20 Series

Piezoresistive OEM pressure transducers with optimum stability

Features

- High long-term stability
- Robust, compact stainless-steel housing
- High proof pressure
- Optimised thermal behaviour

Technology

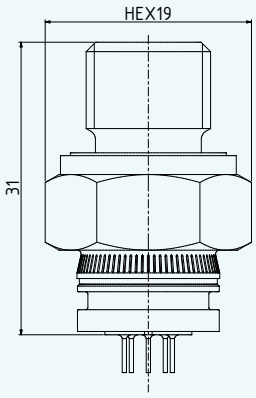
- Insulated piezoresistive pressure sensor encapsulated in an oil-filled metal housing
- Fully welded design with no internal seals
- Typical range of output signal of 160 mV / mA

Typical applications

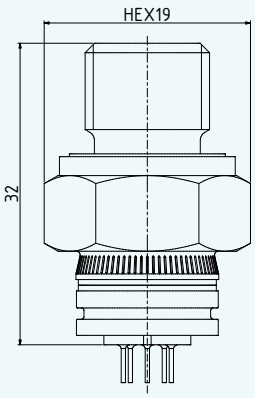
- OEM
- Industry
- Water management
- Air-conditioning technology

Accuracy
± 0,50 %FS
Long-term stability
± 0,3 %FS / year
Pressure ranges
0…5 bar to 0…600 bar

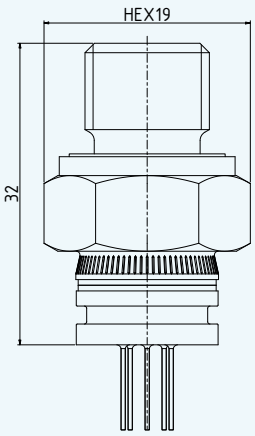
20 Series: 0…5 to 0…50 bar



20 Series: 0…50 to 0…200 bar



20 Series: 0…200 to 0…600 bar



20 Series – Specifications

Standard pressure ranges

Relative pressure PR	Absolute pressure PAA	Absolute pressure PA	Proof pressure	Sensitivity min.	Sensitivity typ.	Sensitivity max.
0…5	0…5	0…5	15	24	32	40
0…10	0…10	0…10	30	12	16	20
0…30	0…30	0…30	90	4	5,3	6,7
	0…100	0…100	300	1,2	1,6	2
	0…200	0…200		0,48	0,64	0,80
	0…400	0…400	600	0,30	0,40	0,50
	0…600	0…600	900	0,20	0,267	0,33
bar rel.	bar abs.	bar abs.	bar	mV / (mA × bar)		
Reference pressure at ambient pressure	Reference pressure at 0 bar abs. (vacuum)	Reference pressure at 1 bar abs.	Based on reference pressure	The standard pressure ranges are available from the warehouse. Additional calibrations to intermediate pressure ranges can also be made.		

Performance

Accuracy @ RT (20 – 25 °C)	≤ ± 0,50 %FS	Non-linearity (best fitted straight line BFSL), pressure hysteresis, non-repeatability
Offset @ RT (20…25 °C)	< ± 25 mV / mA	Uncompensated, the sensitivity value must be added for PA.
	< ± 2 mV / mA	Compensated with R3 or R4.
Compensated temperature range	-10…80 °C	Other temperature ranges within -20…100 °C possible as an option.
Long-term stability	≤ ± 0,3 %FS	Per year under reference conditions.
Degree of dependency on location	≤ 2 mbar	Calibrated in vertical installation position with pressure connection facing downwards.
Temperature coefficient	≤ ± 0,025 %FS / K	Zero (TCzero) pre-compensated with R1 or R2.
	≤ ± 0,06 % / K	Sensitivity (TCsens)
	1800…3000 ppm / K	Total bridge resistance TC-resistance

20 Series – Specifications

Electrical data

Half-bridge configuration

Constant current supply	1 mA nominal 3 mA maximum	
Bridge resistance @ RT (20…25 °C)	3,5 kΩ ± 20 %	
Electrical connection	Gold-plated pins ø 0,45 mm L = version-dependent	See Dimensions and options Optional: AWG28 (0,09 mm2) silicone wires, L = 70 mm, other lengths on request. Optional: Circuit board with JST female connector
Insulation	> 100 MΩ @ 500 VDC	

Mechanical data

Materials in contact with fluid

Housing and separating diaphragm	Stainless steel AISI 316L	
Pressure connection seal	FKM (75 Shore) -20…200 °C	For medium temperatures < -20 °C FVMQ is used. Others on request.

Other materials

Pressure transducer oil filling	Silicone oil	Others on request.

Further details

Pressure connection	G1/4 male	See Dimensions and options
	1/4-18NPT male	
Diameter × height	Depends on pressure range	
Connection for capillary for reference pressure compensation	ø 1,2 mm × 3 mm	Optional: Capillary (silicone)
Weight	approx. 40 g	For pressure ranges ≤ 200 bar
	approx. 45 g	For pressure ranges > 200 bar

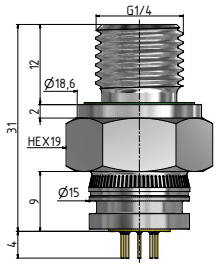
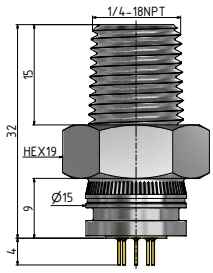
Ambient conditions

Media temperature range	-20…100 °C	Operating temperature, consider o-ring. Icing not permitted
Ambient temperature range	-20...100 °C	
Storage temperature range	-20…100 °C	
Vibration endurance	10 g, 10…2000 Hz, ± 10 mm	IEC 60068-2-6
Shock endurance	50 g, 6 ms	IEC 60068-2-27
Natural frequency (resonance)	> 20 kHz	
Pressure endurance @ RT (20…25 °C)	> 10 million pressure cycles	0…100 %FS

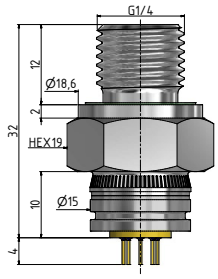
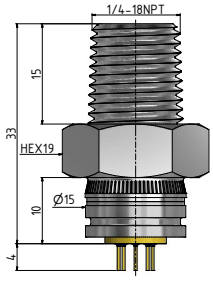
20 Series – dimensions and options

Available pressure connection

For pressure ranges ≤ 50 bar

G1/4	1/4-18NPT
	
DIN EN ISO 1179-2	ASME/ANSI B 120.1

For pressure ranges > 50 bar to ≤ 200 bar

G1/4	1/4-18NPT
	
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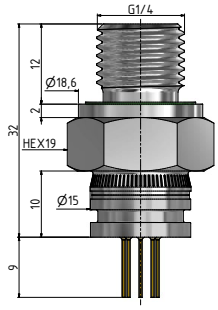
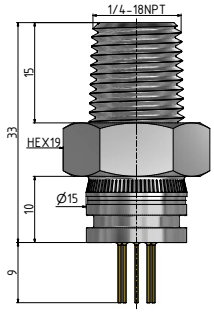
For pressure ranges > 200 bar

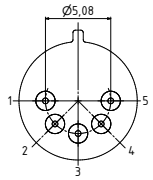
G1/4	1/4-18NPT
	
DIN EN ISO 1179-2	ASME/ANSI B 120.1

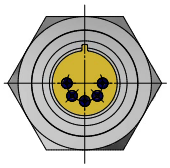
Other pressure connections available on request.

20 Series – dimensions and options

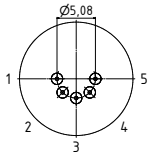
Electrical connection

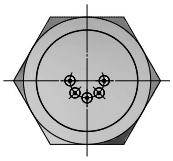
Glass feedthrough connection





For pressure ranges ≤ 200 bar



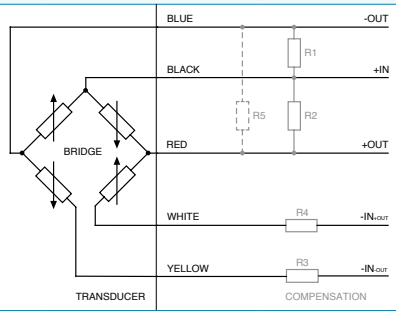


For pressure ranges > 200 bar

Half-open measurement bridge pin assignment

PIN	Label	Designation	Wire colour
1	+OUT	Positive Output	red
2	+IN	Positive Supply	black
3	-OUT	Negative Output	blue
4	$-IN_{-OUT}$	Negative Supply (half bridge -OUT)	yellow
5	$-IN_{+OUT}$	Negative Supply (half bridge +OUT)	white

Electrical diagram with compensation resistors



Overview of customer-specific options

- Calibration to other pressure ranges
- Calibration to other temperature ranges
- Calibration with mathematical modeling
- O-Rings made of other materials
- Other oil filling types for pressure transducers – e.g. special oils for oxygen applications
- Modifications to customer-specific applications

Examples of similar products

- 20Y Series: Pressure transducer 20 with analog compensation electronics
- 20C Series: Pressure transducer 20 with chip-in-oil technology and analog ratiometric output signal
- 20D Series: Pressure transducer 20 with chip-in-oil technology and I²C interface
- 20S Series: High-stability pressure transducer with pressure ranges of 0…0,3 bar to 0…1000 bar

20 Series – Analysis and characteristic curves

Standard analysis

Calibration sheet: Example type PA-10L	Key
---------- 449 **PA-10L / 10 bar / 10-1005-118** (1) **Sn I107547** (2) ---------- 29/01 (3) Temp [°C] / (4) Zero [mV] / (5) +510 [mV] / (6) Comp [mV] / (7) dZero [mV] -9.5 / 18.5 / 13.3 / -0.6 / 0.2 0.1 / 18.7 / 13.3 / -0.6 / 0.2 25.0 / 19.1 / 13.1 / -0.8 / 0.0 50.2 / 19.8 / 13.0 / -0.9 / -0.1 79.9 / 20.8 / 12.9 / -1.1 / -0.2 ---------- L1 COMP R1 510 kOhm (8) R3 56.0 Ohm (8) RB 3482 Ohm (9) ZERO -0.8 mV (10) P_atm 964 bar **SENS 16.41 mV/bar** (11) LIN (14) Lnorm [%Fs] / (15) Lbfsl [%Fs] (12) [bar] / (13) [mV] 0.000 / 0.0 / 0.00 / -0.01 2.500 / 41.1 / 0.02 / 0.01 5.000 / 82.1 / 0.00 / 0.00 7.500 / 123.1 / -0.02 / -0.01 10.000 / 164.1 / -0.01 / -0.01 ---------- Long Term Stability Ok (16) Lot 72114-2 (17) Test 500 Volt Ok (18) **Supply 1.000 mA** (19) 01.09.17 (20) ---------- GOL3.A03D1K (20)	1. Type (PA-10L) and measuring range (10 bar) of pressure sensor 2. Serial number of pressure sensor 3. Actual test temperatures 4. Uncompensated zero offset 5. Zero offset values with calculated compensation resistor R1 (+) or R2 (-) 6. Zero offset values with calculated compensation resistors R1 or R2 and R3 or R4 7. Temperature zero error with calculated compensation resistors 8. Calculated compensation resistor R1 or R2 (TCzero) and R3 or R4 (offset) 9. RB: Bridge resistance at room temperature 10. Calculated offset with compensation resistors R1 or R2 and R3 or R4 11. Sensitivity of pressure sensor at room temperature 25° C 12. Pressure test points 13. Signal change at pressure test points at room temperature 25° C 14. Non-linearity (best straight line through zero) 15. Non-linearity (best straight line) 16. Result of the long-term stability test 17. Sensor traceability information 18. Insulation test 19. Excitation (constant current) 20. Date of test -------- Test equipment

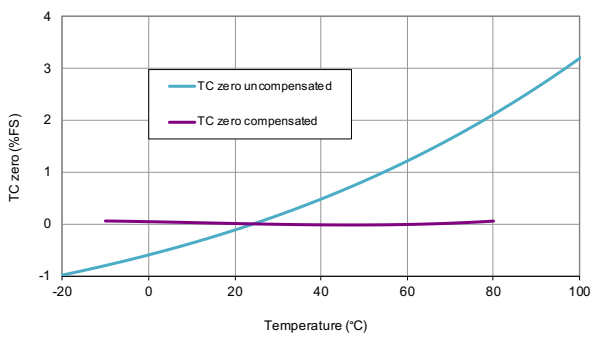
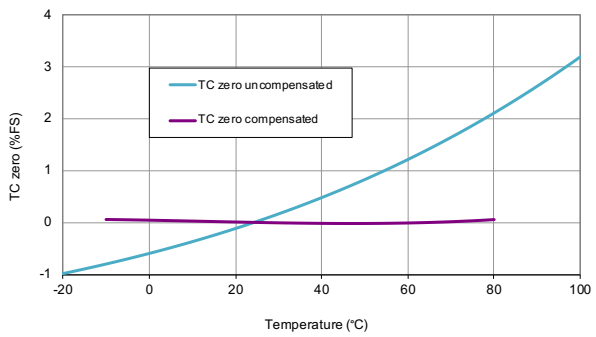
Notes

- 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 5.

Characteristic lines

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

Temperature coefficient zero (TCzero)



Temperature coefficient sensitivity (TCsens)