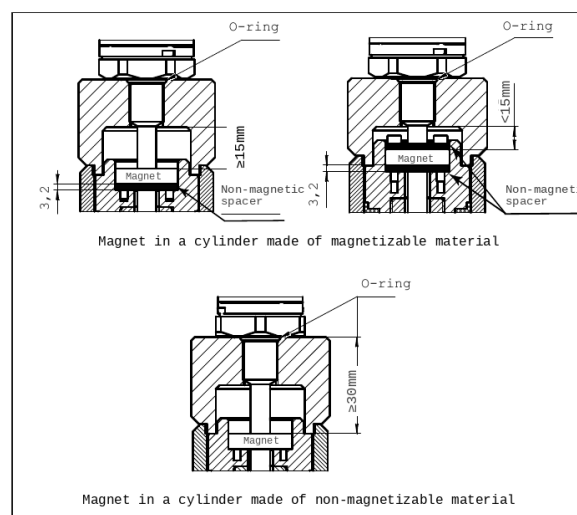
The hydraulic cylinder is made of non-magnetizable material. No non-magnetic spacers are used. Distance A is the null zone.



10.4. Mounting the position magnet

Use non-magnetic material for mounting the magnet: screws, spacers, etc.

- maximum permissible surface pressure — 40 N/mm²;
- maximum tightening torque of M4 screws — 1 N·m; if necessary, use



Mounting the magnet in a cylinder made of magnetizable and non-magnetizable material

10.5. Maintenance

Maintenance, replacement, adjustment and testing must be carried out by specially trained electrical personnel who have passed a safety knowledge test and are authorized to work on electrical installations.

MSI-H series sensors have an integrated status LED; its location is shown in the figure, and the LED states are described in the table.



Status LED

Green	Red	Status
Off	Off	Sensor not connected to the power supply or faulty
On	Off	Normal operation
On	On	Position magnet missing or incorrect number of position magnets
On	Fast flashing	Position magnet demagnetized or faulty

11. Preservation

The sensor does not require preservation.

12. Transport

The sensor may be transported at ambient temperatures from -50 to +50 °C and relative humidity up to 95 % in protective film packaging.

The sensors may be transported by all means of transport, including by air in heated pressurized compartments. Boxes with products must be stowed so that they cannot shift. Transport conditions must correspond to storage condition 5 according to GOST 15150-69. Products may be stored either in transport packaging stacked up to 5 boxes high or in consumer packaging on racks. Storage conditions for sensors in transport packaging correspond to storage condition 3 according to GOST 15150-69.

When products are shipped to the Far North and equivalent regions, transport must comply with GOST 15846.

The sensors may remain under transport conditions for no more than three months.

13. Storage

The sensors must be stored in their packaging in accordance with the requirements of group 1 according to GOST 15150. The storage room must be free of conductive dust, acid and alkali vapors, and gases that cause corrosion and damage insulation.

Safety regulations for loading and unloading operations — according to GOST 12.3.009 and GOST 12.3.020.

14. Disposal

The materials and components used in the sensor design are not hazardous during disposal and are disposed of in accordance with the applicable regulatory documents approved in the established manner.

A sensor at the end of its service life must be handed over for disposal to specialized material recycling companies.

15. Warranty obligations

15.1. The manufacturer provides this warranty subject to compliance with the transport, storage and operating conditions specified in the operating instructions of the product of which it is a component.

15.2. The warranty covers only defects detected within the warranty period and caused by manufacturing and/or design faults.

15.3. The warranty obligations become void:

- if the user fails to observe the sensor operating instructions;
- in case of mechanical damage;
- in case of exposure of the device to adverse atmospheric and other external influences such as rain, snow, high humidity, heat, aggressive media, or non-compliance of the supply mains parameters with the standards;
- if the device has been opened, repaired or modified in any way.

15.4. Faulty equipment must be returned to the supplier. When returning equipment, the following documents must be enclosed:

- warranty certificate;
- failure report;
- the wiring (installation) diagram of the equipment used in this case;
- a copy of the delivery note under which the equipment was supplied to the customer.

If any of these documents is missing, the supplier is entitled to refuse warranty service for the product.

15.5. If the sensor fails during the warranty period and all documents listed in clause 15.4 are provided, the supplier undertakes to carry out a fault analysis of the equipment. If the case is covered by the warranty, the supplier repairs or replaces the equipment. Transport costs are not covered by the warranty obligations.

15.6. Any claims are valid only if they are duly submitted in writing.

15.7. Warranty storage period — 1 year from the date of manufacture.

15.8. The warranty period for this device is 12 months from the date of sale. If defects of the device are rectified, the warranty period is extended by the period during which the device was out of use.

15.9. The warranty obligations are borne by LLC "MultiSystem Integration".