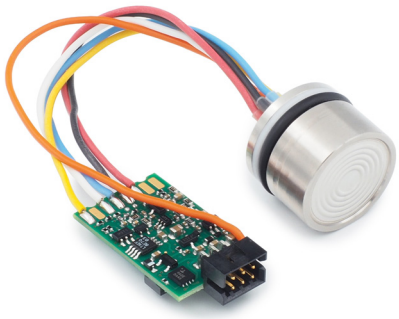
Series 10LX / 10LHPX

Custom piezoresistive OEM pressure transmitter



Features

- Highest accuracy / precision up to 0,01 %FS
- RS485 interface can be combined with analog output
- Highest long-term stability
- Front-flush diaphragm welded with no gaps

Technology

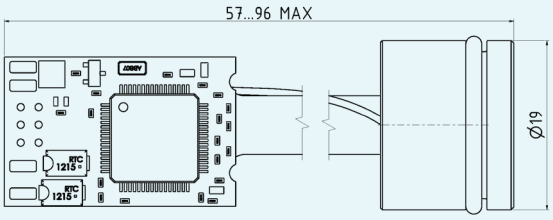
- Insulated and encapsulated piezoresistive pressure sensor
- High-quality OEM pressure transmitters and tried-and-tested mathematical compensation
- Ideal for mounting with O-ring

Typical applications

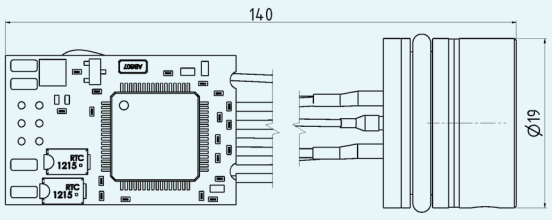
- OEM
- Industrial applications
- Laboratory use
- Oceanology

Accuracy
± 0,05 %FS
Total Error Band
± 0,1 %FS @ -10…80 °C
Pressure ranges
0…0,3 to 0…1000 bar

10LX ≤ 200 bar



10LHPX > 200 bar



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Series 10LX / 10LHPX – specifications

Standard pressure ranges

Relative pressure PR	Relative pressure PR	Proof pressure
0…0,3	-0,3…0,3	3
0…1	-1…1	
0…3	-1…3	9
0…6	-1…6	18
0…10	-1…10	30
0…16	-1…16	48
0…30	-1…30	90
bar rel.		bar
Reference pressure at atmospheric pressure		Based on reference pressure

All intermediate ranges for the analog interface can be ranged (turn-down) from the standard ranges without surcharge.
Smallest range: 0,1 bar. Negative and further +/- ranges also possible.
Optional: Adjust directly to intermediate ranges.

Absolute pressure PAA	Absolute pressure PA	Proof pressure
0,8…1,2		3
0…1	0…1	
0…3	0…3	9
0…6	0…6	18
0…10	0…10	30
0…16	0…16	48
0…30	0…30	90
0…60	0…60	180
0…100	0…100	300
0…300	0…300	600
0…700	0…700	1100
0…1000	0…1000	1100
bar abs.	bar	bar
Reference pressure at 0 bar abs. (vacuum)	Reference pressure at 1 bar abs.	Based on reference pressure

Performance

Pressure

Digital non-linearity	≤ ± 0,02 %FS	Best fit straight line (BFSL)
Accuracy @ RT (20…25 °C)	≤ ± 0,05 %FS	Non-linearity (best fit straight line, BFSL), pressure hysteresis, non-repeatability, zero point deviation and amplification deviation
Total Error Band (-10…80 °C)	≤ ± 0,1 %FS	Maximum deviation within the specified pressure and temperature range Experience shows that, outside the compensated temperature range, the total error band in the ambient temperature range is expanded by 0,1 %FS
Compensated temperature range	-10…80 °C	Other temperature ranges between -40…125 °C are possible as an option
Analog interface additional deviation	≤ ± 0,05 %FS	Based on accuracy @ RT and the total error band
Long-term stability	Typ. ± 0,05 %FS	Per year under reference conditions
	Max. ± 0,10 %FS	
Position dependency	≤ ± 2 mbar	Calibrated in vertical installation position with pressure connection facing downwards
Resolution	0,0005 %FS	Digital
Signal stability	0,0025 %FS	Digital, noise-free
Internal measurement rate	≥ 1800 Hz	For version «3-wire + digital (0…10 V, 0…5 V)» > 6000 Hz
Pressure range reserve	± 10 %	Outside the pressure range reserve, +Inf / -Inf is displayed If there is an error in the device, NaN is displayed
Vacuum resistance	For operating pressures ≤ 0,1 bar abs., a vacuum-optimised version is recommended	
Note	For pressure ranges < 1 bar, all data apply with reference to a full-range signal (FS) of 1 bar The specifications listed can only be guaranteed if the installation recommendations have been abided by	

Temperature

Accuracy	≤ ± 2 °C	The temperature is measured on the pressure sensor (silicon chip) that sits behind the metallic separating diaphragm The data applies within the compensated temperature range
Resolution	≤ 0,01 °C	
Internal measurement rate	> 10 Hz	

Series 10LX / 10LHPX – specifications

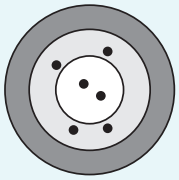
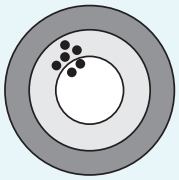
Increased Precision

If customers choose, KELLER can achieve the highest degree of reproducibility (precision) for certain products by increasing the amount of measurement work it undertakes and selecting corresponding pressure transducers. The specifications for increased precision only refer to the digital interface RS485. See the more comprehensive descriptions below for more details.

Limitations:

- Only for absolute pressure PAA/PA
- Only for standard pressure ranges ≥10 bar
- Analog output 4…20 mA excluded

Precision @ RT (10…40°C)	≤ ± 0,01 %FS	With KELLER calibration certificate ex works
	≤ ± 0,025 %FS	

	Accuracy ± 0,05 %FS, with KELLER calibration certificate ex works (standard) Keller uses pressure sources to calibrate its products that are at least four times more accurate than the product to be tested. This enables us to produce products in our factory with an absolute accuracy of up to ± 0,05 %FS.
	Precision ± 0.01 %FS / 0.025 %FS, with KELLER calibration certificate ex works Additional measurement work and selection of a specific pressure transducer means that optimum repeatability is guaranteed for selected pressure transmitters and digital manometers. Owing to the residual measurement uncertainty of the pressure sources used at its factory, KELLER cannot provide any verification of measurement accuracy at scales below ± 0,05 %FS for these ultra-precise devices. KELLER therefore uses the term "precision" to denote the ability of a pressure transmitter or manometer to repeat measured values within a tolerance of 0,01 %FS based on the pressure sources used at the factory.

Electrical data

Connectivity	Digital	2-wire + digital	3-wire + digital		
Analog interface	None	4…20 mA	0…10 V	0…5 V	0,1…2,5 V
Digital interface	RS485	RS485	RS485	RS485	RS485
Voltage supply	3,2…32 VDC	8…32 VDC	13…32 VDC	8…32 VDC	3,2…32 VDC
Power consumption (without communication)	< 8 mA	3,5…22,5 mA	< 8 mA	< 8 mA	< 8 mA
RS485 voltage insulation	± 32 VDC	± 18 VDC	± 32 VDC	± 32 VDC	± 32 VDC
Note	Disturbance of the 4...20 mA signal occurs during communication via the digital interface 3-wire types are designed for simultaneously operating analog and digital interfaces				

Start-up time (power supply ON)	< 250 ms
Overvoltage protection and reverse polarity protection	± 32 VDC
GND case isolation	> 10 MΩ @ 300 VDC

Analog interface

Load resistance	< (U - 8 V) / 25 mA	2-wire
	> 5 kΩ	3-wire
Limiting frequency	≥ 300 Hz	2-wire
		3-wire (0,1…2,5 V)
	≥ 1000 Hz	3-wire (0…10 V, 0…5 V)
Note	Filter properties can be adjusted by the customer	

Series 10LX / 10LHPX – specifications

Digital interface

Type	RS485	Half-duplex
Communication protocols	Modbus RTU	
	KELLER bus protocol	Proprietary
Identification	Class.Group: 5.24	Standard settings: bus address 1, baud rate 9600 bit/s. Other default settings available on request Can be reconfigured via software by the customer later
Pressure unit	Bar	
Unit of temperature	°C	
Data type	Float32 and Int32	
Baud rates	9600 and 115,200 bit/s	
Cable lengths	Up to 1,2 km	

Electrical connection

Standard	Through-hole technology	6 x ø 0,8 mm
Plug type	Molex angled	6-pin
	Molex straight	6-pin
Cable	Wires	On request

Mechanical data

Materials in contact with media

Housing and separating diaphragm	Stainless steel AISI 316L	Others on request
O-ring	FKM (75 Shore, -20…200 °C) ø 15,6 mm x 1,78 mm	Others on request

Other materials

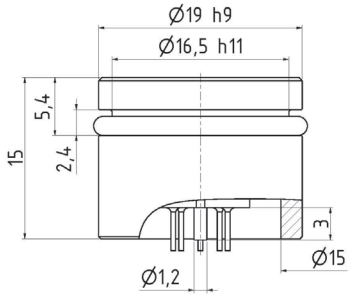
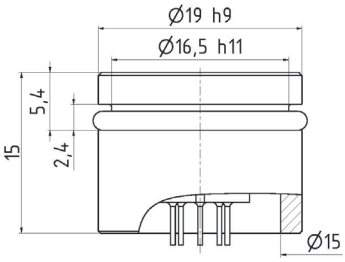
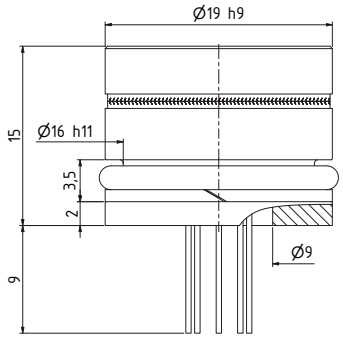
Pressure transducer oil filling	Silicone oil	Others on request

Environmental conditions

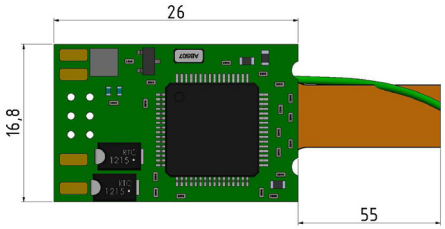
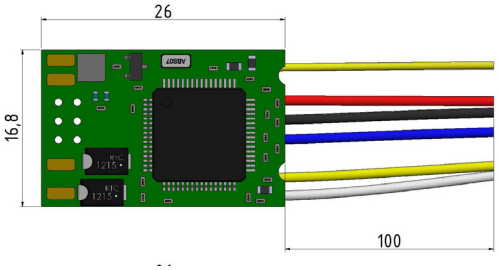
Medium temperature range	-20…125 °C	Optional: -55...150 °C	Icing not permitted
Ambient temperature range	-20…85 °C		
Storage temperature range	-20…85 °C		
Vibration resistance	10 g, 10…2000 Hz, ± 10 mm	IEC 60068-2-6	
Shock resistance	50 g, 11 ms	IEC 60068-2-27	
Load cycles @ RT (20…25 °C)	> 10 million pressure cycles	0…100 %FS	

Series 10LX / 10LHPX – Dimensions and options

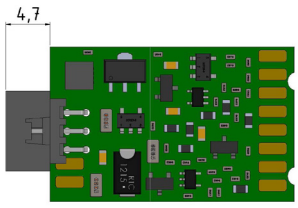
Overview of versions

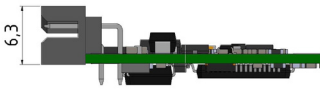
PR-10LX	PA-10LX / PAA-10LX	PA-10LHPX / PAA-10LHPX
		

Electrical contacts – Electronics to pressure transducer

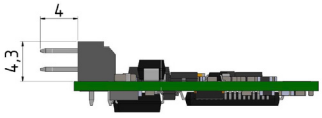
PCB - Flexprint	PCB - Wires
	

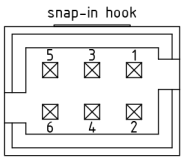
Electrical connections



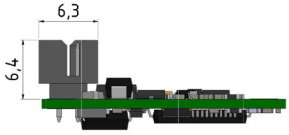


Molex type 87760-0616, 2 mm pitch

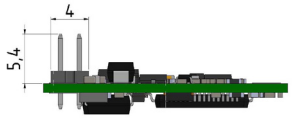


Molex type 87833-0631, 2 mm pitch	Digital		2-wire		3-wire	
			4…20 mA		0…max. 10 V	
	1	Do not connect	1	Do not connect	1	+OUT
	2	Do not connect	2	Do not connect	2	GND
	3	+Vs	3	+Vs	3	+Vs
	4	GND	4	OUT/GND	4	GND
	5	RS485B	5	RS485B	5	RS485B
	6	RS485A	6	RS485A	6	RS485A

Molex type 87831-0641, 2 mm pitch



Molex type 87758-0616, 2 mm pitch



Series 10LX/10LHPX – dimensions and options

Other customer-specific options

- Other compensated pressure ranges
- Other compensated temperature ranges between -40…125 °C
- Parts that come into contact with media made from Hastelloy C-276 or titanium
- Other oil filling types for pressure transducers: e.g. special oils for oxygen applications
- Vacuum-optimised version for operating pressures ≤ 0,1 bar abs.
- Integration of application-specific calculations
- Modifications to customer-specific applications

Examples of related products

- Series 10LXi: OEM pressure transmitters with TTL-UART or I2C or SDI-12 interface
- Series 10LXc: OEM pressure transmitters with CANopen interface
- Series 33X: Pressure transmitters based on series 10LX OEM pressure transmitters
- Series 10L/10LHP: OEM pressure transducers without compensation electronics

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Series 10LX / 10LHPX – software, scope of delivery and accessories

Modbus interface

The X-line products have a digital interface (RS485 half-duplex), which supports the MODBUS RTU and KELLER bus protocols. Details of the communication protocols can be found at www.keller-druck.com. Documentation, a Dynamic Link Library (DLL) and various programming examples are available for integrating the communication protocol into your own software.

Interface converters

The connection to a computer is established via an RS485-USB interface converter To ensure smooth operation, we recommend the K-114 with the corresponding mating plug, robust driver module, fast RX/TX switching and connectable bias and terminating resistors.

"CCS30" software

The licence-free software CCS30 is used to carry out configurations and record measured values.

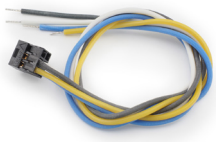
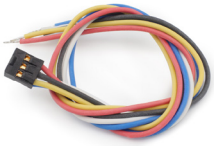
Record of measured values
- Live visualisation
- Adjustable measuring and storage interval
- Export function
- Parallel recording in bus operation
- Up to 100 measured values per second

Configuration
- Call up of information (pressure and temperature range, software version, serial number etc.)
- Readjustment of zero point and amplification
- Rescaling of analog output (unit, pressure range)
- Adjustment of low-pass filter
- Selection of instrument address and baud rate

Scope of delivery

KELLER test report


Accessories

Interface converter	Mating plug	Mating plug
		
K-114 • Analog measurement 0…10 V and 4…20 mA • 12 V measuring device supply via USB • USB interface galvanically isolated • Bias and terminating resistors can be activated	Molex, 6p, 4 wires, 200 mm • Compatible with digital and 2-wire • Product number 600510.0143	Molex, 6p, 5 wires, 200 mm • Compatible with 3-wire • Product number 600510.0144