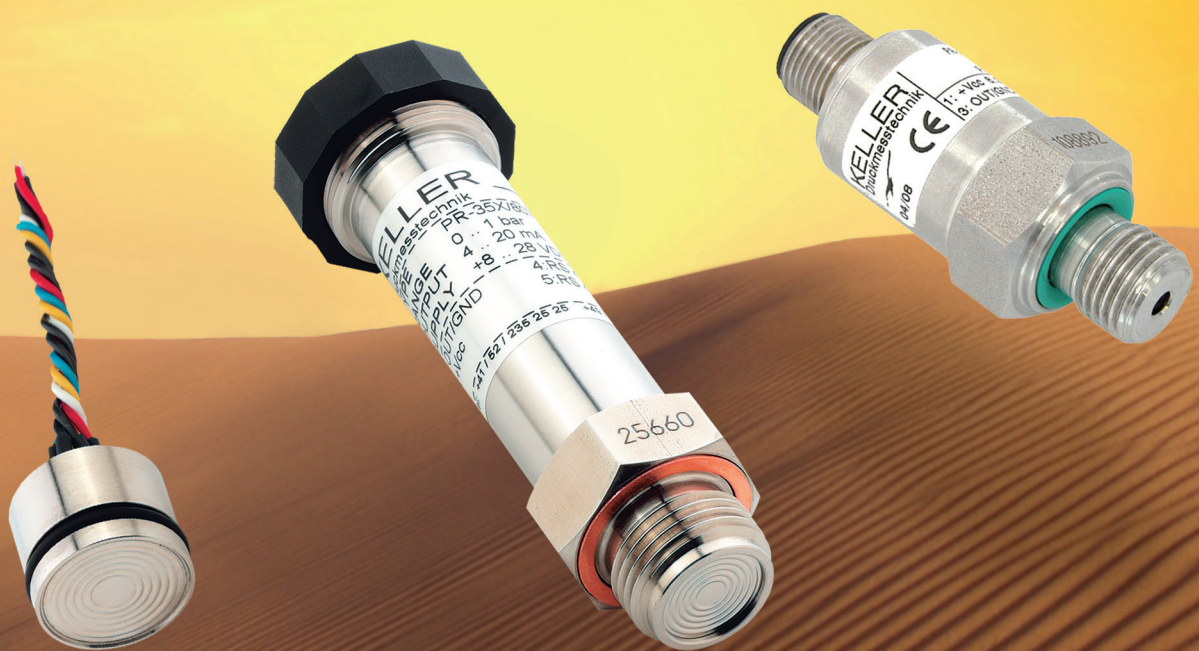


Pressure Transmitters and Pressure Transducers



Product Lines at a Glance

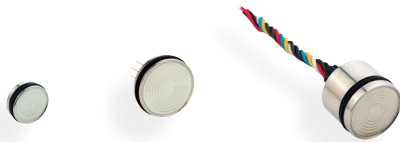
MathMod Compensation: Mathematical modelling of the sensor characteristics allows for accurate compensation and results in a standardized output signal. Depending on the complexity of the modelling or the compensation algorithms, this is practically free of temperature influences and linearity errors.

CiO-Technology: In chip-in-oil technology, the signal conditioning chip is housed with the pressure sensing chip inside the oil-filled housing. As there are no external electronics, more compact constructions are possible, and the products are extremely robust against environmental influences such as moisture, vibrations, shock and EMC.

	Accuracy	Speed	Temperature Range	MathMod Compensation	Direct Analog Signal Path	CiO-Technology	Low Power	ATEX / IECEx	Digital Interface	Analog Interface
X-Line The flagship in terms of precision, this line stands out thanks to its high level of accuracy achieved by the elaborate digital compensation of the sensor characteristics, as well as the wide range of digital and analog interfaces.	● ● ●	●	● ●	✓			optional	✓	RS485 SDI-12 CAN	4...20 mA 0...10 V 0...5 V 0...2,5 V 0,1...2,5 V
Y-Line The classic analog industrial transmitter with a very low temperature error. The temperature compensation allows for an accuracy specification as the overall error band across a defined temperature range.	● ●	● ●	● ●	✓	✓			✓		4...20 mA 0...10 V 0...5 V 0,5...4,5 V
C-Line This one-chip solution for signal processing serves as a supplement to the Y-Line and covers ratiometric applications. It can be operated up to an extraordinary 150 °C and stands out in general thanks to its robustness against environmental influences.	● ●	● ●	● ● ●	✓		✓				0,5...4,5 V ratiom.
D-Line Probably the world's smallest pressure transmitters; with their I ² C interface, these are excellent for simple integration in microcontroller-based systems. The low-power optimised design lends itself well to battery-operated devices.	● ●	●	● ●	✓		✓	✓	✓	I ² C	
HB-Line (High Bandwidth) The hybrid wiring concept, which combines the accuracy of digital compensation with the high bandwidth of a direct analog signal path, was developed for highly dynamic applications and is paired with correspondingly highly reactive sensors.	● ●	● ● ●	● ● ●	✓	✓					0...10 V
Laser-Line (22 M/S) Pure amplifier circuits with laser-adjustable resistors are suitable for high-volume jobs with reduced accuracy requirements and allow for customer-specific analog solutions thanks to the high degree of design flexibility.	●	● ●	● ●		✓					4...20 mA 0,5...4,5 V ratiom.
Pressure transducers (basis of all lines) In contrast to pressure transmitters, pressure transducers do not contain active signal processing. The signals from the measurement bridge are provided directly to the user, and there are only minor limitations in terms of bandwidth and resolution. A calibration certificate indicates the sensor characteristics and the possibility of compensation with resistors.	to be defined	● ● ●	● ● ●	optional (CaliCard)	✓					Semi-open Wheatstone bridge

● ● ● excellent ● ● good ● adequate

Piezoresistive Pressure Transducers



Pressure transducers with laser-welded stainless-steel diaphragm
Series 3 L to 9 L – compact designs $\varnothing$ 9,5 to 19 mm
Series 10 L – “the original” $\varnothing$ 19 x 15 mm

- ♦ Pressure ranges from -1 to 1000 bar
- ♦ Absolute, relative and differential pressure
- ♦ Signal output typ. 200 mV @ 1 mA supply
- ♦ Individual calibration certificate (including compensation values)

- ♦ Very high long-term stability
- ♦ Temperature ranges from -55 to 150 °C
- ♦ Integrated temperature sensor (top of bridge)
- ♦ Housing optionally made from Hastelloy® and Titanium
- ♦ Mathematical modelling on customer request



Pressure transducers for high pressure

Series 6 L HP / 7 L HP / 8

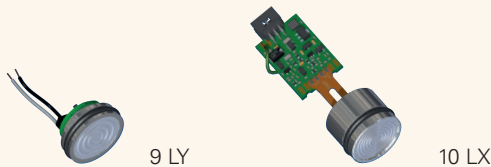
Series 7 LI – Inconel™ up to 200 °C

- ♦ Pressure ranges from 200 to 1500 bar
- ♦ Absolute pressure
- ♦ Signal output typ. 200 mV @ 1 mA supply
- ♦ Individual calibration certificate (including compensation values)

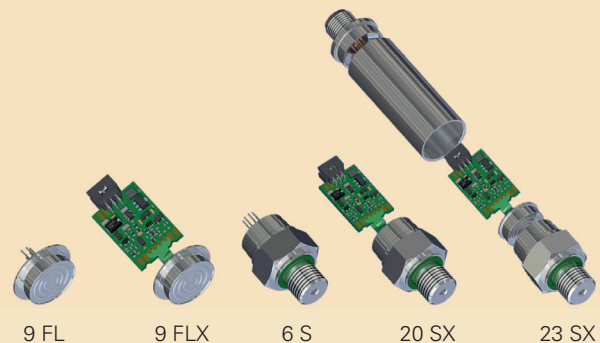
- ♦ Very high long-term stability
- ♦ Robust and corrosion-resistant
- ♦ Optionally available with integrated PT1000 temperature sensor
- ♦ Also available as a screw-mounted housing with metallic seal
- ♦ Mathematical modelling on customer request

OEM Pressure Transmitters

OEM pressure transmitters are built to various levels of completion to meet customer's integration needs: these unique products can thus be supplemented with electronics and calibrations, for example.



Housing components such as pressure connections can be made on customer request thanks to the high degree of vertical integration.



Every mechanical expansion stage of a complete pressure transmitter can become a sales product (see exploded view).

Calibration

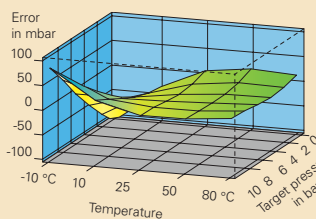
PA-10L/20 BAR/81838.3 ⁽¹⁾ SN E133755 ⁽²⁾										134
(3) Temp [°C]		(4) Zero [mV]		(5) Comp [mV]		(7) dZero [mV]				
-9.8	0.0	-2.6	0.4	0.2		0.2				
-0.6	0.1	-2.6	0.4	0.1						
21.8	0.2	-2.8	0.2	0.0						
49.4	0.5	-2.9	0.0	-0.2						
79.6	0.8	-3.2	-0.2	-0.4						L1
COMP	R1	1000 kOhm	R4	12.0 Ohm	(8)					
RB		3465 Ohm								
ZERO		0.2 mV	P _{atm}	965 mbar	(9)					
SENS		8.43 mV/bar	at 1.000 mA	(10)						
(12) [bar]	(13) [mV]	(14) Lnorm [%FS]	(15) Lbfs [%FS]							
0.000	0.0	0.00	-0.11							
5.000	42.4	0.14	0.07							
10.000	84.5	0.15	0.11							
15.000	126.5	0.04	0.04							
20.000	168.3	-0.15	-0.11							
Long Term Stability Ok ⁽¹⁸⁾										
Lot 70590 ⁽¹⁷⁾										
Test 500 Volt ok ⁽¹⁶⁾										
Supply 1.000 mA ⁽¹⁵⁾										
20.06.15 ⁽²⁰⁾ PH02.A03Dqk ⁽²⁰⁾										

At KELLER, all pressure measuring devices are calibrated for pressure and temperature.

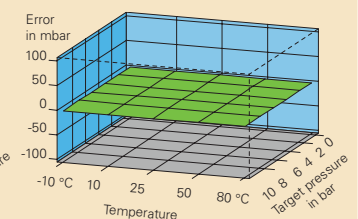
Depending on the product's expansion stage, an electronic circuit is responsible for compensating and processing the signals, or else the sensor's calibration data are provided (calibration certificate left).

The following is an example of the effect of digital compensation of the X-line with a resulting typical error band of only 0,05 %FS from -10 to 80 °C.

Standard Transmitter



Digitally compensated Transmitter



KELLER compensated pressure transmitters are provided with an indication of the total error band – a maximum signal variation in a defined temperature range. In addition, test reports can be displayed, with measurement data recorded at a minimum of 3 temperatures and 4 pressure points.

Digital Pressure Transmitters

15:00

X-Line Technical Features

- ♦ Digital interfaces: Modbus RTU via RS485, CANopen
- ♦ Scalable Analog output (2-conductor or 3-conductor)
- ♦ Mathematical compensation of non-linearity and temperature dependencies

- ♦ Temperature as an additional digital measured variable
- ♦ Free software for recording, configuring and readjusting
- ♦ Available in ex-version



High-precision pressure transmitters

Series 33 X / 35 X

- ♦ Pressure ranges from 0.3 to 1000 bar
- ♦ Accuracy 0.02% of the full range
- ♦ Precision of 0.01 %FS optionally available

Capacitive pressure transmitters

Series 41 X

- ♦ Pressure ranges from 10 to 300 mbar
- ♦ Resolution up to 1 µbar
- ♦ Gold-plated ceramic measuring cell



Differential pressure transmitters

Series PD-39 X

- ♦ High overload resistance thanks to double sensor design, numerical differential pressure build-up
- ♦ Basic pressure ranges from 3 to 300 bar
- ♦ Differential pressure range freely scalable within the basic pressure range

Differential pressure transmitters

Series PD-33 X

- ♦ Pressure ranges from 0,3 to 30 bar
- ♦ Classic "wet/wet" differential pressure measurement

Series PRD-33 X

- ♦ Pressure ranges from 0,35 to 3 bar, all with 40 bar basic pressure range
- ♦ With additional absolute basic pressure sensor

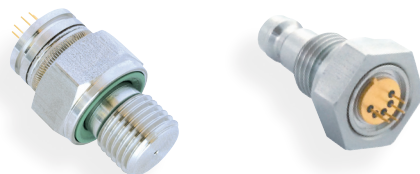
D-Line Technical Features

- ♦ With I²C microcontroller interface
- ♦ Extremely low power consumption
- ♦ Hermetically sealed sensor electronics (chip-in-oil technology)

- ♦ Robust stainless-steel housing
- ♦ Available in ex-version
- ♦ Available with RFID interface and integrated logger: 21 D RFID / 21 DC RFID



I²C is a trademark of NXP



Embedded OEM pressure transmitters

Series 4 LD to 9 LD

- ♦ "Probably the world's smallest pressure transmitter!"
- ♦ Pressure ranges from 0,3 to 1000 bar
- ♦ Operating temperature range from -40 to 110 °C

Embedded OEM pressure transmitter heads

Series 20 D

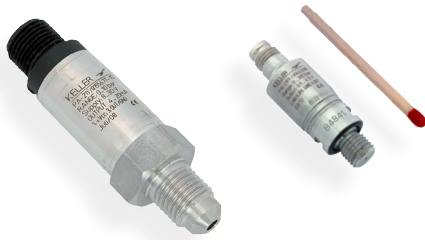
- ♦ Based on 7 LD or 9 FLD
- ♦ Various pressure connections (thread, quick-fit, etc.)
- ♦ Also available as a complete transmitter with cable

Analog Pressure Transmitters



Y-Line Technical Features

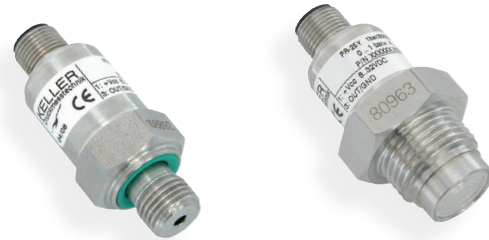
- ♦ Analog outputs: 4 to 20 mA, 0 to 10 V, 0 to 5 V, 0,5 to 4,5 V not ratiometric
- ♦ Compensated over the entire temperature range
- ♦ No internal seals
- ♦ Optimised electromagnetic compatibility
- ♦ Ideal for industrial applications



Compact pressure transmitters

Series 21 Y / 21 PY

- ♦ Pressure ranges from 2 to 1000 bar
- ♦ Total error band max. ± 1 %FS @ 0 to 50 °C
- ♦ Optimised for high-volume series



Variable pressure transmitters

Series 23 SY / 25 Y

- ♦ Pressure ranges from 0,1 to 1000 bar
- ♦ Total error band max. $\pm 0,5$ %FS @ 0 to 50 °C
- ♦ Various electrical and pressure connections possible
- ♦ Available in ex-version

C-Line Technical Features

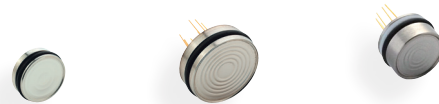
- ♦ Ratiometric output: 0,5 to 4,5 V @ 5 VDC
- ♦ Reverse polarity and overload protection ± 33 VDC
- ♦ Hermetically sealed sensor electronics (chip-in-oil technology)
- ♦ Robust stainless-steel housing
- ♦ Exceptional electromagnetic compatibility
- ♦ Digitally compensated over the entire temperature range



Compact pressure transmitters – ratiometric

Series 21 C

- ♦ Pressure ranges from 2 to 1000 bar
- ♦ Total error band max. ± 1 %FS @ 0 to 50 °C
- ♦ No internal seals



Embedded OEM pressure transmitters – ratiometric

Series 4 LC to 9 LC

- ♦ Pressure ranges from 1 to 1000 bar
- ♦ Can be compensated in the range of -40 to 150 °C
- ♦ Also available with thread connection

ATEX / IECEx

The ATEX directives apply in the EU and require the use of products that are suitable for explosive atmospheres.

KELLER produces intrinsically safe transmitters, as well as transmitters with a pressure-resistant enclosure. Intrinsically safe transmitters (ia) can only be operated in conjunction with an intrinsically safe power supply, which is not included. They can be used up to Zone 0, depending on the product. Transmitters with a pressure-resistant enclosure (db), on the other hand, can only be used up to Zone 1.



Series 23 SY Ei

Series 23 Ed

Series 33 X Ei

Application-specific Designs



Front-flush pressure transmitters

Series 35 X HT(T)

- ♦ Food-grade front-flush process connections
- ♦ Media temperatures of up to 150 °C
- ♦ FDA certification
- ♦ Material certificate DIN EN 10204
- ♦ Optionally also available in Hastelloy®

- ♦ Food industry
- ♦ Beverage production
- ♦ Pharmaceuticals sector



High-temperature pressure transmitters

Series 35 X HTC

- ♦ Food-grade front-flush process connections
- ♦ Media temperatures of up to 300 °C
- ♦ Material certificate DIN EN 10204
- ♦ Optionally also available in Hastelloy®

- ♦ Biotechnology
- ♦ Chemical industry
- ♦ Pharmaceuticals sector

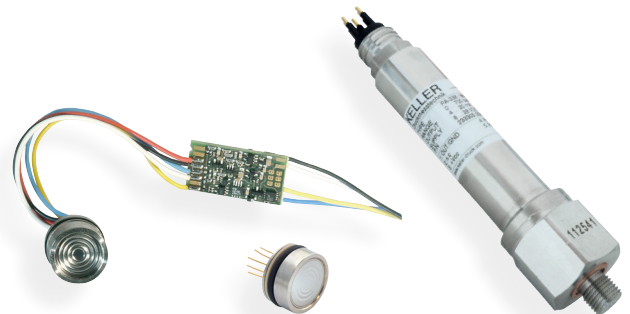


Miniature pressure transmitters

Series M5 HB

- ♦ Temperature resistance up to 200 °C
- ♦ Measuring dynamics from static to 50 kHz
- ♦ Local measurement thanks to M5 fine thread
- ♦ Also available as a pressure transducer without electronics

- ♦ Engine test stands
- ♦ Wind tunnels / shock waves
- ♦ Compressors / pumps
- ♦ Leak tests



High-precision pressure gauges

Series 8 LX / 7 Li / 33 X with SubConn®

- ♦ Suitable for high pressures up to 1500 bar
- ♦ Suitable for media temperatures up to 200 °C
- ♦ Various materials such as titanium, Hastelloy®, Inconel™
- ♦ Oil & gas exploration

- ♦ Remotely operated vehicle (ROV)
- ♦ Marine research
- ♦ Downhole, topside, wellhead, "Christmas tree"



Inert gas-filled pressure transmitter

Modifications of the Series 23 or 35 X

- ♦ Modular design
- ♦ Hermetically sealed housing
- ♦ Specification-dependent, also in accordance with DO 160, MIL 810 or similar
- ♦ KELLER centre of competence for design and approval

- ♦ Aviation
- ♦ Space flight



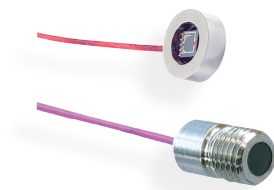
Homologated pressure transmitters

Series 22 DT / 22 M/S

- ♦ Pressure ranges of 5 to 250 bar
- ♦ Ratiometric signal output
- ♦ Homologation E4-110R, E4-10R and E4-67R
- ♦ Series 22 DT with temperature sensor in volume flow

- ♦ Automotive industry
- ♦ Bivalent vehicles (22 DT / 14 bar)

Miniature Pressure Sensors



Miniature pressure sensors

Series 2 Mi

- Pressure ranges from 1 to 400 bar
- Signal output typ. 200 mV @ 1 mA supply
- Optionally also available with offset compensation electronics

- Hydrodynamic and aerodynamic pressure measurements
- Typical overall size $\varnothing 4.5 \times 3$ mm
- Local measurement with minimal system intervention
- Sensors can be installed in delivered components

Interface Converters



Interface converters

For communication between device and computer

- USB – RS485: K-114 family with various electrical connections
- RS232 – RS485: K-102 (I), K-103 A, K-107
- USB – I²C: K-404 T

The K-114 interface converter is also available with a Bluetooth interface and integrated accumulator. This allows for a wireless connection via Serial Port Profile (SPP) in addition to the USB interface. The connected device is supplied by the converter's battery.

Special Devices



Piezoresistive pressure transducers and transmitters

Customer-specific products

In addition to more than 500 standard products, KELLER also develops and produces customer-specific solutions. In over 35 highly specialised production islands, the latest production processes are used to manufacture special designs in small

quantities, among other things. Their operating sites could not be more varied: they can be found in painting facilities, dive computers, refrigeration units (in cooling compressors in general), in the aviation and auto industries and in oil and gas extraction (downhole), to name but a few.

Options and approvals

- Titanium, Hastelloy®, Inconel™ – in all metallic components
- Various cable materials possible such as PE / TPE / FEP (Teflon®)
- Various interfaces are available to choose from
- Customer-specific analyses
- Enhanced lightning protection
- Extended temperature ranges

ATEX and IECEx approval



Welcome to KELLER AG für Druckmesstechnik. Your Swiss Pressure Sensing Specialist.

KELLER AG für Druckmesstechnik, which has its headquarters in Winterthur, Switzerland, is Europe's leading manufacturer of media isolated pressure transducers and transmitters.

The entire production process, from the manufacturing of the individual components and the calibration of the sensors through to the final quality control of the finished products, takes place at the company's headquarters in Winterthur. This means that all of KELLER AG's products are officially «Made in Switzerland». The application areas for KELLER's pressure transducers are just as broad as KELLER's product range.

KELLER AG für Druckmesstechnik and KELLER Gesellschaft für Druckmesstechnik mbH Jestetten have ISO 9001 certification.

Founder / Founded in
Hannes W. Keller, dipl. Phys. ETH / 1974

Workforce
450 employees

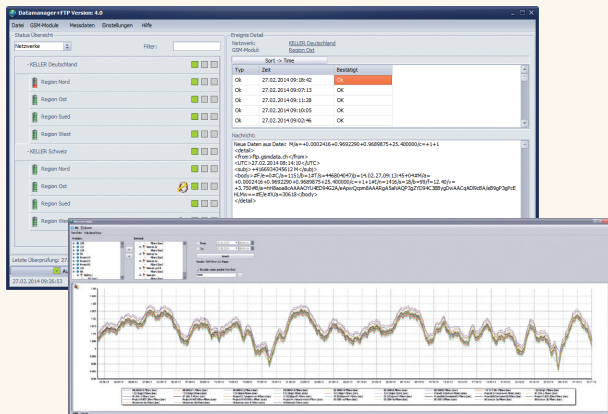
Turnover
CHF 80 million

Warehouse / Shipping
Winterthur (CH), Head Office and Production
Jestetten (D), EU Logistics Centre

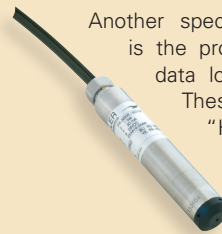
Subsidiaries and sales partners all around the world.

KELLER Software

KELLER AG für Druckmesstechnik has its own software department. Its comprehensive range of applications is always included with the relevant products. No licence fees are charged.



Other Product Overviews



Another special area of expertise of KELLER AG is the production and sale of level sensors and data loggers – usually in the water industry. These are presented in the overview of “Hydrostatic pressure measurement for fill levels and gauges.”

Our digital manometers are also presented in a product overview: these high-precision manometers are used to measure and monitor pressure. They can be found in measurement and testing technology, hydraulics and pneumatics and in medical technology, to name but a few industries.



KELLER AG für Druckmesstechnik
St. Gallerstrasse 119
8404 Winterthur
Switzerland

+41 52 235 25 25



KELLER Gesellschaft für Druckmesstechnik mbH
Schwarzwaldstr. 17
79798 Jestetten
Germany

+49 7745 9214 0

info@keller-druck.com
www.keller-druck.com

Your contact at KELLER: