Series PD-10L

Piezoresistive OEM differential pressure transducers with optimum stability

Features

- Optimum long-term stability
- Robust stainless-steel housing
- Front-flush, crevice-free welded diaphragm
- Very high proof pressure
- Line pressure up to 200 bar
- Optimised thermal behaviour

Technology

- Insulated piezoresistive pressure sensor encapsulated in an oil-filled metal housing
- Ideal for mounting with o-ring
- Typical range of output signal of 160 mV / mA

Typical Applications

- OEM
- Industry
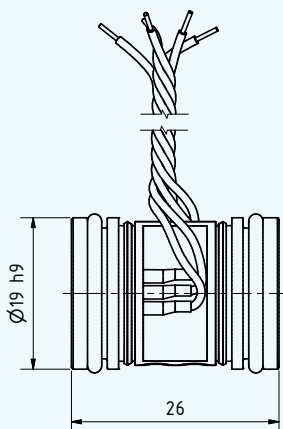- Laboratory

Accuracy
± 0,25 %FS
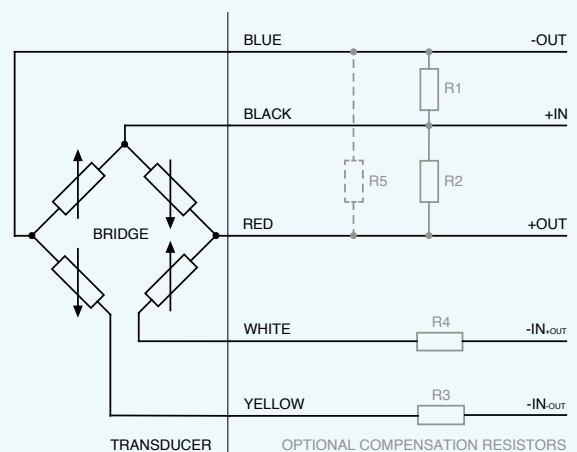
Long-term Stability
± 0,15 %FS/year

Pressure Ranges
0…0,1 bar to 0…30 bar

Series PD-10L

Ø19 h9

26

Electrical Diagram of a PD-10L with compensation resistors

BLUE — -OUT

R1

BLACK — +IN

R5 R2

BRIDGE

RED — +OUT

WHITE — R4 — -IN+OUT

YELLOW — R3 — -IN-OUT

TRANSDUCER — OPTIONAL COMPENSATION RESISTORS

Edition 10/2024
Subject to alterations
info@keller-pressure.com

Series PD-10L – Specifications

Standard Pressure Ranges

Differential pressure		Proof pressure	Proof pressure	Sensitivity		
PD		positive	negative	min.	typ.	max.
-0,1…0,1	0…0,1	5	2,5	98	130	163
-0,3…0,3	0…0,3					
-1…1	0…1	15	7,5	40	53	66,7
	0…3	15	7,5	40	53	66,7
	0…10	50	25	12	16	20
	0…30	120	60	4	5,3	6,7
bar diff.		bar		mV / (mA × bar)		
Reference pressure at 0 bar differential pressure		Based on reference pressure				

Performance

Accuracy @ RT (20…25 °C)	± 0,25 %FS typ.	Non-linearity (BFSL), pressure hysteresis, non-repeatability
	± 0,50 %FS max.	
Offset @ RT (20…25 °C)	< ± 25 mV / mA	Uncompensated
	< ± 2 mV / mA	Compensated with R3 or R4.
Compensated temperature range	-10…80 °C	Other temperature ranges between -55…150 °C are possible as an option.
Long-term stability	≤ ± 0,15 %FS	For pressure ranges > 1 bar, per year under reference conditions.
	≤ ± 1,5 mbar	For pressure ranges ≤ 1 bar, per year under reference conditions.
Line pressure	≤ 200 bar	
Line pressure dependency	< 0,01 mV / bar	For pressure ranges ≥ 1 bar
	< 0,02 mV / bar	For pressure ranges < 1 bar
Position dependency	≤ ± 3 mbar	Calibrated in vertical installation position with metal diaphragm (+) side facing downwards.
Temperature coefficient zero TCzero pre-compensated with R1 or R2	≤ ± 0,015 %FS / K	For pressure ranges ≥ 3 bar
	≤ ± 0,45 mbar / K	For pressure ranges < 3 bar
Temperature coefficient sensitivity TCsens	≤ ± 0,06 % / K	For pressure ranges ≥ 1 bar
	≤ ± 0,12 % / K	For pressure ranges < 1 bar
Temperature coefficient total bridge resistance TC-resistance	1800…3000 ppm / K	

Edition 10/2024
Subject to alterations
info@keller-pressure.com

Find your local KELLER contact keller-pressure.com

Page 2 of 6

Series PD-10L – Specifications

Electrical Data

Half-bridge configuration

Constant current supply	1 mA nominal 3 mA max.
Bridge resistance @ RT (20…25 °C)	3,5 kΩ ± 20 %
Electrical connection	Optional: Silicone wires AWG28 (0,09 mm2), L = 100 mm, other lengths on request.
Insulation	> 100 MΩ @ 500 VDC

Mechanical Data

Materials in contact with media

Housing and diaphragms	Stainless steel AISI 316L	Optional: Hastelloy C-276
O-ring at 200 bar line pressure	ø 15,6 mm × 1,78 mm FKM (75 Shore) -20…200 °C	For medium temperatures < -20 °C FVMQ is used. Other materials on request.

Other materials

Pressure transducer oil filling	Silicone oil	Others on request.

Further details

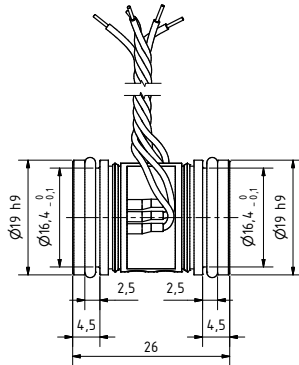| Diameter × height	ø 19 mm × 26 mm	See Dimensions and Options
Weight	approx. 36 g	

Environmental conditions

Media temperature range	-40…125 °C	Optional: -55...150 °C	Operating temperature, consider o-ring. Icing not permitted.
Ambient temperature range	-40…125 °C		
Storage temperature range	-40…125 °C		
Vibration resistance	10 g, 10…2000 Hz, ± 10 mm		IEC 60068-2-6
Shock resistance	50 g, 11 ms		IEC 60068-2-27
Natural frequency (resonance)	> 30 kHz		
Endurance @ RT (20…25 °C)	> 10 million pressure cycles		0…100 %FS
Dead volume change @ RT (20…25 °C)	< 10 mm^3		

Edition 10/2024
Subject to alterations
info@keller-pressure.com

Find your local KELLER contact **keller-pressure.com**

Page 3 of 6

Series PD-10L – Dimensions and Options

Overview of Versions

PD-10L

Electrical Connection

Half-open measurement bridge pin assignment		
Label	Designation	Wire colour
+OUT	Positive Output	red
+IN	Positive Supply	black
-OUT	Negative Output	blue
-IN$_{-OUT}$	Negative Supply (half bridge -OUT)	yellow
-IN$_{+OUT}$	Negative Supply (half bridge +OUT)	white

Overview of Customer-specific Options

- Calibration to other pressure ranges
- Calibration to other temperature ranges
- Calibration with mathematical modeling
- Housing and diaphragm made of Hastelloy C-276
- O-Rings made of other materials
- Other oil filling types for pressure transducers
- Modifications to customer-specific applications

Examples of Similar Products

- Series PD-10LHP: Differential pressure transducer with line pressure ≤ 600 bar
- Series PD-10LX: Pressure transducer PD-10L with digital compensation electronics
- Series 10L: Low-pressure transducer for absolute and relative pressure ranges ≤ 200 bar
- Series 10LHP: High-pressure transducer for absolute and relative pressure ranges > 200 bar
- Series 4L…9L: Low-pressure transducer in more compact designs for absolute and relative pressure ranges ≤ 200 bar

Find your local KELLER contact keller-pressure.com

Series PD-10L – Analysis and Characteristic Lines

Standard Analysis

The PD-10L are intended for o-ring mounting and depend on the stress isolation provided by o-rings for performance within stated specifications. This installation enables the values measured during factory testing to remain valid. If the transducers are not installed free from stress, the mechanical forces may change the measured values and the stability of the pressure transducers.
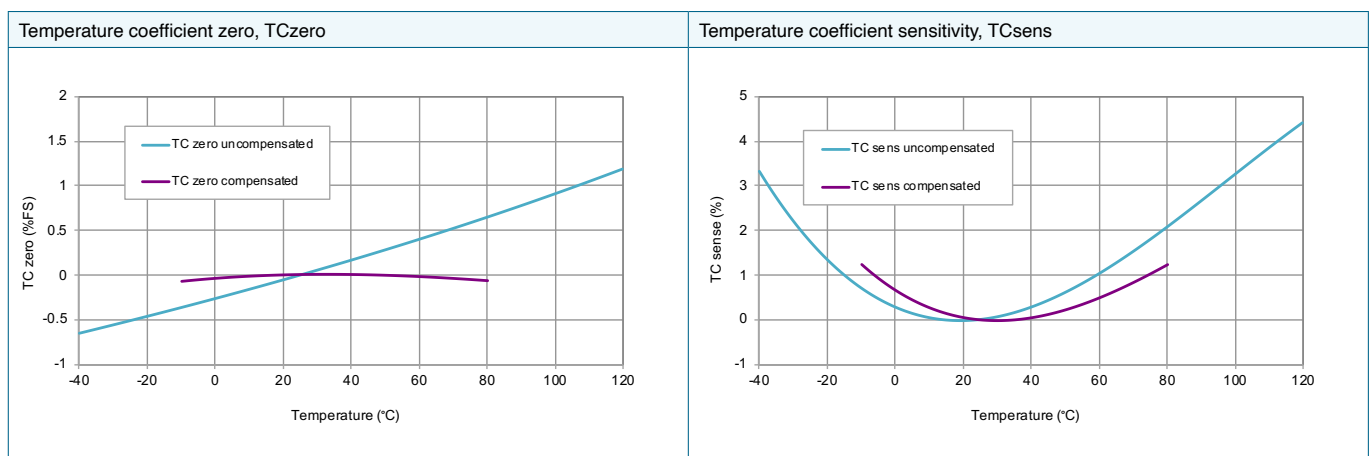
Calibration sheet: Example type PD-10L	Key
| ```
------------------------------------------------- 4
PD-10L / 10 bar / 10-1035-142 (1)      Sn 8447 (2)
-------------------------------------------------
(3) Temp   (4) Zero   (5) +1000   (6) Comp   (7) dZero
   [°C]       [mV]       [mV]       [mV]        [mV]
   -9.3        3.5        1.1        1.1        -0.1
   -0.5        4.0        1.2        1.2        -0.1
   24.0        4.3        1.3        1.3         0.0
   49.3        4.8        1.3        1.3         0.1
   79.1        5.5        1.4        1.4         0.1
------------------------------------------------- 1
COMP   R1   1000 kOhm (8)      R3        0.0 Ohm (8)
RB         3425 Ohm (9)
ZERO       1.3 mV (10)
SENS       16.72 mV/bar (11)

LIN                          (14) Lnorm      (15) Lbfsl
  (12) [bar]       (13) [mV]      [%Fs]         [%Fs]
  0.000        0.0        0.00        -0.01
  2.500       41.8        0.02         0.01
  5.000       83.6        0.00         0.00
  7.500      125.4       -0.02        -0.01
 10.000      167.2       -0.01        -0.01
-------------------------------------------------
Long Term Stability Ok (16)
Lot 72114-2 (17)
Test 500 Volt Ok (18)
Supply 1.000 mA (19)
30.11.18 (20) ------------------------ PH02.A03D1S (20)
``` | 1. Type (PA-10L) and measuring range (10 bar) of pressure sensor<br>2. Serial number of pressure sensor<br>3. Actual test temperatures<br>4. Uncompensated zero offset<br>5. Zero offset values with calculated compensation resistor R1 (+) or R2 (-)<br>6. Zero offset values with calculated compensation resistors R1 or R2 and R3 or R4<br>7. Temperature zero error with calculated compensation resistors<br>8. Calculated compensation resistor R1 or R2 (TCzero) and R3 or R4 (offset)<br>9. RB: Bridge resistance at room temperature<br>10. Calculated offset with compensation resistors R1 or R2 and R3 or R4<br>11. Sensitivity of pressure sensor at room temperature 25° C<br>12. Pressure test points<br>13. Signal change at pressure test points at room temperature 25° C<br>14. Non-linearity (best straight line through zero)<br>15. Non-linearity (best straight line)<br>16. Result of the long-term stability test<br>17. Sensor traceability information<br>18. Insulation test<br>19. Excitation (constant current)<br>20. Date of test -------- Test equipment |

Notes
- The indicated specifications apply only for constant current supply of 1 mA. The sensor must not be supplied with more than 3 mA.
  The output voltage is proportional to the supply current. If the supply deviates from the calibration, this will cause signal shifts.
- The compensation resistors described in this data sheet are not part of the pressure transducer and are not included in the scope of delivery.
- It is recommended to use compensation resistors with temperature coefficients of < 50 ppm/°C for large temperature ranges. Sensor and resistors can be exposed to different temperatures.
- In addition, a maximum TC-sensitivity can be guaranteed on request or the value for the compensation resistor (R5) can be indicated.
  See "Electrical diagram of compensation resistors" on page 1.

Characteristic Lines

Examples of typical characteristic curves of the temperature coefficients, normalised at 25 °C, uncompensated vs. compensated.

Temperature coefficient zero, TCzero	Temperature coefficient sensitivity, TCsens

Edition 10/2024
Subject to alterations
info@keller-pressure.com

Find your local KELLER contact keller-pressure.com

Page 5 of 6

Series PD-10L – Analysis and Characteristic Lines

Mathematical compensation model

KELLER's PD-10L Series pressure transducers can be ordered with an optional mathematical compensation model.

The compensation model is a mathematical formula that helps to calculate the compensated pressure value of the pressure transducer. Both the pressure signal and the temperature signal of the pressure transducer are incorporated into the calculation. Polynomial functions are used as the basis for this mathematical model.

The pressure transducers are characterised in the factory in order to produce the compensation model. This involves measuring pressure and temperature signals at various pressure and temperature levels. Comparing the measured values with the known pressure and temperature values makes it possible to calculate the compensation coefficients of the pressure transducer. These compensation coefficients are made available to the customer along with the respective pressure transducer.

KELLER
myCalibration

KELLER myCalibration

Content
myCalibration is a digital data platform provided free of charge to KELLER customers. It provides an easy option for transferring and providing sensor calibration data.

Format
The calibration data is available in the standard JSON file format, which facilitates smooth integration into the customer's software. The file structure is clearly defined in a publicly accessible JSON schema. This means that the customer is able to integrate the data seamlessly into their software.

Access
The platform can be accessed either via a standard web browser (web view) or directly within the customer's linked software using an API. The calibration data remains available in myCalibration for 24 months.

Web app
Customers can access the calibration data for their sensors via a user-friendly interface. The system ensures secure authentication by asking users to enter their personal login details, thereby preventing unauthorised access to the data by third parties.
The user has the option to use various search and filter functions to download calibration data for specific sensors or mass export multiple datasets simultaneously.

API
Customers have the option to use the REST API for automated access and to integrate it into their processes. This means that calibration data for new sensors can be called up automatically and then processed, for example.

Documentation
Comprehensive technical documentation including example software is available at the following link: https://mycalibration.github.io

Edition 10/2024
Subject to alterations
info@keller-pressure.com

Find your local KELLER contact keller-pressure.com

Page 6 of 6