DATASHEET



SM-F18 SERIES | LVDT

Inductive Position Transducer: Pressure-tight design for integration into hydraulic and pneumatic cylinders or servo valves.

- Ranges 2...200 mm
- M18x1,5 mounting thread
- Linearity up to ±0.10 % of full scale
- Operating pressure 150 bar
- Protection class IP67 or IP68
- Max. temperature up to +200 °C

eddylab

LVDTs (Linear Variable Differential Transformers) are inductive sensors excellent for use in harsh industrial environments, e.g. high temperature and pressure applications, as well as high accelerations and measuring cycles.
The **SM-F18 series** offers ultimate reliability and precision in a small size, and is designed for industrial and lab use. The position transducer is a pressurized hydraulic model up to 150 bar for installation directly in hydraulic and pneumatic cylinders. The sensors can also be used under water because of their high protection class.

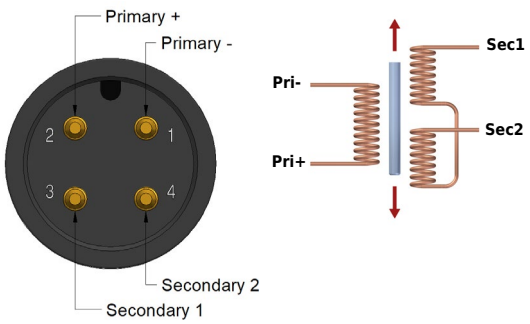
Please note: A measuring amplifier is required to use LVDT sensors. eddylab offers the digital signal conditioners **DEEneo** for DIN rail mounting and **DEEneo-ISC**, a version integrated into the sensor connection cable. See p.5 or separate data sheets at www.eddylab.com.
The electronics take over the sensor supply and convert the sensor signal into a standardised, analogue output signal with the help of a microcontroller.
They also offer simple adjustment (teach function) and linearisation of the sensor characteristic curve to achieve the highest possible precision.

TECHNICAL DATA - SENSORS

SENSORS							
Measurement range FS [mm]	0...2	0...5	0...10	0...25	0...50	0...100	0...200
Linearity [% of FS]	0.30 % (0.20 % optional, 0.10 % for selected models)						
Types	spring loaded (up to range 0...100 mm), free core, push rod guided/ unguided						
Protection class cable/ connector side	IP67, optional IP68						
Protection class flange side	IP68/ 150bar						
Vibration stability DIN IEC68T2-6	10 G						
Shock stability DIN IEC68T2-27	200 G/ 2 ms						
Supply voltage/ frequency	3 V_{eff}/ 3 kHz						
Supply frequency	2...10 kHz						
Temperature range	-40...+120 °C (H option: 150 °C , H200 option: 200 °C)						
Mounting	thread M18x1,5						
Housing	stainless steel 1.4301, chrome plated steel						
Connection	cable output or M12-connector with coupling nut						
cable TPE (standard)	ø 4.5 mm, 0.14 mm², non-halogen, suitable for drag chains						
PTFE (option H)	ø 4.8 mm, 0.24 mm², max. temperature 200°C, UL-Style 2895						
Max. cable length	100 m between sensor and electronics						
Spring loaded version (up to range 100 mm MR)							
Spring force (middle of range) [N]	0.9	0.9	0.9	0.95	0.95	1.50	-
Max. cycles of tip at 1 mm amplitude [Hz]	55	50	50	35	20	15	-
Life cycle	> 10 Mio. cycles						
Free core/ push rod/ push rod guided							
Max. acceleration of core/ push rod	100 G						
Life cycle	infinite						
Weight approx. [g]	85	91	96	108	140	190	290

CABLE/PIN ASSIGNMENT (AC OUTPUT)

	WIRE COLOUR OF EDDYLAB CABLES		M12 CONNECTOR
FUNCTION	TPE CABLE	PTFE-UL CABLE	PIN
Primary +	white	white	2
Primary -	brown	yellow	1
Secondary 1	blue	brown	3
Secondary 2	black	green	4

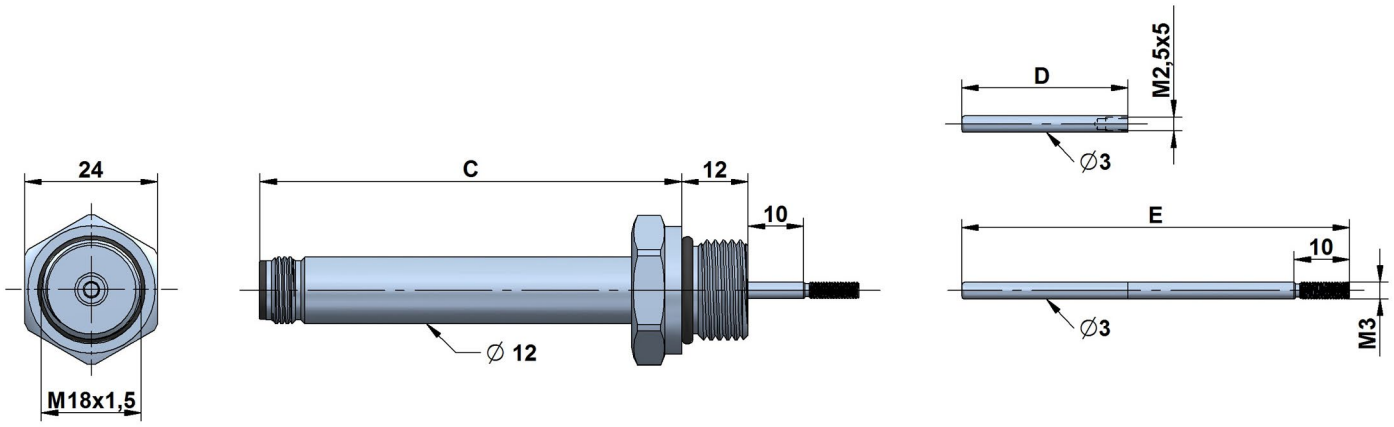


TECHNICAL DIMENSIONS

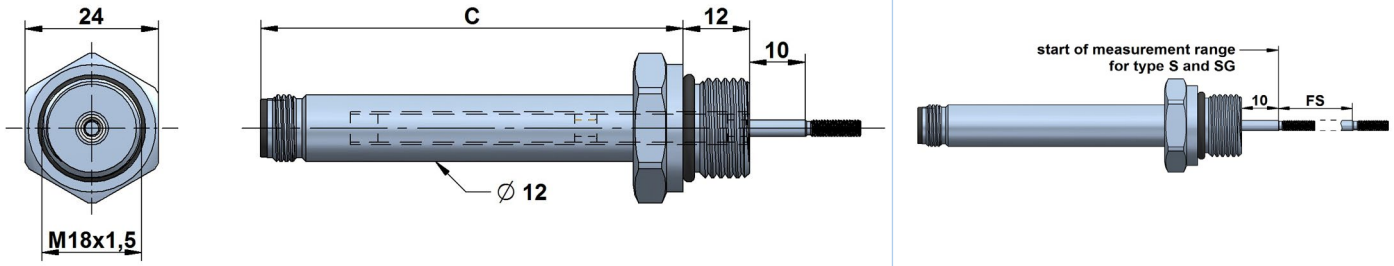
RANGE (FS) [MM]	BODY LENGTH B CABLE/ CONNECTOR RADIAL [MM]	BODY LENGTH C CONNECTOR M12 [MM]	MAX. LENGTH A SPRING LOADED MECHANICS [MM]	CORE LENGTH D [MM]	PUSH ROD LENGTH E [MM]
0...2	57	60	39	22	62
0...5	63	66	42	25	68
0...10	73	76	47	30	78
0...25	103	106	62	45	108
0...50	153	156	87	70	158
0...100	253	256	137	120	258
0...200	453	456	-	220	458

Other measurement ranges are available on request.

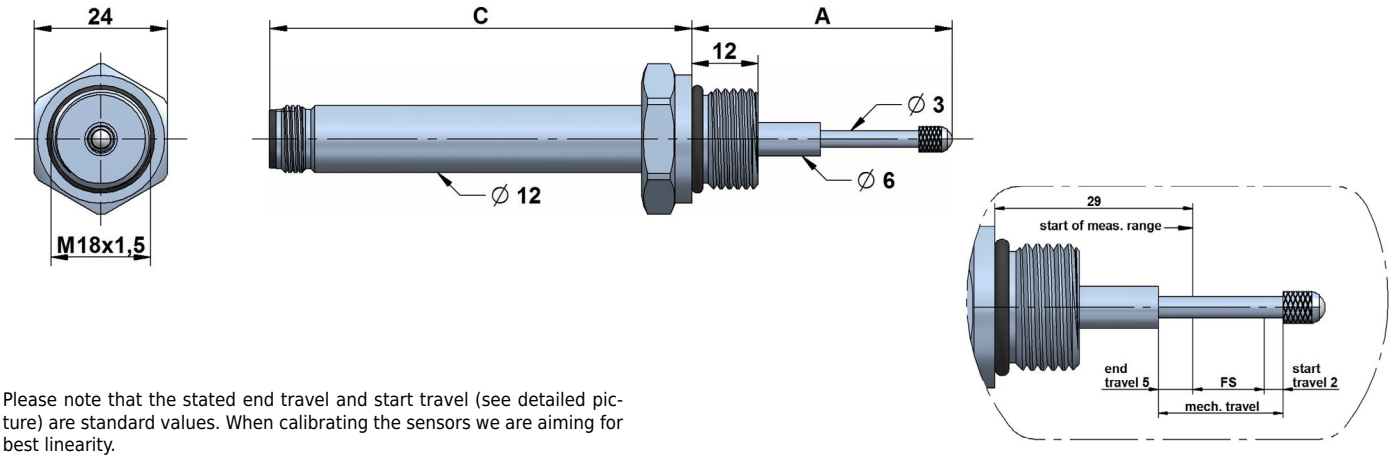
TYPE: FREE CORE (D), PUSH ROD UNGUIDED



TYPE: PUSH ROD GUIDED



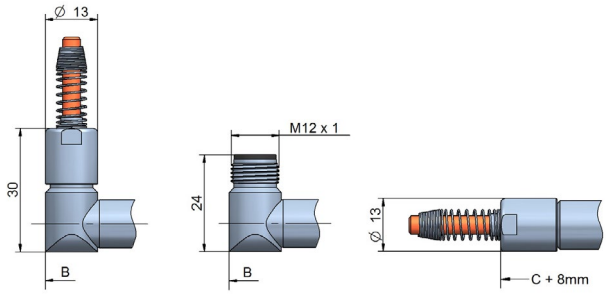
TYPE: SPRING LOADED



Please note that the stated end travel and start travel (see detailed picture) are standard values. When calibrating the sensors we are aiming for best linearity.

SENSOR TYPES

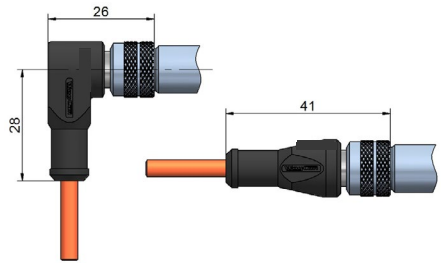
CABLE /CONNECTOR OUTPUT AXIAL /RADIAL



Sensors with cable output have a cable fitting and a spring for bend protection of the cable. For installation, the bending radius should not be less than 3 times the cable diameter. The standard cable length is 2 m.

Instruments with option H for temperatures up to 150 °C/ 200 °C feature a PTFE cable.

CONNECTOR OUTPUT (CABLE WITH STRAIGHT OR ANGULAR CONNECTOR)



For sensors with connector output the cable has to be ordered separately.
You can choose from a cable with a straight connector or with an angular connector.

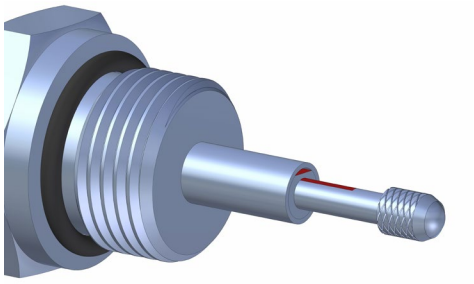
The connector is protected from accidental removal by a threaded fitting (M12).
The cable lengths are 2/ 5/ 10/ 15/ 20/ 50 m.

The connector pair has protection class IP67.

The total length of the sensor with connector is:

- body length of the connector M12 (see table) + 20 mm (angular connector)
- body length of the connector M12 (see table) + 37 mm (straight connector)

OPTION VH

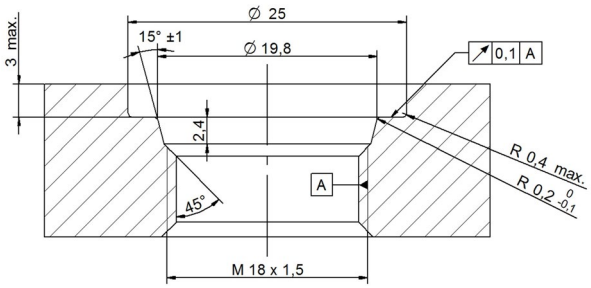


The option VH should to be chosen, if the sensor is used in liquids (oil, water, ...) or if fast pressure variations may occur. By milling plane surfaces on parts of the mechanics (see picture red marked) the pressure balance or venting of the inside area will be improved.

- For „spring loaded version“: Two plane surfaces combined with a higher spring force of approximately 2,5 N improve significantly the mechanical performance.
- For version „guided push rod“: The push rod features a plane surface.

INSTALLATION DRAWING

FOR FLANGE WITH THREAD M18



* note: Rz = 1,6 for non pulsating pressure
Rz = 0,8 for pulsating pressure

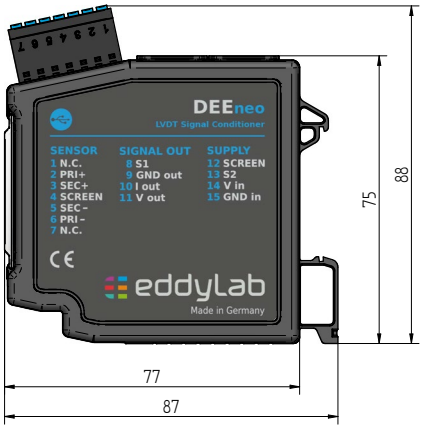
DEENEO | DEENEO-ISC

The **DEEneo** signal conditioner was developed for operating inductive LVDT sensors (full bridge). The electronics supply the sensor and convert the sensor signal into a standardized, analogue output signal with the help of a microcontroller. A push button (SET button) is used for the basic configuration and to set the measuring range limits - this enables quick and easy adaptation to the customer's application. Where possible, eddylab calibrates the sensor and electronics together. The sensor characteristic curve can be linearized to meet the highest demands on the accuracy of the measuring chain. Further features can be configured via the **eddySETUP** configuration software. Further information can be found in the DEEneo and DEEneo-ISC data sheets.

DEENEO*

Digital signal converter for DIN rail mounting



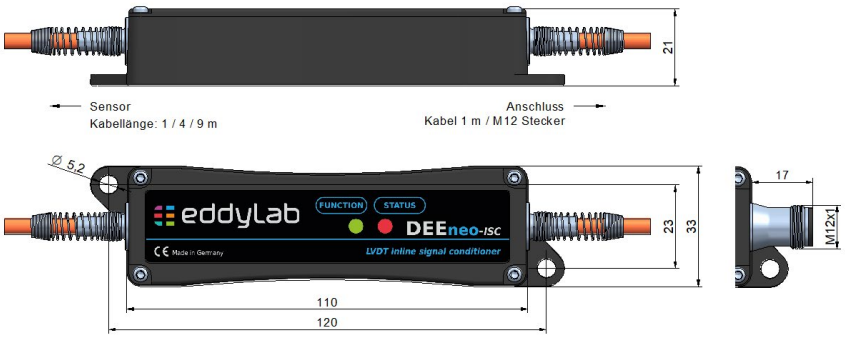




DEENEO-ISC*

Inline Signal Conditioner (cable electronics)





TECHNICAL DATA

ELECTRONICS	DEEneo*	DEEneo-ISC*
Current output signal	configurable in the range -20...+20 mA (e.g. 4...20 mA)	
Voltage output signal	configurable in the range -10...+10 V (e.g. 0...10 V)	
Mounting	on 35 mm DIN rail in accordance with DIN EN 60715	integrated in sensor cable
Power supply	9...36 VDC	
Power consumption	70 mA at 24 VDC, 130 mA at 12 VDC	
Sensor supply	configurable: 0...5 Vrms differential; 1...10 kHz (standard: 3 Vrms / 3.3 kHz)	
Resolution	16 bit	
Signal processing	digital via microcontroller	
Signal adjustment	via SET-button or software	
Linearisation of sensor	yes, optionally possible	
Features		
Switching output	open drain up to 60 V, max. 115 mA	-
Alarm output	open drain up to 60 V, max. 115 mA	-
Cable break detection	configurable (standard: enabled)	

*Separate data sheets for DEEneo and DEEneo-ISC at www.eddylab.com

ACCESSORIES

CONNECTION CABLE (SHIELDED) FOR CONNECTOR OUTPUT

CABLE M12 ANGULAR CONNECTOR	
K4P2M-SW-M12	2 m
K4P5M-SW-M12	5 m
K4P10M-SW-M12	10 m
K4P15M-SW-M12	15 m
K4P20M-SW-M12	20 m
K4P50M-SW-M12	50 m

CABLE M12 WITH STRAIGHT CONNECTOR	
K4P2M-S-M12	2 m
K4P5M-S-M12	5 m
K4P10M-S-M12	10 m
K4P15M-S-M12	15 m
K4P20M-S-M12	20 m
K4P50M-S-M12	50 m



MATING CONNECTOR M12 (SHIELDED)

	STRAIGHT CONNECTOR D4-G-M12-S	ANGULAR CONNECTOR D4-W-M12-S
Protection class	IP67	
Temperature range	-25...+90 °C	
Mode of connection	spring closure construction	
Cable diameter	ø 4...8 mm	
Conductor	0,14...0,34 mm²	



ORDER CODE SENSOR

SM X (a) _ X (b) _ X (c) – **F18** – X (d) X (e) X (f) X (g) . X (h) X (i) X (j)

a measurement ranges [mm]
2 / 5 / 10 / 25 /
50 / 100 / 200

b type
A = free core
S = unguided push rod
SG = guided push rod
T = spring loaded

c cable/ connector
KA = axial cable output
KR = radial cable output
SA = axial connector M12
SR = radial connector M12

d cable / connector output

S1: sensor with connector output
1 = radial connector output M12 (no cable)

S2: sensor with cable output, open cable end for DEEneo
A = TPE cable 2 m
B = TPE cable 5 m
C = TPE cable 10 m
D = PTFE-UL cable 2 m (option H)
E = PTFE-UL cable 5 m (option H)
F = PTFE-UL cable 10 m (option H)

S3: sensor with cable output for DEEneo-ISC
G = TPE cable 2 m
H = TPE cable 5 m
J = TPE cable 10 m
K = PTFE-UL cable 2 m (option H)
L = PTFE-UL cable 5 m (option H)
M = PTFE-UL cable 10 m (option H)

e linearity
1 = 0,30 % (standard)
2 = 0,20 % (option L20)
3 = 0,10 % (option L10)

f temperature range
1 = -40...+120 °C (standard)
2 = -40...+150 °C (option H)
3 = -40...+200 °C (option H200)

g push rod sealing
1 = standard
2 = ventilation hole (option VH)

h protection class
1 = IP67
2 = IP68 (option IP68)

i housing
1 = stainless steel / chrome-plated steel

j spring force
1 = for type „A/S/SG“
2 = standard
3 = HD2.5 (approx. 250g)
4 = HD (approx. 500g)

ORDER CODE ELECTRONICS

DEEneo – X (a)

DEEneo-ISC – X (a) – X (b)

type
DEEneo = external electronics
DEEneo-ISC = inline signal conditioner

a output signal
020A = 0...20 mA
420A = 4...20 mA
10V = 0...10 V
5V = 0...5 V
±5V = -5...5 V
±10V = -10...10 V

b type of cable / length

E1: for sensor with cable output
- = integrated in sensor cable

E2: for sensor with connector output
A = cable 2 m, M12 straight female conn.
B = cable 2 m, M12 angular female conn.
C = cable 5 m, M12 straight female conn.
D = cable 5 m, M12 angular female conn.
E = cable 10 m, M12 straight female conn.
F = cable 10 m, M12 angular female conn.

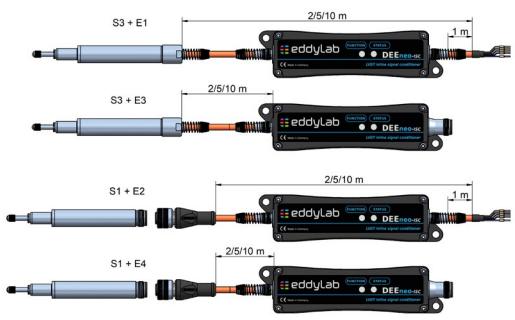
b type of cable / length

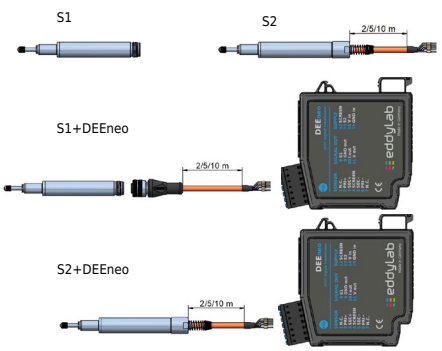
E3: for sensor with cable output
M12 = integrated in sensor cable, M12 connector

E4: for sensor with connector output
M12A = cable 2 m, M12 straight female conn., M12 conn.
M12B = cable 2 m, M12 angular female conn., M12 conn.
M12C = cable 5 m, M12 straight female conn., M12 conn.
M12D = cable 5 m, M12 angular female conn., M12 conn.
M12E = cable 10 m, M12 straight female conn., M12 conn.
M12F = cable 10 m, M12 angular female conn., M12 conn.

possible combinations:

- S3+E1: sensor with cable output, DEEneo-ISC integrated in sensor cable
- S3+E3: sensor with cable output, DEEneo-ISC integrated in sensor cable, M12 connector
- S1+E2: sensor with connector output, DEEneo-ISC with cable K4PxM
- S1+E4: sensor with connector output, DEEneo-ISC with cable K4PxM, M12 connector
- S1+DEEneo: sensor with connector output, cable K4PxM, electronics DEEneo
- S2+DEEneo: sensor with cable output, electronics DEEneo







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