

LVDT

Inductive Position Transducer - Hydraulic Series



SM-HYD Hydraulic Series

Key-Features:

- Screw flange M18x1,5 / M30x1,5 or plug-in flange Ø18
- Pressure up to 400 bar
- Measurement range 2...180 mm
- Linearity up to $\pm 0.10\%$
- Protection class IP67
- Sensor working temperature up to 150°C
- High EMC-grade
- Customized versions available

Content:

DESCRIPTION

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 SM series is also available as a pressurized hydraulic model to 400 bar for installation directly in hydraulic cylinders (See data sheet SM-HYD and SM-F18). As of 2013 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 sensors are used in hydraulic cylinders with a maximum pressure resistance of up to 400 bar. They are especially suited to be employed 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

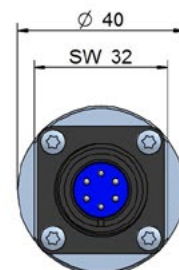
Sensor	
Ranges [mm]	2...180 mm (see chart on page 3)
Linearity [% of FS]	±0.20 % - 0.80 % (see chart on page 3), 0.10 % for selected models
Temperature range	-40...+120 °C, optional up to 150 °C (H-option)
Vibration stability DIN IEC68T2-6	10 G
Shock stability DIN IEC68T2-27	200 G / 2 ms
Connection	4 core cable or M12-connector with coupling nut
cable TPE (standard)	ø 4.5 mm, 0.14 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

Electronics	IMCA external electronics (built-in)	KAB cable electronics
Output signal	0...20 mA, 4...20 mA (load < 300 Ohm) 0...5 V, ± 5 V (load > 5 kOhm) 0...10 V, ± 10 V (load > 10 kOhm)	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	-0,0055, ±0,002 %/K
Resolution*	0,04 % FS	0,04 % FS
Corner frequency	300 Hz/-3 dB (6-pole Bessel)	300 Hz/-3 dB (6-pole Bessel)
Isolation stability	> 1000 VDC	> 1000 VDC
Power supply	9...36 VDC	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)	3 V _{eff} , 3 kHz (adjustable, 1-18 kHz)
Working temperature	-40...+85 °C	-40...+85 °C
Storage temperature	-40...+85 °C	-40...+85 °C
Housing	polyamide PA6.6, meets UL94-VO	aluminium
Mounting	on DIN EN-rail	-

* 98.5% confidence interval (confidence limit)

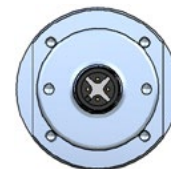
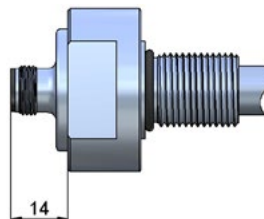
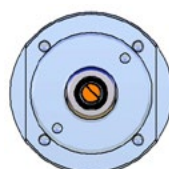
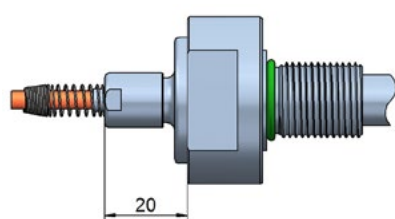
other ranges on request

Connector, 6-pole,
(according to MIL-5015)



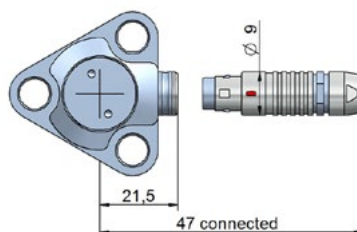
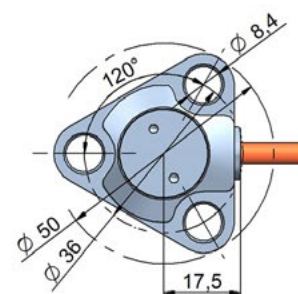
Cable output

Connector, 4-pole, M12



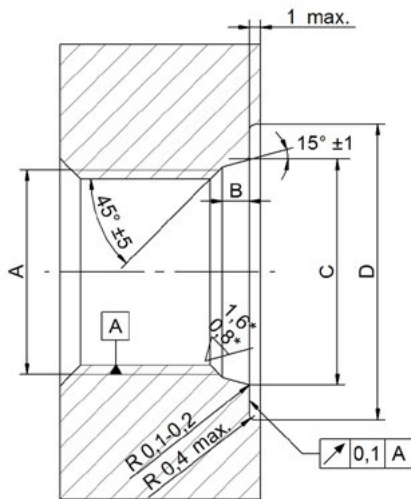
diameter of inner tube \varnothing 4 mm

Technical drawing of a hydraulic cylinder assembly. The main view shows a side profile with dimensions: total length A, mounting bracket width 21, bracket to seal distance 20, seal dimensions (o-ring FPM 13,94x2,62; backup-ring FPM 14,66x2,18; Ø18 f7), rod diameter Ø18, rod end thread M3, rod end diameter Ø8, and rod end length 10. An inset shows a top view of the mounting bracket with three holes and a width of 21,5. Another inset shows a detail of the rod end with a diameter of Ø9 and a length of 47 connected.



INSTALLATION DRAWING

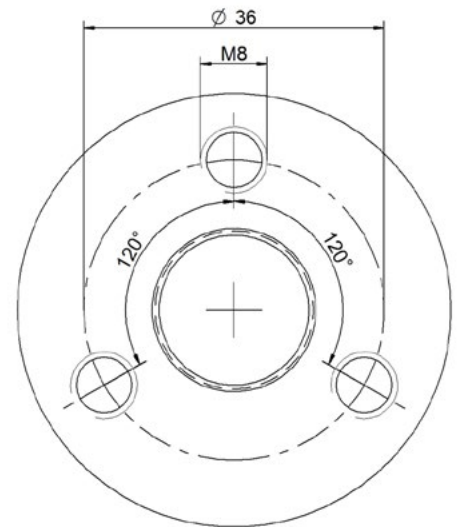
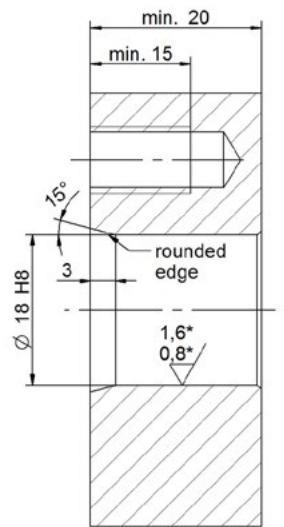
flange with thread M30



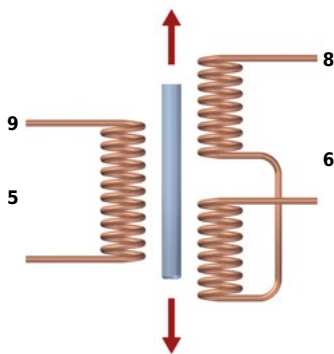
* note: Rz = 1,6 for non pulsating pressure
Rz = 0,8 for pulsating pressure

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

for plug-in flange S18



AC-OUTPUT



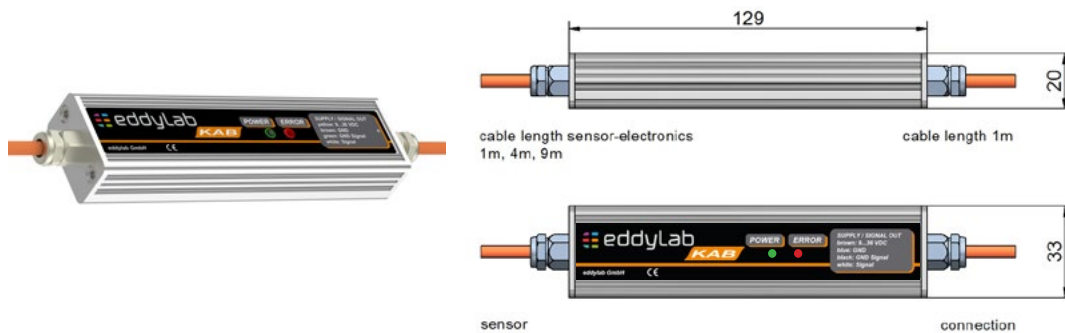
assignment for TPE-cable:

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



assignment for TPE-cable:

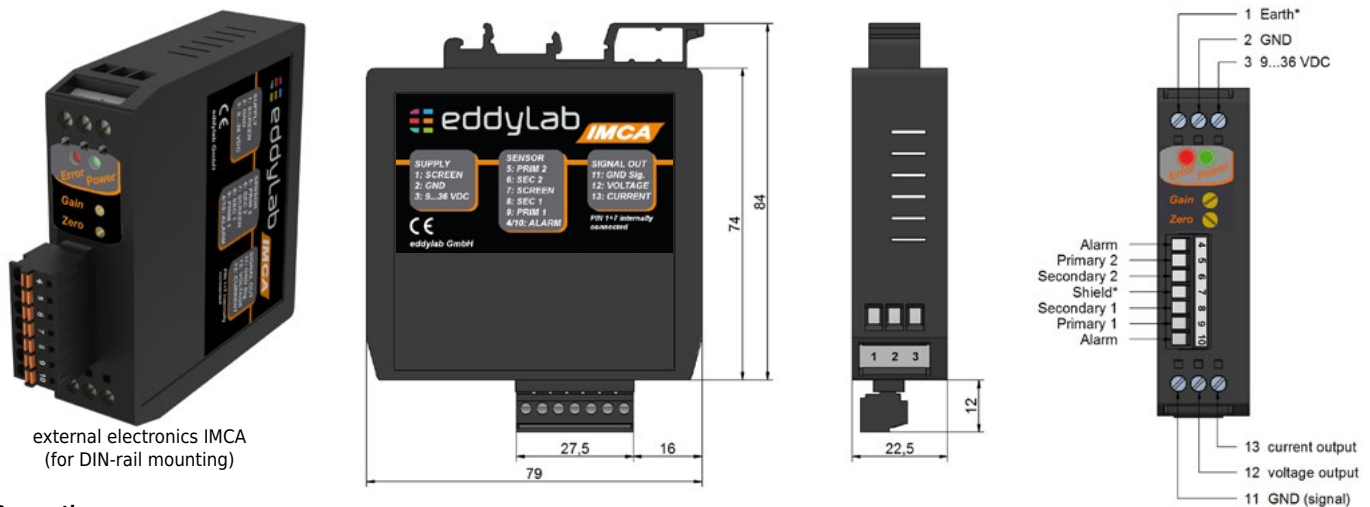
brown: supply V+
blue: GND
black: output GND
white: output signal

assignment for PTFE-cable:

yellow: supply V+
brown: GND
green: output GND
white: output signal

The standard position of the cable electronics is 1 m away from the end of the cable, independent of the total cable length. On request the cable electronics can be placed at a different position.

EXTERNAL ELECTRONICS IMCA



Connection

The external electronics IMCA is designed to be installed in switch cabinets (Din-rail mounting). The connection to the sensor is conducted as connector with push-in spring connection.

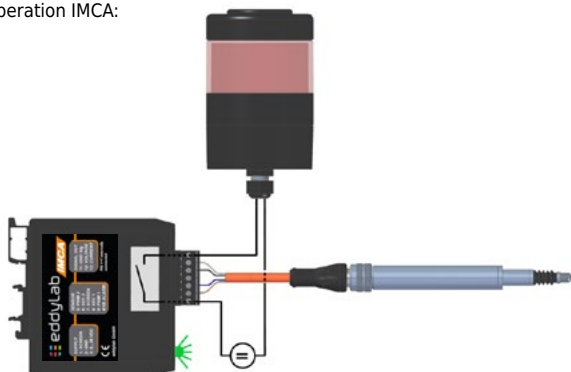
* Terminals 1 and 7 are internally connected.

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.

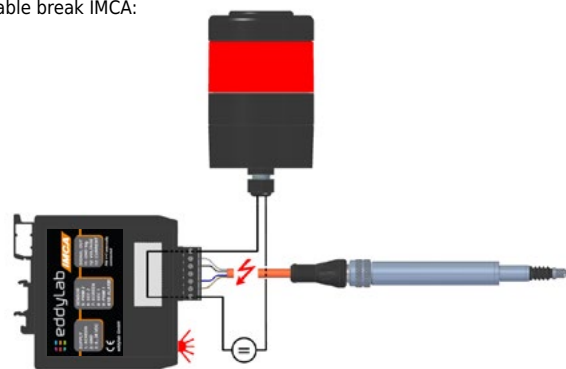
IMCA: For the use of the cable break functions an alarm system (signal lamp, acoustic alarm device) or an alarm input of the PLC must be connected to the 7-pole terminal. The circuit board features a analog switch which is a normally open.

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.

CABLE BREAK DETECTION

Normal operation KAB:



- The green „POWER-LED“ is on.

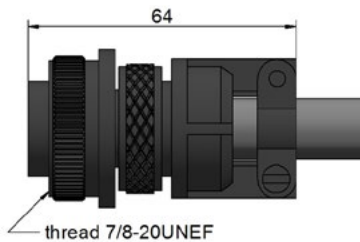
Cable break KAB:



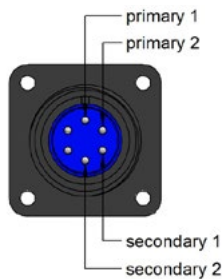
- The red „ERROR-LED“ is on.

ELECTRICAL CONNECTION & CABLE

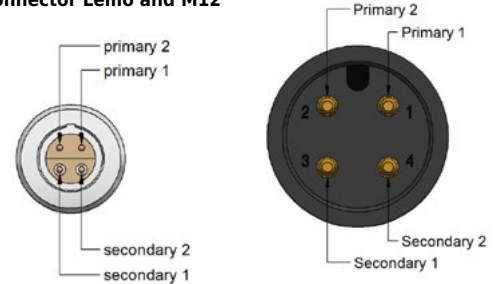
mating connector: AT3106F, according to MIL-5015 (please order separately)



PIN assignment



PIN assignment connector Lemo and M12



Connection cable (shielded) for connector output

Cable M12 with straight connector

K4P2M-S-M12	2 m
K4P5M-S-M12	5 m
K4P10M-S-M12	10 m

Cable M12 with angular connector

K4P2M-SW-M12	2 m
K4P5M-SW-M12	5 m
K4P10M-SW-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
Temperature range	-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

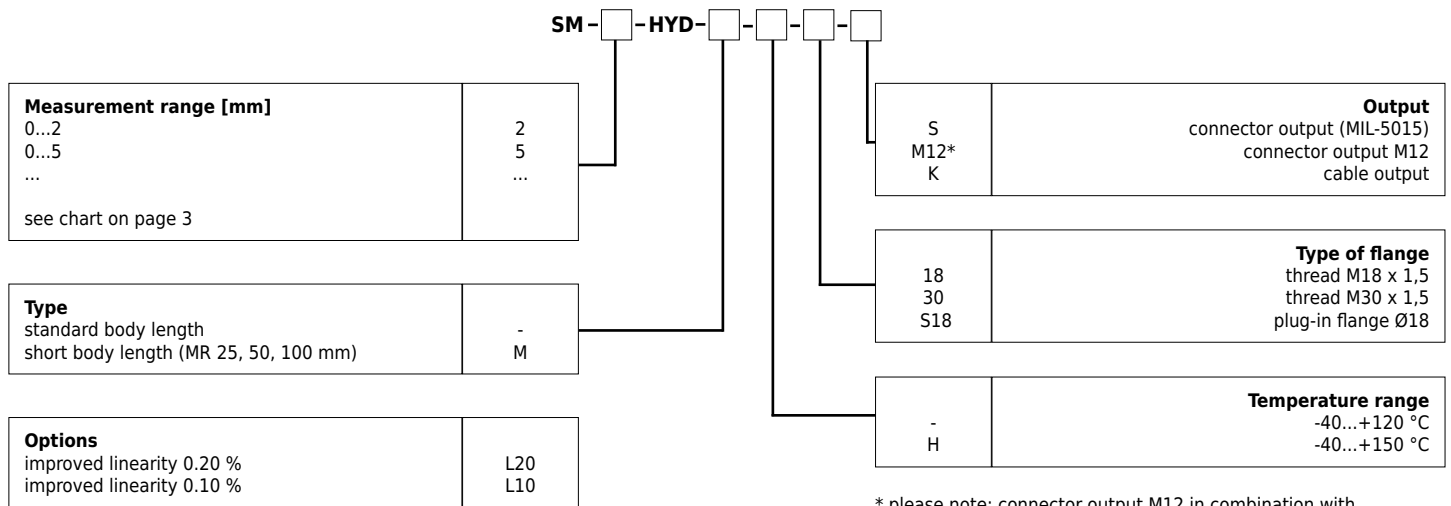
Please note that the zero point and gain may shift for long cable length between sensor and electronics. Thus install the sensor with the according cable length to the electronics and then adjust zero point and gain.

1. 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.
2. 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.

Signal inversion:

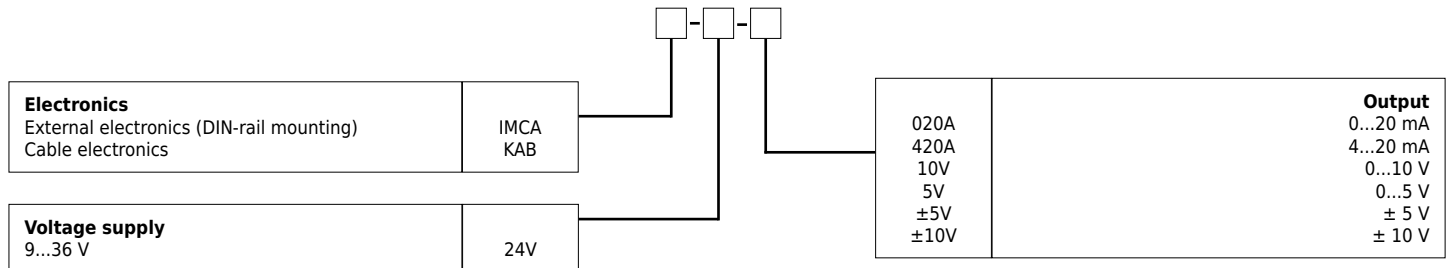
If an inverted output signal is required (20...4 mA /10...0 V/5...0 V), swap clamps 6 and 8 (secondary coil) on the external electronics.

ORDER CODE SENSOR



* please note: connector output M12 in combination with cable electronics KAB: a connection cable K4P... is necessary.

ORDER CODE ELECTRONICS



SM2-HYD	0...2 mm
SM5-HYD	0...5 mm
SM10-HYD	0...10 mm
SM25-HYD / SM25-HYD-M	0...25 mm
SM50-HYD / SM50-HYD-M	0...50 mm
SM100-HYD / SM100-HYD-M	0...100 mm
SM120-HYD	0...120 mm
SM140-HYD	0...140 mm
SM160-HYD	0...160 mm
SM180-HYD	0...180 mm

Connection cable with M12 connector

K4P2M-S-M12	2 m, straight connector
K4P5M-S-M12	5 m, straight connector
K4P10M-S-M12	10 m, straight connector
K4P2M-SW-M12	2 m, angular connector
K4P5M-SW-M12	5 m, angular connector
K4P10M-SW-M12	10 m, angular connector

Additional cable (2 m length is standard)

Kabel-TPE	order code for 1 meter of additional TPE cable
Kabel-PTFE-UL	order code for 1 meter of additional PTFE cable

Mating connector (for self assembly)

D4-G-M12-S	straight, M12, shielded
D4-W-M12-S	angular, M12, shielded
Lemo-FGG.0T	straight
AT3106F	



Subject to change without prior notice.