

SM-HYD SERIES | LVDT

Designed for integration into hydraulic and pneumatic cylinders or servo valves.

- Screw flange M18x1,5 / M30x1,5 or plug-in flange Ø18
- Pressure up to 400 bar
- Sensor working temperature up to 150°C
- Linearity up to ± 0.10 %
- Measurement range 2...180 mm



LVDTs (Linear Variable Differential Transformers) are inductive sensors excellent for use in harsh industrial environments, e.g. high temperature and pressure ranges, as well as high accelerations and measuring cycles. The SM-series offers ultimate reliability and precision in a small size, and is designed for industrial- and lab use. The sensors can also be used under water because of their high protection class. IMCA and KAB electronics (explanation see page 5) have a built-in cable breakage monitoring and are entirely galvanically isolated. The signal output is optimized for interference compatibility with very low residual noise. The guarantee for ultimate resolution and measuring accuracy.

The SM-HYD-series are used in hydraulic cylinders with a maximum pressure resistance of up to 400 bar. The sensors are especially suited to be installed in harsh industrial environments where a high electromagnetic tolerance is required. The sensor works nearly unaffected by electric or magnetic fields.

This sensor enables a connection between the hydraulic cylinder and the machine control.



TECHNICAL DATA - SENSORS

SENSOR	
Ranges [mm]	2...180 mm (see chart on page 3)
Linearity [% of FS]	±0.20 % - 0.80 % (see chart on page 3), 0.10 % for selected models
Temperature range	-40...+120 °C, optional up to 150 °C (H-option)
Vibration stability DIN IEC68T2-6	10 G
Shock stability DIN IEC68T2-27	200 G / 2 ms
Connection	4 core cable or M12-connector with coupling nut
cable TPE (standard)	ø 4.5 mm, 0.14 mm ² , non-halogen, suitable for drag chains
PTFE (option H)	ø 4.8 mm, 0.24 mm ² , max. temperature 200 °C, UL-Style 2895
Max. cable length	100 m between sensor and electronics

TECHNICAL DATA - ELECTRONICS

ELECTRONICS	IMCA EXTERNAL ELECTRONICS*	KAB CABLE ELECTRONICS
Output signal	4...20 mA (load < 300 Ohm) 0...5 V, ± 5 V (load > 5 kOhm) 0...10 V, ± 10 V (load > 10 kOhm)	
Temperature coefficient	-0.0055, ±0.002 %/K	
Resolution**	0.04% of FS	
Corner frequency	300 Hz/-3 dB (6-pole Bessel)	
Isolation stability	> 1000 VDC	
Power supply	9...36 VDC	
Current consumption	75 mA at 24 VDC 150 mA at 12 VDC	65 mA at 24 VDC 140 mA at 12 VDC
Sensor supply	3 V _{eff} , 3 kHz (adjustable, 1-18 kHz)	
Working temperature	-40...+85 °C	
Storage temperature	-40...+85 °C	
Housing	polyamide PA6.6, meets UL94-VO	ABS
Mounting	on DIN EN-rail	bore diameter ø 5,5

* built-in

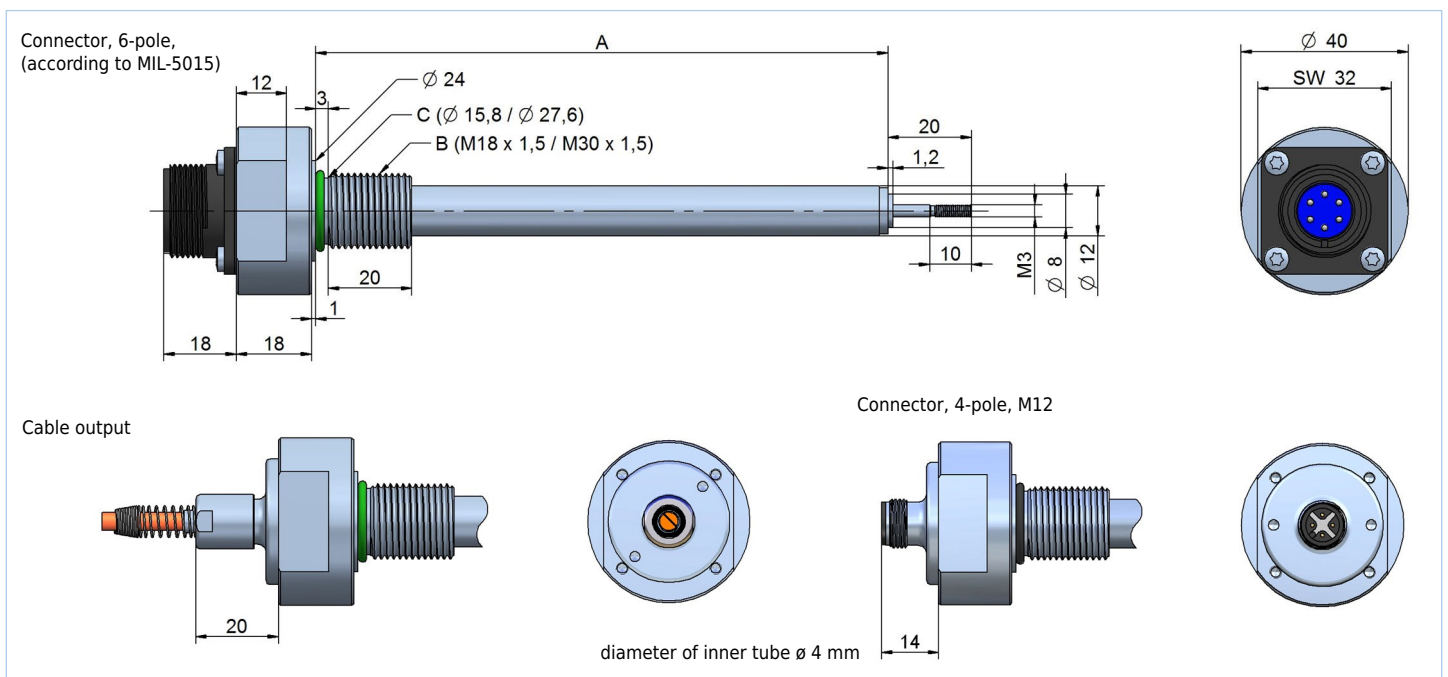
** 98.5% confidence interval (confidence limit)

TECHNICAL DIMENSIONS

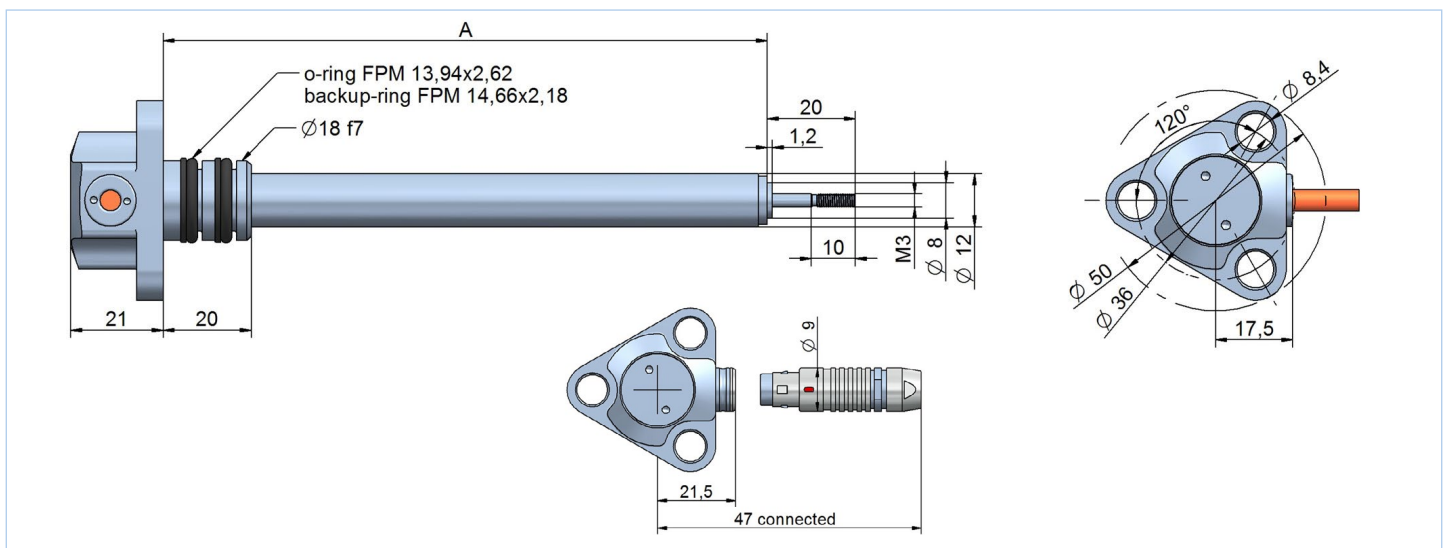
RANGE (FS) [MM]	TYPE	BODY TYPE	BODY LENGTH A [MM]	LINEARITY [%] (STANDARD)	LINEARITY [%] (OPTIONAL)
0...2	SM2-HYD	1	48	0.30	0.20
0...5	SM5-HYD	1	54	0.30	0.20
0...10	SM10-HYD	1	64	0.30	0.20
0...25	SM25-HYD	2	94	0.30	0.20
0...25	SM25-HYD	1	137	0.30	0.20
0...50	SM50-HYD	2	144	0.30	0.20
0...50	SM50-HYD	1	207	0.30	0.20
0...100	SM100-HYD	2	220	0.80	-
0...100	SM100-HYD	1	244	0.30	0.20
0...120	SM120-HYD	1	227	0.80	-
0...140	SM140-HYD	1	260	0.80	-
0...160	SM160-HYD	1	336	0.80	-
0...180	SM180-HYD	1	300	0.80	-

other ranges on request

DIFFERENT OUTPUT TYPES WITH FLANGE TYPE THREAD M18 X 1,5 / M30 X 1,5



PLUG-IN FLANGE WITH RADIAL CABLE OR RADIAL CONNECTOR OUTPUT



INSTALLATION DRAWING

SCREW FLANGE M18 / M30

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

	M18X1,5	M30X1,5
A	M18x1,5	M30x1,5
B	2,4	3,1
C	19,8	32,4
D	26	42

PLUG-IN FLANGE S18

AC-OUTPUT

assignment for TPE-cable:
 white (5): primary 2
 black (6): secondary 2
 brown (9): primary 1
 blue (8): secondary 1

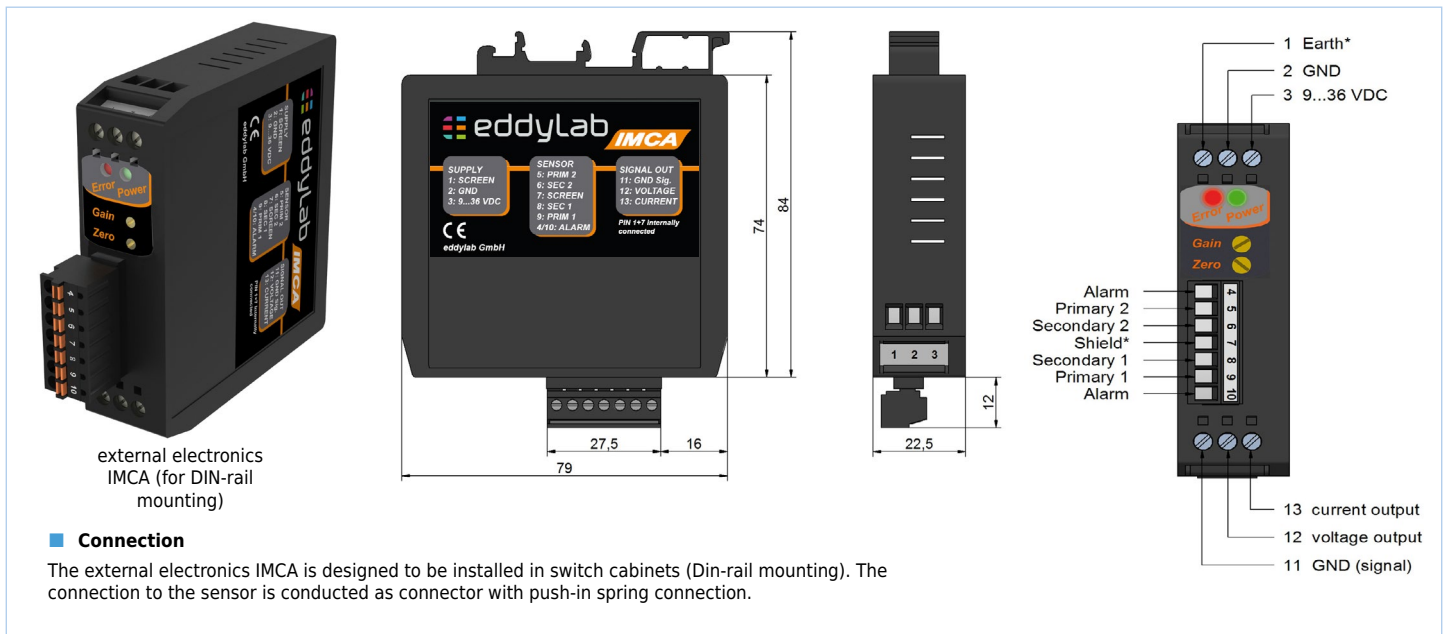
assignment for PTFE-cable:
 white (5): primary 2
 green (6): secondary 2
 yellow (9): primary 1
 brown (8): secondary 1

CABLE ELECTRONICS KAB

FUNCTION	CABLE TPE	CABLE PTFE-UL
V+	brown	yellow
GND	blue	brown
signal	white	white
signal GND	black	green

If not specified otherwise the cable electronics is placed at 1 m from the end of the cable.

EXTERNAL ELECTRONICS IMCA

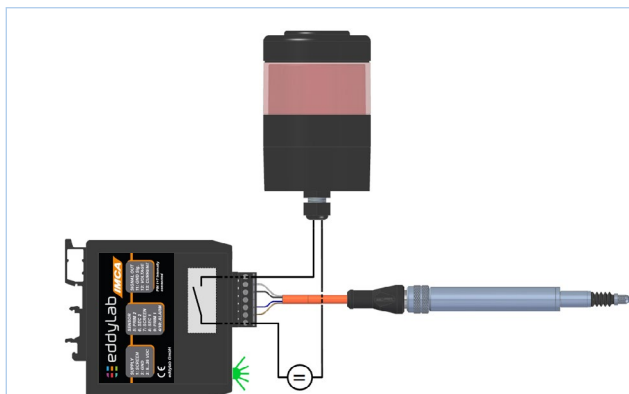


CABLE BREAK DETECTION

The electronics by eddylab feature a built-in cable break detection. This is achieved by an impedance measurement of the LVDT's secondary coil. If the sensor cable is cut, the impedance on the secondary connections of the electronics change regardless of the push rod position, triggering the cable break detection. This feature is based on a broken secondary connection. A partial cable break of the primary connections (cables between primary coil and electronics) will not activate this function. The electronics vary in their functional range. The external electronics IMCA offers the widest range. The cable electronics KAB only visualises a cable break by a red LED.

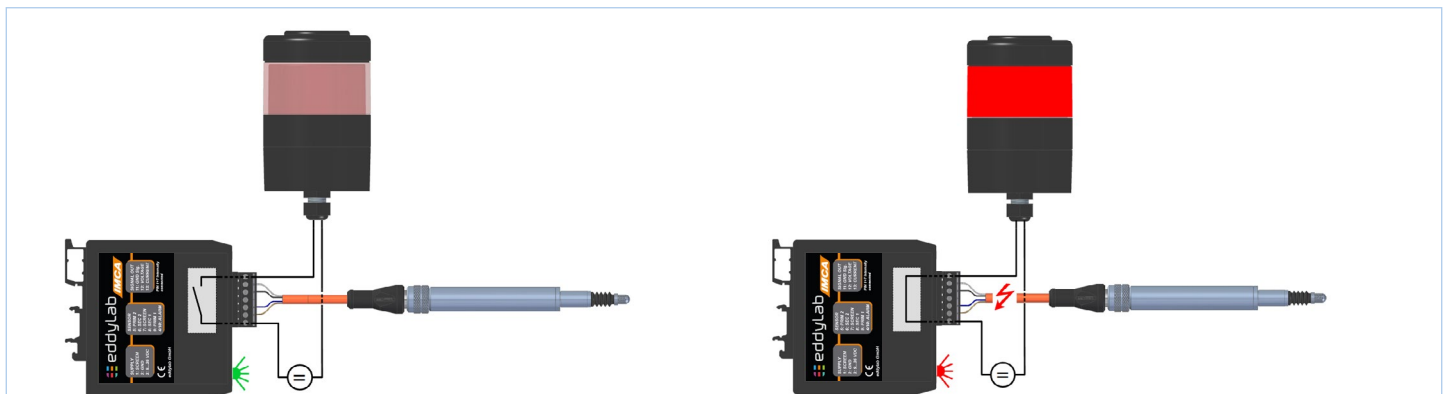
IMCA: For the use of the cable break functions an alarm system (signal lamp, acoustic alarm device) or an alarm input of the PLC must be connected to the 7-pole terminal. The circuit board features a analog switch which is a normally open.

■ NORMAL OPERATION IMCA:



- The green „POWER-LED“ on the front side is on.
- The signal output is active.
- The alarm output is disabled.

■ CABLE BREAK IMCA:



- In case of a cable break the analog switch closes and the alarm system is activated or an electrical signal is conducted. Please note the maximum electrical values: 30 mA or 14 V.
- A front side „ERROR-LED“ flashes in case of an error.
- The signal output is deactivated. There is no current or voltage signal.

■ NORMAL OPERATION KAB:



- The green „POWER-LED“ on the front side is on.

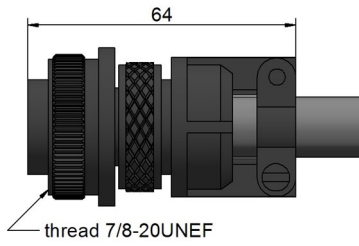
■ CABLE BREAK KAB:



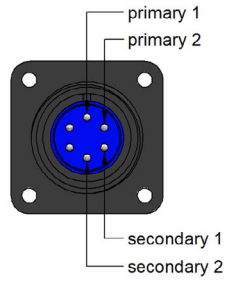
- A front side „ERROR-LED“ flashes in case of an error.

ELECTRICAL CONNECTION

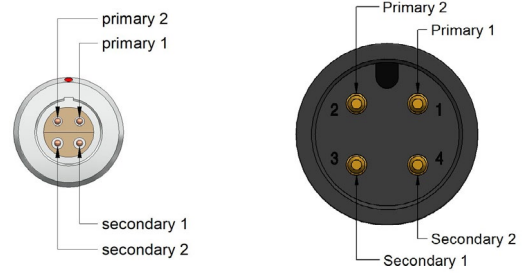
mating connector: AT3106F, according to MIL-5015 (please order separately)



PIN assignment



PIN assignment connector Lemo and M12



ACCESSORIES

CONNECTION CABLE (SHIELDED) FOR CONNECTOR OUTPUT M12

CABLE M12 ANGULAR CONNECTOR		CABLE M12 WITH STRAIGHT CONNECTOR	
K4P2M-SW-M12	2 m	K4P2M-S-M12	2 m
K4P5M-SW-M12	5 m	K4P5M-S-M12	5 m
K4P10M-SW-M12	10 m	K4P10M-S-M12	10 m



MATING CONNECTOR FOR SELF ASSEMBLY (SHIELDED)

	STRAIGHT CONNECTOR D4-G-M12-S M18 / M30 FLANGE	ANGULAR CONNECTOR D4-W-M12-S M18 / M30 FLANGE	STRAIGHT CONNECTOR LEMO-FGG.0T S18 FLANGE
Protection class	IP67		IP68
Temperatur	-25...+90 °C		-40...150 °C
Mode of connection	spring closure construction		soldering contact
Cable diameter	ø 4...8 mm		Ø 4,5...5,0 mm
Conductor	0,14...0,34 mm ²		0,14...0,25 mm ²



ADJUSTMENT OF ZERO POINT AND GAIN

Each sensor, manufactured by eddylab, is basically adjusted and calibrated. You will receive a traceable calibrated measurement equipment, adjusted and tested in the company's own high-end calibration laboratory, and a calibration certificate. Please note: If the zero point or gain is changed the calibration certificate will lose validity. The potentiometers shall be protected by a label against unauthorised access. In some cases, it is necessary to adjust the zero point and gain, e.g. with hydraulic cylinders or reduced measurement ranges. In this case, the output signal can be adapted to the mechanical stroke of the measurement object precisely. Please note that the zero point and gain may shift for long cable length between sensor and electronics. Thus install the sensor with the according cable length to the electronics and then adjust zero point and gain.

- Push rod entirely in - adjust offset.
Move the sensor to the zero point of the measuring range and set the offset potentiometer on 4 mA/0 V for the output signal
- Push rod entirely out - adjust gain.
Move the sensor to the end of the measuring range (push rod moved out) and set the gain potentiometer on 20 mA /10 V/5 V for the output signal.

Running direction of signal: If the push rod is moving into the sensor (e.g. sprung load pushed in), the signal is reducing. If the push rod is moving out, the output signal is increasing. The running direction of the signal can also be inverted.

ORDER CODE SENSOR

SM **X** -HYD- **X** - **X** - **X** **X** **X** **X**

a **b** **c** **d** **e** **f** **g**

a measurement ranges [mm]

2 / 5 / 10 / 25 / 50 / 100
120 / 140 / 160 / 180

b type of flange

18 = thread M18 x 1,5
30 = thread M30 x 1,5
S18 = plug-in flange ø18

c output

S = connector output (MIL-5015 / LEMO)
M12 = connector output (M12)
K = cable output

d cable / connector output

S1: sensor with connector output

1 = connector output

S2: sensor with cable output, open cable end (for IMCA)

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 KAB

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 / 0,80 % (see table page 3)
2 = 0,20 %
3 = 0,10 %

f temperature range

1 = -40...+120 °C (standard)
2 = -40...+150 °C (option H)

g housing

1 = standard body length
2 = short body length

ORDER CODE ELECTRONICS

IMCA - 24V - **X**

a

KAB - 24V - **X** - **X**

a **b**

type

IMCA = external electronics
KAB = cable electronics

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 KAB: type of cable / length

E1: for sensor with cable output

- = KAB 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 KAB: type of cable / length

E3: for sensor with cable output

M12 = KAB 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, KAB integrated in sensor cable
- S3+E3: sensor with cable output, KAB integrated in sensor cable, M12 connector
- S1+E2: sensor with connector output, cable electronics with cable K4PxM
- S1+E4: sensor with connector output, cable electronics with cable K4PxM, M12 connector

- IMCA: sensor with connector output (S1), cable K4PxM, external electronics IMCA
- IMCA: sensor with cable output (S2), external electronics IMCA

