MICRO-EPSILON

Operating Instructions

induSENSOR, EDS

EDS-75-S
EDS-100-S/F
EDS-160-S/F
EDS-200-S/F
EDS-220-Z
EDS-250-S/F
EDS-260-Z
EDS-300-S/F/Z
EDS-370-Z
EDS-400-S/F/Z
EDS-500-S
EDS-630-S/F

Long-stroke sensors, EDS series

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Contents

1. Safety

System operation assumes knowledge of the operating instructions.

1.1 Symbols Used

The following symbols are used in these operating instructions:

⚠ CAUTION	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	Indicates a situation that may result in property damage if not avoided.
➔	Indicates a user action.
i	Indicates a tip for users.

1.2 Warnings

⚠ CAUTION

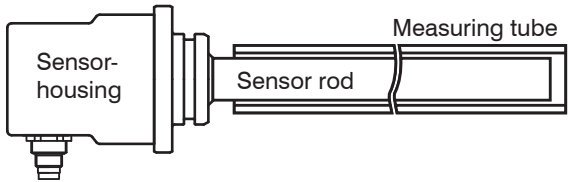
Connect the power supply according to the safety regulations for electrical equipment.
> Risk of injury

> Damage to or destruction of the sensor

NOTICE

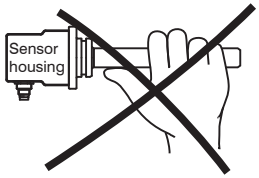
The supply voltage must not exceed the specified limits.
> Damage to or destruction of the sensor

Avoid shocks and impacts to the sensor.
> Damage to or destruction of the sensor



Avoid bending the sensor rod or the measuring tube.
> Damage to or destruction of the sensor

Do not carry the sensor on the sensor rod.
> Damage to or destruction of the sensor



1.3 Notes on CE Marking

The following apply to EDS eddy current long-stroke displacement sensors:

- EU Directive 2014/30/EU
- EU Directive 2011/65/EU

Products which carry the CE mark satisfy the requirements of the EU directives cited and the relevant applicable harmonized European standards (EN). The measuring system is designed for use in industrial and laboratory applications.

The EU Declaration of Conformity and the technical documentation are available to the responsible authorities according to the EU Directives.

1.4 Proper Use

- The sensors are designed for use in industrial and laboratory applications. They are used for
  - displacement measurement in presses, punches, rolling mills, etc.
  - position determination of pistons in hydraulic and pneumatic cylinders
- The system must only be operated within the limits specified in the technical data, see 2.3.
- The system must be used in such a way that no persons are endangered or machines and other material goods are damaged in the event of malfunction or total failure of the sensor.
- Take additional precautions for safety and damage prevention in case of safety-related applications.

1.5 Proper Environment

- Protection class:
  - Front side: 450 bar
  - Rear side: [1]
    - F series: IP65
    - S series: IP67
    - Z series: IP40
- Temperature range:
  - Storage: -40 ... +100 °C (-40 ... +212 °F)
  - Operation: -40 ... +85 °C (-40 ... +185 °F)
  - Humidity: 5 - 95 % (non-condensing)
- Ambient pressure: 450 bar (front side)

1) Models with plug connection only with suitable and connected mating plug

2. Functional Principle, Technical Data

2.1 Measuring Principle

Eddy current long-stroke displacement sensors transform the linear motion (e.g. displacement of a piston in hydraulic cylinders) into a linear electrical signal. The measuring object is an aluminum tube that is moved concentrically and without contact over a coil. By inducing eddy currents in the aluminum tube, energy is extracted from the coil, thus detuning it. The integrated electronics converts the tube position into a linear electrical output signal. The eddy current principle applied works contact-free. The sensors are therefore not subject to mechanical wear.

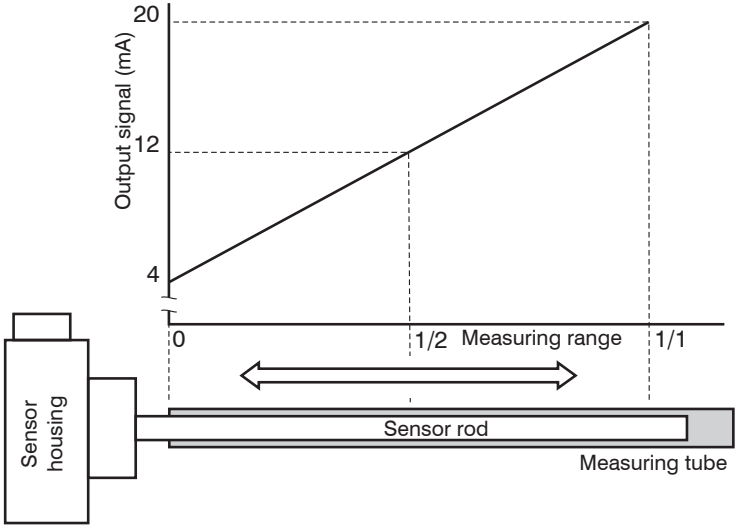


Fig. 1 Output characteristic of an eddy current long-stroke displacement sensor. Position of measuring tube: start of measuring range

2.2 Structure

A coil is arranged in the sensor rod, and is thus protected against environmental influences. The controller is integrated in the sensor housing. Long-stroke displacement sensors are designed for measuring ranges from 75 to 630 mm.

Electrical connection:

- 4-pin Amphenol connector, type C164P compact, (EDS-...-S... model) [1]
- 7-pin Binder connector, type 712 (EDS-...- S ...7... model)
- 5-pin connector, type CA02COM-E14S with bayonet lock (EDS-...-F... model)
- Axial braid (EDS-...-Z... model)

1) Previous model no longer available

2.3 Technical Data

Model		EDS -75	EDS -100	EDS -160	EDS -200	EDS -220	EDS -250	EDS -260	EDS -300	EDS -370	EDS -400	EDS -500	EDS -630
Series		S	S, F	S, F	S	Z	S, F	Z	S, F, Z	Z	S, F, Z	S	S, F
Measuring range	mm	75	100	160	200	220	250	260	300	370	400	500	630
Resolution	mm	0.038	0.05	0.08	0.1	0.11	0.125	0.13	0.15	0.18	0.2	0.25	0.315
Frequency response (-3 dB)		150 Hz											
Measuring rate		600 Sa/s											
Linearity	≤ ±0.3 % FSO/ mm	≤ ±0.23	≤ ±0.3	≤ ±0.48	≤ ±0.6	≤ ±0.66	≤ ±0.75	≤ ±0.78	≤ ±0.9	≤ ±1.1	≤ ±1.2	≤ ±1.5	≤ ±1.89
Temperature stability		≤ 200 ppm FSO / K											
Supply voltage		18 ... 30 VDC											
Max. current consumption		40 mA											
Analog output [1]		4 … 20 mA (load ≤ 500 Ohm)											
Connection	S series	7-pin M9 screw/plug connection (Binder); axial, also radial (see accessories for connection cable)											
	F series	Bayonet 5-pin screw/plug connection; radial (see accessories for connection cable)											
	Z series	Integrated braids, axial											
Temperature range	Storage	-40 … +100 °C (-40 ... +212 °F)											
	Operation	-40 … +85 °C (-40 ... +185 °F)											
Pressure resistance		450 bar (front)											
Shock (DIN EN 60068-2-27)		40 g / 6 ms in 3 axes, 1000 shocks each											
		100 g / 6 ms radial, 3 shocks each											
		300 g / 6 ms axial, 3 shocks each											
Vibration (DIN EN 60068-2-6)		±2.5 mm / 5 … 44 Hz, 10 cycles each											
		±23 g / 44 … 500 Hz, 10 cycles each											
Protection class (DIN EN 60529)		IP65 (F series) / IP67 (S series) / IP40 (Z series)											
Material		Stainless steel (housing); Aluminum (measuring tube)											

FSO = Full Scale Output

1) Optional voltage output (1 ... 5 V) with C703-5/U connection cable for EDS, S series

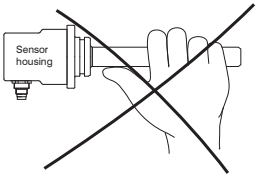
2) Models with plug connection only with suitable and connected mating plug

3. Delivery

3.1 Unpacking, Included in Delivery

1 Eddy current long-stroke displacement sensor
1 Measuring tube
1 Assembly Instructions
1 O-ring (mounted on sensor) [1]
1 Test report
1 5-pole cable connector (only for the F series)

➡ Do not use the sensor rod to pick up or carry the eddy current long-stroke displacement sensors.



➡ Carefully remove the components of the measuring system from the packaging and ensure that the goods are forwarded in such a way that no damage can occur.

➡ Check the delivery for completeness and shipping damage immediately after unpacking.

➡ If there is damage or parts are missing, immediately contact the manufacturer or supplier.

3.2 Storage

- Temperature range: -40 ... +100 °C (-40 ... +212 °F)
- Humidity: 5 - 95 % (non-condensing)
- Atmospheric pressure

1) For S and F sensor models only

4. Installation and Assembly

4.1 Precautions

The measuring tube must not contact the sensor rod during operation.
> Damage to or destruction of the sensor through abrasion is possible.

Do not deform or shorten the measuring tube.
> Loss of specified technical data.

Do not crush the O-ring or damage through sharp-edged items.
> Loss of functionality

4.2 Measuring Tube Guidance and Fastening

➡ Mount the measuring tube flush in the piston bore, see Fig. 2.

NOTICE

The dimensions for the measuring tube can be found in the following figures, see Fig. 9 ff. The measuring tube must not touch the sensor shaft when the piston is retracted. Note the measuring tube position at zero point (= 4 mA output), see Fig. 3 ff.
> Improper measuring tube guidance can lead to increased wear and premature failure.

A slightly eccentric mounting of the measuring tube has no negative influence on the sensor signal.
➡ Mount the measuring tube in the piston by means of pressing or glueing.

Spot clamping is not permissible.

i The specified technical data only apply when the measuring tube supplied by MICRO-EPSILON is used!

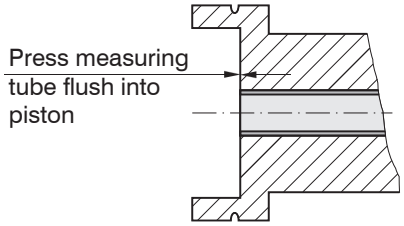


Fig. 2 Positioning of measuring tube in the piston

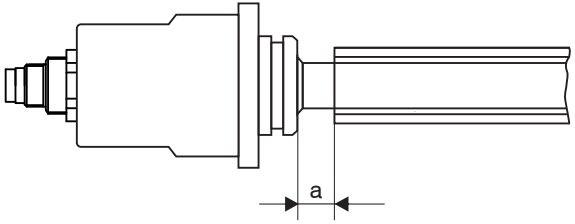


Fig. 3 Zero point of the measuring tube, EDS- ... -S

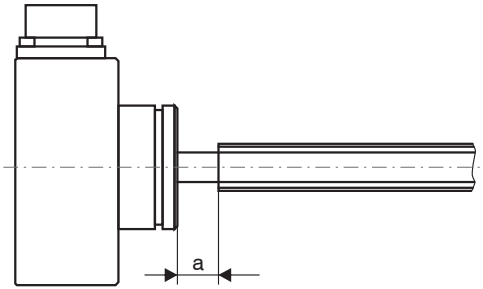


Fig. 4 Zero point of the measuring tube, EDS- ... -F

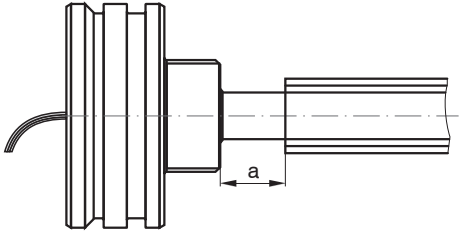


Fig. 5 Zero point of the measuring tube, EDS- ... -Z

Measuring range	Dimension a
75	15 (0.59)
100	20 (0.79)
160	20 (0.79)
200	20 (0.79)
220	20 (0.79)
250	20 (0.79)
260	20 (0.79)
300	20 (0.79)
370	25 (0.98)
400	25 (0.98)
500	25 (0.98)
630	25 (0.98)

Dimensions in mm (inches)

4.3 Sensor Mounting

4.3.1 EDS- ... -S Model

EDS-75-S	EDS-100-S	EDS-160-S	EDS-200-S	EDS-250-S	EDS-300-S	EDS-400-S
EDS-500-S	EDS-630-S					

Mount the sensor in the cylinder with a mounting ring, see Appendix Optional Accessories, and 6 cylinder head screws (M5 x 10).

Sealing is provided by a supplied O-ring on the sensor shaft.

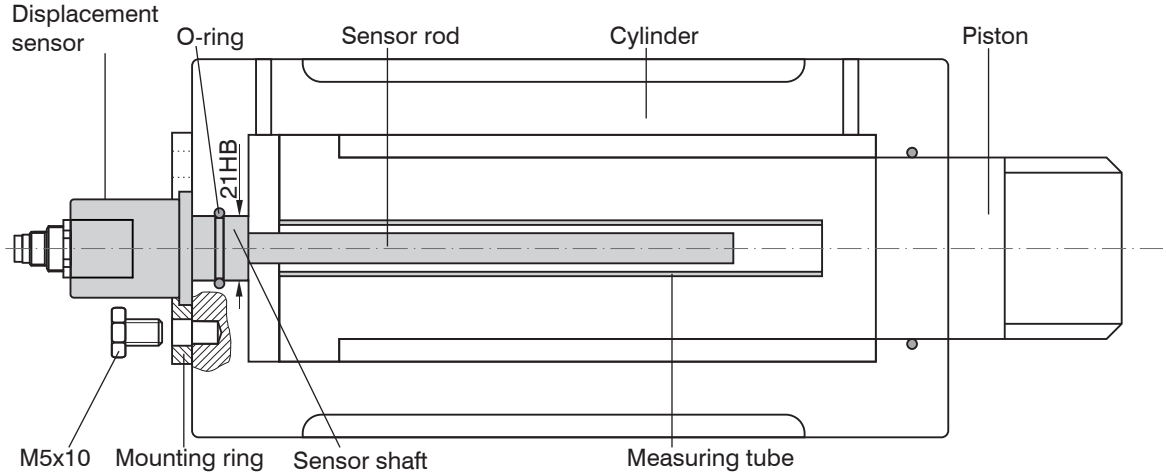


Fig. 6 Sensor mounting in a hydraulic cylinder, EDS- ... -S model

Pressure chamber seal:
- O-ring: 18.5 x 1.5
- Material: Viton

Mounting hole for flange: 21H8 dia.
Borehole surface:
- R_a = 0.8
- R_{max} = 3.2

Dimension	Tolerance µm
21H8	+33 0

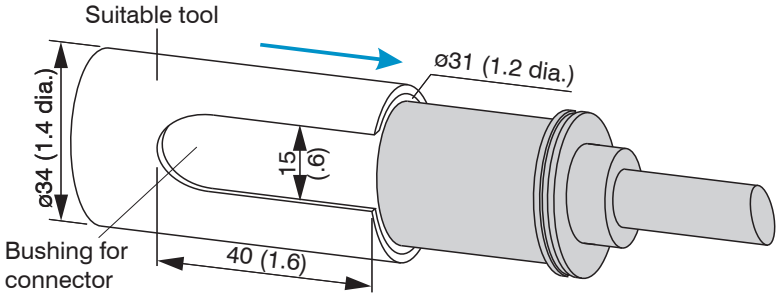


Fig. 7 Mounting of an induSENSOR, EDS- ... -S model

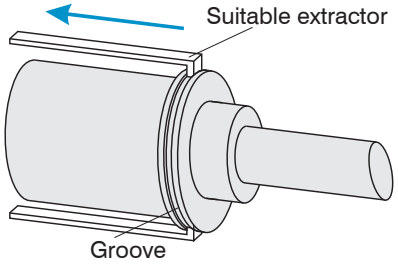


Fig. 8 Dismounting of an induSENSOR, EDS- ... -S model

Dimensions in mm (inches)

Use a suitable tool for mounting, see Fig. 7.

The bushing must be congruent with the connector for models with radial connector.

Dismantling

Use an suitable extractor for dismantling, see Fig. 8.

Dimensions of the flange groove: 1.5 x 1.5 mm (0.06 x 0.06“,depth x width).

Dimensional drawing, EDS- ... -S model

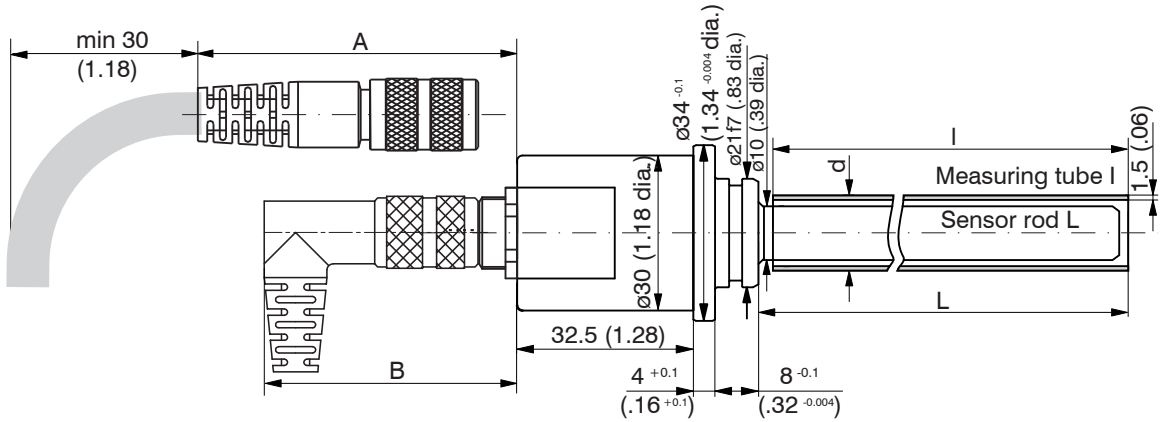


Fig. 9 induSENSOR with axial connector, EDS- ... -SA7 - l model, measuring range: 75 / 100 / 160 / 200 / 250 / 300

Dimension	Tolerance µm
21f7	-20 -41

	A	B
EDS-xxx-S-Sx-l [1]	31 (1.2)	16 (.63)
EDS-xxx-S-Sx7-l	51 (2.0)	47 (1.85)

Dimensions in mm (inches)

1) Previous model no longer available.

Measuring range	Sensor rod L	Measuring tube l	Measuring tube d
75 (2.95)	110 (4.33)	110 (4.33)	16 (.63)
100 (3.94)	140 (5.51)	140 (5.51)	16 (.63)
160 (6.29)	200 (7.87)	200 (7.87)	16 (.63)
200 (7.87)	240 (9.45)	240 (9.45)	16 (.63)
250 (9.84)	290 (11.42)	290 (11.42)	16 (.63)
300 (11.81)	340 (13.39)	340 (13.39)	16 (.63)

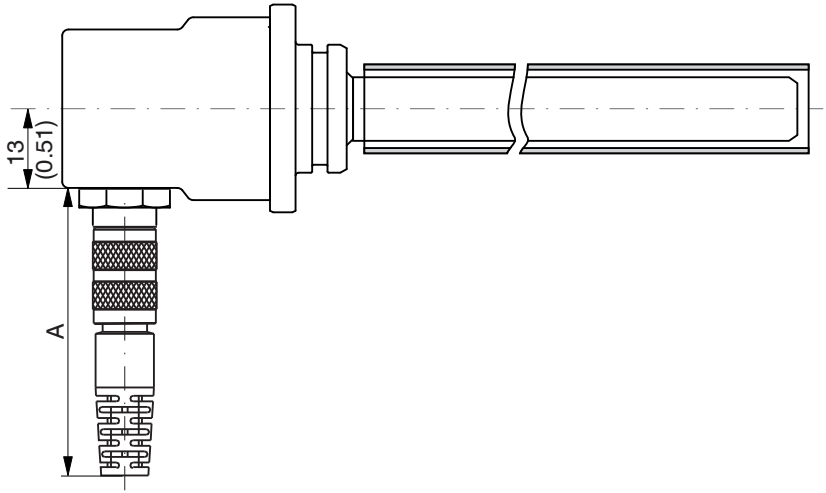


Fig. 10 induSENSOR with radial connector, EDS- ... -SR7 - I model, measuring range: 75 (2.95) / 100 (3.94) / 160 (6.29) / 200 (7.87) / 250 (9.84) / 300 (11.81)

	A
EDS-xxx-S-Sx-I [1]	31 (1.2)
EDS-xxx-S-Sx7-I	51 (2.0)

Dimensions in mm (inches)

1) Previous version no longer available.

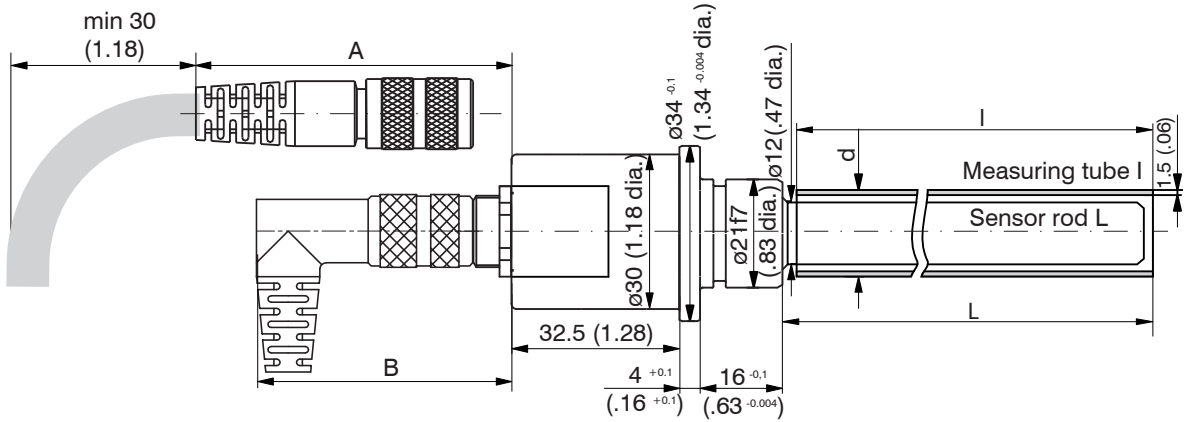


Fig. 11 induSENSOR with axial connector, EDS- ... -SA7 - l model, measuring range: 400 / 500 / 630

Dimension	Tolerance µm
21f7	-20 -41

	A	B
EDS-xxx-S-Sx-l [1]	31 (2.19)	16 (.63)
EDS-xxx-S-Sx7-l	51 (2.1)	47 (1.85)

Measuring range	Sensor rod	Measuring tube	
	L	l	d
400 (15.74)	450 (17.72)	450 (17.72)	18 (.71)
500 (19.69)	550 (21.65)	550 (21.65)	18 (.71)
630 (24.80)	680 (26.77)	680 (26.77)	18 (.71)

Dimensions in mm (inches)

1) Previous version no longer available.

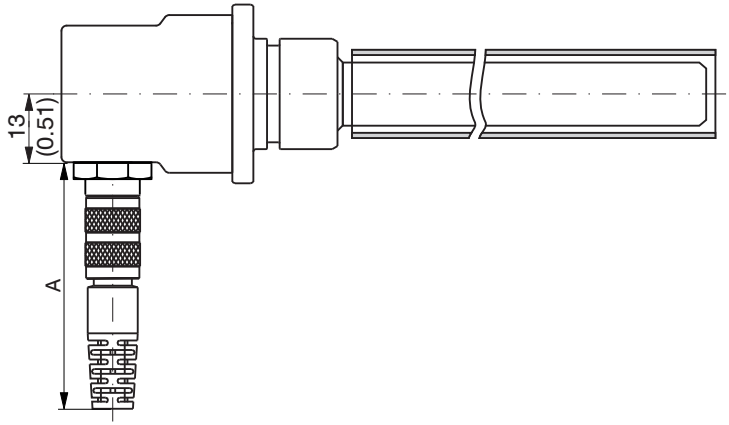


Fig. 12 induSENSOR with radial connector, EDS- ... -SR7 - I model, measuring range: 400 (15.74) / 500 (19.69) / 630 (24.80)

	A
EDS-xxx-S-Sx-I [1]	31 (1.2)
EDS-xxx-S-Sx7-I	51 (2.0)

Dimensions in mm (inches)

1) Previous version no longer available.

4.3.2 EDS- ... -F Model

EDS-100-F	EDS-160-F	EDS-200-F	EDS-250-F	EDS-300-F	EDS-400-F	EDS-630-F

➪ Mount the sensor in the cylinder using 6 cylinder head screws (M8 x 6).

Sealing is provided by a supplied O-ring on the sensor shaft.

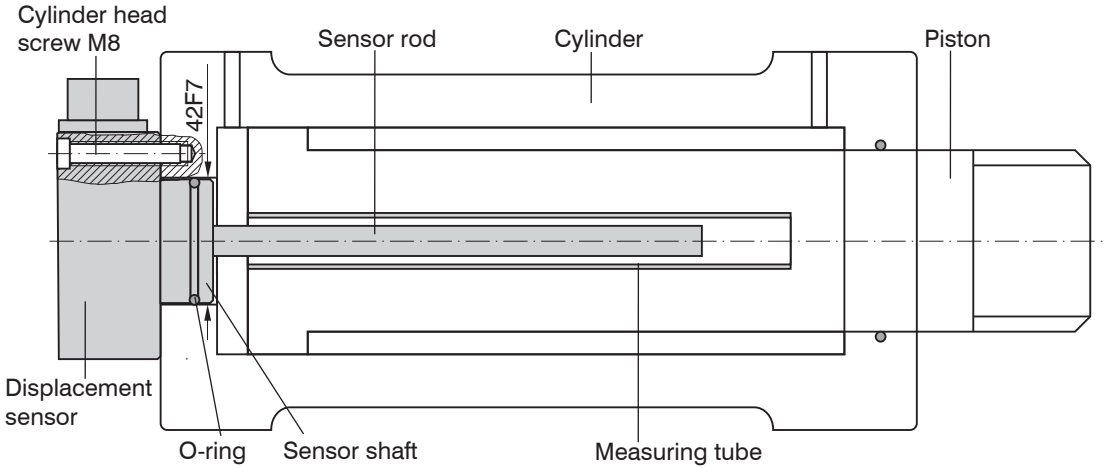


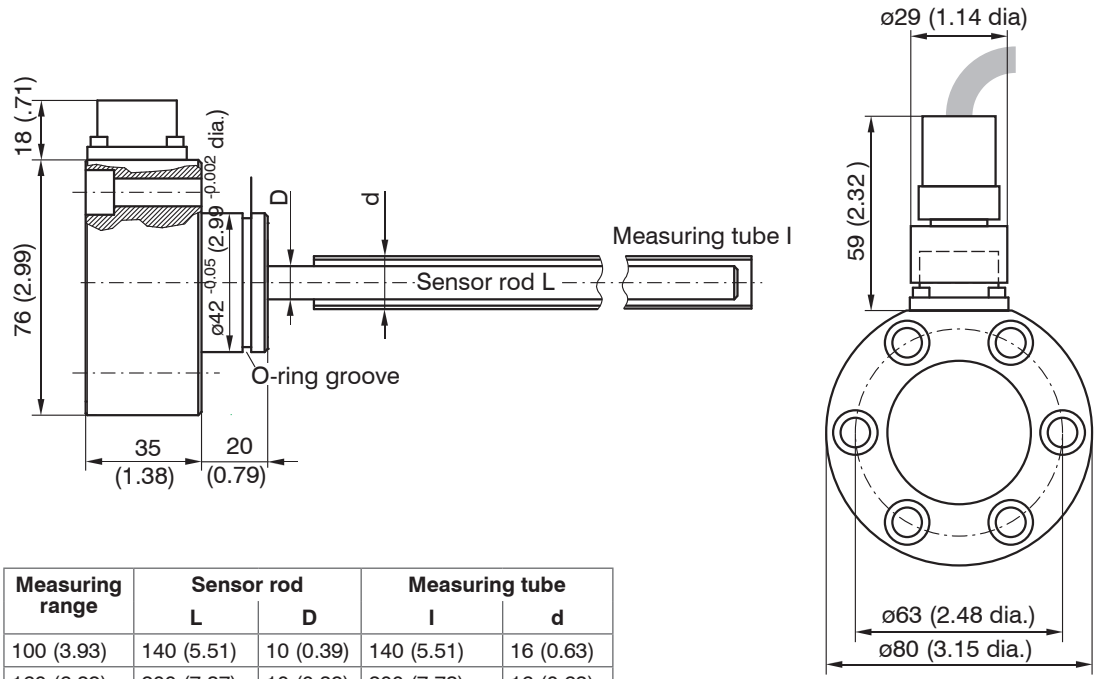
Fig. 13 Sensor mounting in a hydraulic cylinder, EDS- ... -F model

Pressure chamber seal:
- O-ring: 38 x 2.0
- Material: PUR

Mounting hole for flange: 42F7 dia.
Borehole surface:
- R_a = 0.8
- R_{max} = 3.2

Dimension	Tolerance
42F7	+50 +25

Dimensional drawing, EDS- ... -F model



Measuring range	Sensor rod		Measuring tube	
	L	D	l	d
100 (3.93)	140 (5.51)	10 (0.39)	140 (5.51)	16 (0.63)
160 (6.29)	200 (7.87)	10 (0.39)	200 (7.78)	16 (0.63)
200 (7.87)	240 (9.45)	10 (0.39)	240 (9.45)	16 (0.63)
250 (9.84)	290 (11.42)	10 (0.39)	290 (11.42)	16 (0.63)
300 (11.81)	340 (13.39)	10 (0.39)	340 (13.39)	16 (0.63)
400 (15.74)	450 (17.72)	12 (0.47)	460 (18.11)	26 (1.02)
630 (24.80)	680 (26.77)	12 (0.47)	690 (27.17)	26 (1.02)

Dimensions in mm (inches)

Fig. 14 induSENSOR with radial connector, EDS- ... -F model, measuring range: 100 / 160 / 200 / 250 / 300 / 400 / 630

4.3.3 EDS- ... -Z Model

EDS-220-Z	EDS-260-Z	EDS-300-Z	EDS-370-Z	EDS-400-Z

➡ Mount the sensor so that it is held by the back plate and then fix it with a grub screw, see Fig. 15.

Sealing is provided by a supplied O-ring on the sensor shaft.

➡ Guide the connection braids of the sensor in the cable shaft to the outside and connect them with the mounting plug, see Fig. 15.

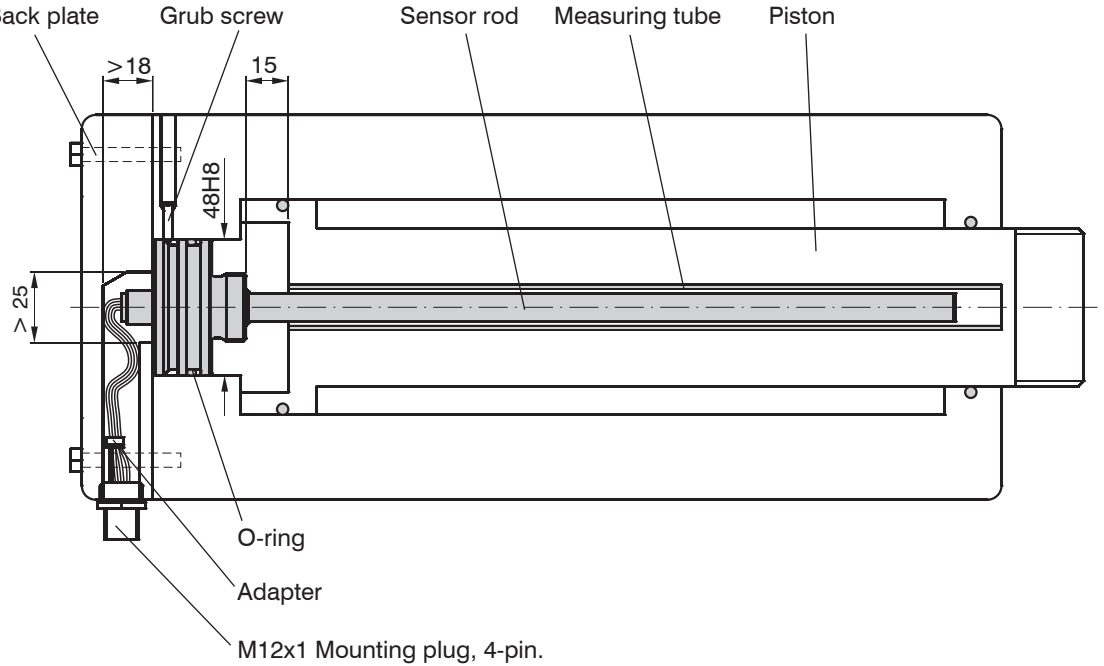


Fig. 15 Sensor mounting in a hydraulic cylinder, EDS- ... -Z model

Pressure chamber seal: [1]
- O-ring: 44.12 x 2.62
- Material: Viton

Mounting bore of the flange: 48H8 dia.
Borehole surface:
- R_a = 0.8
- R_{max} = 3.2

Dimension	Tolerance
48H8	+39 0

1) Not included in delivery

Dimensional drawing, EDS- ... -Z model

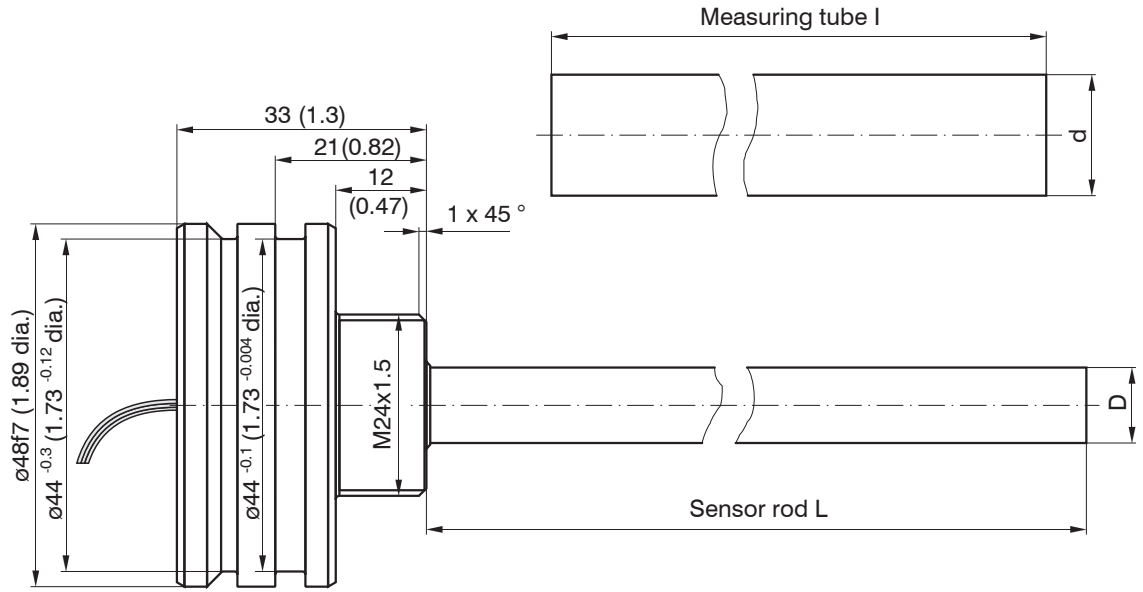


Fig. 16 induSENSOR with axial braids, EDS- ... -Z model, measuring range: 220 / 260 / 300 / 370 / 400

Measuring range	Sensor rod		Measuring tube	
	L	D	l	d
220 (8.66)	252 (9.92)	10 (.39)	250 (9.84)	16 (.63)
260 (10.23)	292 (11.50)	10 (.39)	290 (11.42)	16 (.63)
300 (11.81)	341 (13.43)	10 (.39)	340 (13.39)	16 (.63)
370 (14.57)	457 (17.99)	12 (.47)	450 (17.72)	18 (.71)
400 (15.74)	457 (17.99)	12 (.47)	450 (17.72)	18 (.71)

Dimension	Tolerance µm
48f7	-25 -50

Dimensions in mm (inches)

Dismantling

Use an extractor pipe for dismantling, see Fig. 17.

Female thread in the extractor pipe: M24 x 1.5

Proceeding:

1. Open the plug connection on the intermediate plug.
2. Loosen the grub screw
3. Unscrew the extraction tube on the sensor shaft and pull the sensor out of the cylinder.

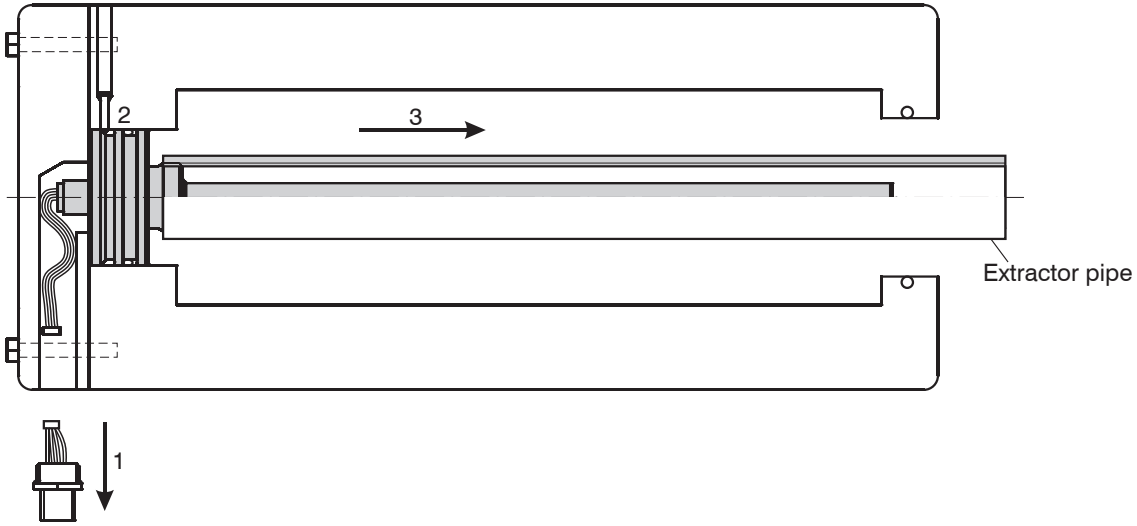
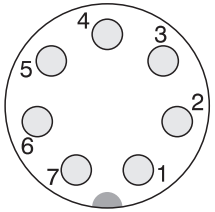


Fig. 17 Dismantling of the induSENSOR, EDS- ... -Z model

4.4 Pin Assignment for Power Supply and Output

4.4.1 EDS- ... -S Model

The 7-pin connector on the sensor housing ensures power supply and signal output.



View on solder pin side

Fig. 18 7-pole M9 cable connector (Binder, type 702)

Pin	Assignment	Color (Cable: C703-x) [1]
1	Power supply + (18 ... 30 VDC)	White
2	0 V Ground	Brown
3	I_{OUT} 4 ... 20 mA [2]	Green
4	Signal ground	Yellow
5	Assigned internally	Gray
6	Assigned internally	Pink
7	Not assigned	Blue

Fig. 19 Pin assignment for power supply and analog output

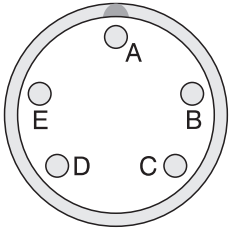
Pin 2 and pin 4 are connected internally on the sensor electronics. The shield of the sensor cable is connected to the housing of the cable socket.

➡ Connect the shield of the sensor cable with the protective ground on the supply side.

1) The C703-5 sensor cable is available as an optional accessory, see Appendix.
2) Output voltage of 1 ... 5 V with the C703-5/U supply and output cable.

4.4.2 EDS- ... -F Model

The 5-pin connector on the sensor housing ensures power supply and signal output.



View on solder pin side

Fig. 20 5-pole cable connector (ITT-Cannon, type CA06COM-PG14S-5S-B with bayonet lock)

Pin	Assignment	Color (Cable: C705-x) [1]
A	Power supply + (18 ... 30 VDC)	White
B	Power supply ground / signal ground	Brown/Yellow
C	Signal 4 ... 20 mA [2]	Green
D	Shield housing	-
E	Not connected	Gray

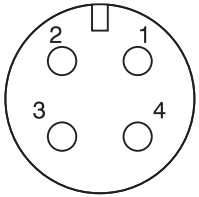
Fig. 21 Pin assignment for power supply and analog output

A 5-pin cable connector for the users to assemble their own connection cable is included in the scope of delivery, see 3.1.

1) The C705-5 sensor cable is available as an optional accessory, see Appendix.
2) Can be converted to voltage output with external load resistor!

4.4.3 EDS-...-Z Model

The 4-pin connector on the hydraulic cylinder ensures power supply and signal output.



View: Connector pin side,
M12 x 1; 4-pin.

Pin	Assignment	Color
1	Signal ground	Brown
2	Power supply + (18 ... 30 VDC)	White
3	Signal (4 ... 20 mA) [1]	Blue
4	Supply ground	Black

Fig. 22 Pin assignment for 4-pin plug-in connection, view on solder pin side of cable connector

1) Can be converted to voltage output with external load resistor!

5. Operation

There are no adjustment and setting elements for long-stroke sensors.

After installation and connecting the supply voltage/display, the sensor is ready for operation after a warm-up time of 10 min.

Output signal: 4 mA (start of measuring range) up to 20 mA (end of measuring range)

The sensor is ready for operation without adjustment.
Warm-up time: 10 min.
Output signal: 4 ... 20 mA

6. Operation and Maintenance

Observe the notes on measuring tube guiding during operation, see 4.2.

Improper measuring tube guidance can lead to increased wear and premature failure.

In the event of intervention by third parties, warranty and any liability claim shall lapse.

Repairs are to be made exclusively by MICRO-EPSILON.

7. Service, Repair

If the sensor or sensor cable is defective, please send us the affected parts for repair or exchange.

If the cause of a fault cannot be clearly identified, please send the entire measuring system to:

MICRO-EPSILON MESSTECHNIK
GmbH & Co. KG
Koenigbacher Str. 15
94496 Ortenburg / Germany

Tel. +49 (0) 8542 / 168-0
Fax +49 (0) 8542 / 168-90
info@micro-epsilon.com
www.micro-epsilon.com

8. Liability for Material Defects

All components of the device have been checked and tested for functionality at the factory. However, if defects occur despite our careful quality control, MICRO-EPSILON or your dealer must be notified immediately.

The liability for material defects is 12 months from delivery. Within this period, defective parts, except for wearing parts, will be repaired or replaced free of charge, if the device is returned to MICRO-EPSILON with shipping costs prepaid. Any damage that is caused by improper handling, the use of force or by repairs or modifications by third parties is not covered by the liability for material defects. Repairs are carried out exclusively by MICRO-EPSILON.

Further claims can not be made. Claims arising from the purchase contract remain unaffected. In particular,

MICRO-EPSILON shall not be liable for any consequential, special, indirect or incidental damage. In the interest of further development, MICRO-EPSILON reserves the right to make design changes without notification.

For translations into other languages, the German version shall prevail.

9. Decommissioning, Disposal

➡ Remove the connection cable from the sensor and the hydraulic.

Incorrect disposal may cause harm to the environment.

➡ Dispose of the device, its components and accessories, as well as the packaging materials in compliance with the applicable country-specific waste treatment and disposal regulations of the region of use.

Appendix

Optional Accessories

Series	Name	Description
EDS- ... -S	C703-5	EDS connection cable, 7-pin, standard length 5 m, (EDS-...- S ...7... series); other lengths on request
	C703/90-5	EDS connection cable, 7-pin, length 5 m with 90° angled cable connector, (EDS-...- S ... 7 ... series)
	C703-5/U	EDS connection cable, 7-pin, length 5 m, for voltage output 1 - 5 VDC, (EDS- ... - S ... 7 ... series)
	Measuring tube for EDS-75-S	Spare tube
	Measuring tube for EDS-100-S	
	Measuring tube for EDS-160-S	
	Measuring tube for EDS-200-S	
	Measuring tube for EDS-250-S	
	Measuring tube for EDS-300-S	
	Measuring tube for EDS-400-S	
	Measuring tube for EDS-630-S	
	Mating plug, S series	
	Mounting ring for sensor mounting (EDS- ... - S ... series)	

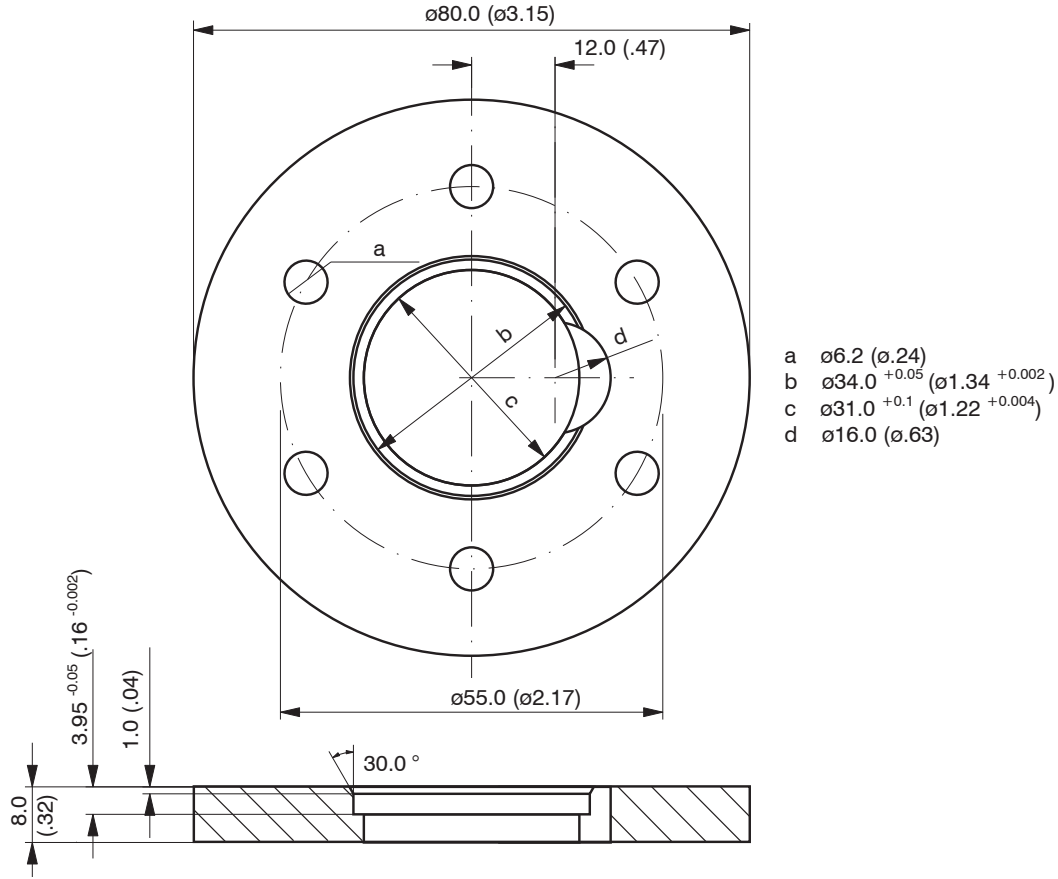


Fig. 23 Mounting ring, EDS- ... -S model, dimensions in mm (inches)

Series	Name	Description
EDS- ... -F	C705-5	EDS connection cable, 5-pin, length 5 m, (EDS-...- F series)
	C705-15	EDS connection cable, 5-pin, length 15 m, (EDS-...- F series)
	Measuring tube for EDS-100-F	
	Measuring tube for EDS-160-F	
	Measuring tube for EDS-200-F	
	Measuring tube for EDS-250-F	
	Measuring tube for EDS-300-F	
	Measuring tube for EDS-400-F	
	Measuring tube for EDS-630-F	
	EDS connector kit, F series	

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