KISTLER
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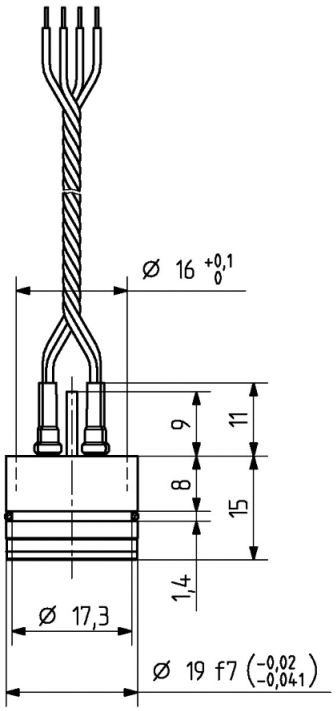
OEM Pressure Sensors

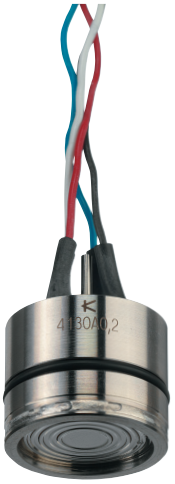
Type 413xA..., 414xA...

for Relative and Absolute Pressure of 0,2 ... 200 bar

OEM pressure sensors of Type 413xA..., 414xA... are particularly suitable for system and instrument manufacturers. They are versatile in application and can be used to measure pressures from 0,2 ... 20 bar relative and from 1 ... 200 bar absolute in liquids and gases in the temperature range between –40 ... 140 °C.

- High accuracy
- Excellent long term stability
- Integrated temperature compensation
- Measuring ranges from 0,2 ... 200 bar
- Relative or absolute pressure
- Low power consumption
- Closed Wheatstone bridge





Description

These sensors meet the highest measuring requirements by reason of their high natural frequency, good attenuation behavior, excellent linearity, combined with negligible hysteresis and high reproducibility.

Type 413xA... sensors are used for measurements in relation to atmospheric pressure, while Type 414xA... measure the absolute pressure. The pressure sensors do contain a Si-Chip as sensing element. Kistler is the owner of the design and production processes. From production point of view, this allows highest stability and continuity.

The pressure to be measured acts through thin corrosion resistant steel diaphragm on a silicon measuring element. The pressure transmitting medium is silicon oil. The measuring element contains diffused piezoresistive resistances which are connected into a Wheatstone bridge. The sensor is temperature-compensated either with integral temperature compensation, with resistors to be installed externally as recorded on a calibration certificate, or by means of digital compensation.

Application

These pressure sensors can be used for the widest variety of applications in industrial automation as well as in measuring instruments.

Examples

- Pressure transmitters
- Analyzers for physical units
- Level measuring instruments
- Medical instruments
- R & D projects
- Hydraulic and pneumatic equipment
- Brake systems for automotive and railway industry
- Mass flow measuring systems for gases
- Deep well probes for exploration
- Instruments for food and pharmaceutical industries
- Instrumentation for aerospace technology
- Barometrical pressure sensors

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Technical Data

(based on Tref = 25 °C; power supply 1 mA constant)

Type 413xA...		**0,2...**	**0,5...**	**1...**	**2...**	**5...**	**10...**	**20...**
Measuring range	bar rel.	0 ... 0,2	0 ... 0,5	0 ... 1	0 ... 2	0 ... 5	0 ... 10	0 ... 20
Overload	bar abs.	3x FS						
Burst pressure	bar rel.	4x FS						
Natural frequency	kHz	20	29	33	45	75	125	150
Full scale signal (FSO nominal) with 1 mA	mV	50 ±50 %	60 ±40 %	100 ±40 %	60 ±40 %	140 ±40 %	140 ±40 %	140 ±40 %
Linearity (BSL), hysteresis and repeatabiliy	%FSO	≤±0,1	≤±0,1	≤±0,15	≤±0,1	≤±0,1	≤±0,1	≤±0,1
Stability: *								
of sensitivity	%/a	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3
of zero	%FSO/a	≤0,7	≤0,5	≤0,4	≤0,4	≤0,3	≤0,3	≤0,3

* Typical value, depends on application

Thermal Sensitivity Shift

Type 4130A... 0 ... 100 °C	%	≤±1,5	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0
Type 4130A... –20 ... 120 °C	%	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0
Type 4131A... 0 ... 100 °C	%	≤±1,5	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0

Thermal Zero Shift

Type 4130A... 0 ... 100°C	%FSO	≤±2,0	≤±1,2	≤±0,8	≤±0,8	≤±0,5	≤±0,5	≤±0,5
Type 4130A... –20 ... 120 °C	%FSO	≤±3,0	≤±2,0	≤±1,2	≤±1,2	≤±1,0	≤±1,0	≤±1,0
Type 4131A... 0 ... 100°C	%FSO	≤±2,0	≤±1,2	≤±0,8	≤±0,8	≤±0,5	≤±0,5	≤±0,5

Type 414xA...		**1...**	**2...**	**5...**	**10...**	**20...**	**50...**	**100...**	**200...**
Measuring range	bar abs.	0 ... 1	0 ... 2	0 ... 5	0 ... 10	0 ... 20	0 ... 50	0 ... 100	0 ... 200
Overload	bar abs.	3x FS						250	500
Burst pressure	bar abs.	>150						>500	>500
Natural frequency	kHz	33	45	75	125	150	>180	>210	>220
Full scale signal (FSO nominal) with 1 mA	mV	60 ±40 %	70 ±40 %	140 ±40 %	140 ±40 %	140 ±40 %	140 ±40 %	140 ±40 %	140 ±40 %
Linearity (BSL), hysteresis and repeatability	%FSO	≤±0,1	≤±0,1	≤±0,1	≤±0,1	≤±0,1	≤±0,1	≤±0,1	≤±0,1
Stability (typical):*									
of sensitivity	%/a	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3
of zero	%FSO/a	≤0,3	≤0,4	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3	≤0,3

* Typical value, depends on application

Thermal Sensitivity Shift

Type 4140A... 0 ... 100 °C	%	≤±1,5	≤±1,5	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0
Type 4140A... –20 ... 120 °C	%	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0	+2,5/–1,0
Type 4141A... 0 ... 100 °C	%	≤±1,5	≤±1,5	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0

Thermal Sensitivity Shift

Type 4140A... 0 ... 100 °C	%FSO	≤±0,8	≤±0,8	≤±0,5	≤±0,5	≤±0,5	≤±0,5	≤±0,5	≤±0,5
Type 4140A... –20 ... 120 °C	%FSO	≤±1,5	≤±1,2	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0	≤±1,0
Type 4141A... 0 ... 100 °C	%FSO	≤±0,8	≤±0,8	≤±0,5	≤±0,5	≤±0,5	≤±0,5	≤±0,5	≤±0,5

Technical Data

Temperature

Compensated temperature range	°C	–20 ... 120
Minimum/maximum temperature	°C	–40 ... 140
Reference temperature	°C	25

General Data

Supply:		
Constant current	mA	1 (0,5 ... 2)
Voltage	VDC	<10
Zero shift with 1 mA supply (only with compensated sensors)	mV	≤±5
Output impedance **	kΩ	2,2 ... 5,2
Vibration, 50 g peak, 10 Hz to 2 kHz per	%FS/g	<0.05
Shock resistance	g	MIL-STD-202G Method 204D, condition E 1000g, 0,5 msec
Acceleration error	mbar/g	<0,3
Insulation resistance	MΩ	100
Voltage proof	$V_{eff.}$	500
Weight	g	20

** in compensated temperature range

Material

Housing	1.4435 (AISI 316 L) or Hastelloy C 276 (on request)
Diaphragm	1.4435 (AISI 316 L) or Hastelloy C 276, 25 µm (on request)
Gasket	FPM
Potting compound	4130/4140-Stycast 2850 FT, 4131/32 and 4141/42-Stycast 3050
Oil filling	Wacker AK100
Reference port	INOX, ø1,5 x 10 mm (only with Type 413xA...)
Electrical connection	5 x 0,09 mm², L ≈ 70 mm, Siliflex® AWG24, external diameter ø 0,95 mm

Electrical Connection

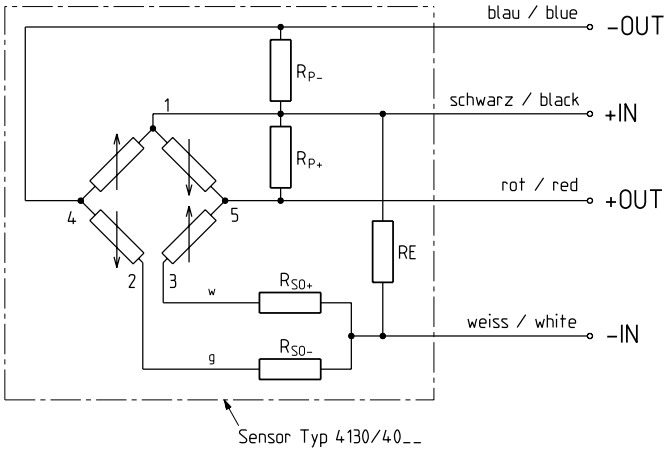

Fig. 1: Connection diagram

Siliflex® is a registered trademark of Calmont Wire and Cable, Inc., Santa Ana, USA.

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Supply and Temperature Compensation

The calibration data are based on a constant current excitation of 1 mA. A supply of between 0,5 ... 2 mA is possible. However, the sensitivity and FSO signal respectively along with the zero measurand signal vary in proportion to the supply current. The sensors can be used in a range between –40 ... 140 °C but are provided with thermal compensation only in the range of –20 ... 120 °C.

The specifications for the thermal zero shift and the thermal sensitivity shift are more narrowly specified in the range from 0 ... 100 °C, and rather wider at the end of the operating temperature range.

Full Temperature Compensation: Type 4130A..., 4140A...

The piezoresistive pressure sensors are pre-aged before calibration with pressure and temperature cycles. They are then subjected to a computer-controlled stability-test program lasting for several days. Finally, the pressure sensors are precisely calibrated with a 1 mA supply current.

The individually determined resistance values for the zero point and sensitivity compensation as well as the zero offset are directly integrated in the sensor. This dispenses with the need for additional compensation by the customer.

External Temperature Compensation: Type 4131A..., 4141A...[1)]

External compensation above all offers price advantages. The resistance values thereby obtained for the thermal zero point and sensitivity compensation, as well as the zero offset are documented in a calibration print-out, which is supplied with the sensor. The components are installed onto the amplifier board by the customer.

Digital Temperature Compensation: Type 4132A..., 4142A...[1)]

For even better compensation of temperature and linearity, the sensors can be supplied with a set of polynomial coefficients for digital compensation. Depending on the measuring and temperature ranges as well as the order of the polynomial, the error can be reduced down to 0,1 %FS. Data sheet Digi-Komp._000-280 provides accurate details in this respect.

Signal Processing and Connections

The output signal is the differential output of the Wheatstone bridge. It requires processing by a differential amplifier with symmetrical input.

On request, Kistler delivers custom made electronic units to OEM customers such as amplifier boards or complete transmitters with standardized industrial output signals.

[1)] on request

Dimensions

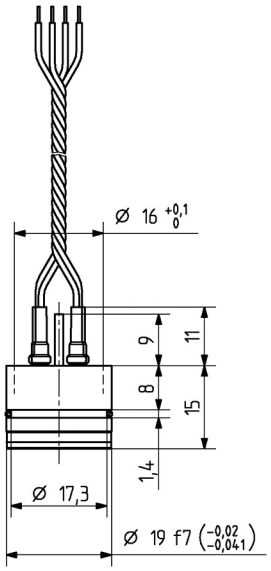

Fig. 2: Type 4130A...
Type 4131A...
Type 4132A...

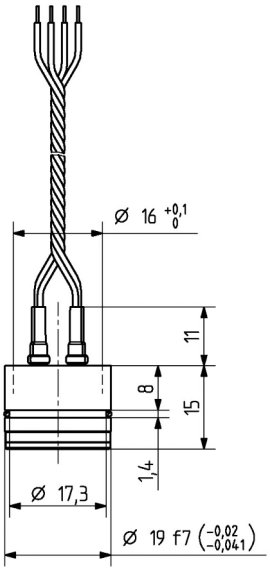

Fig. 3: Type 4140A1...50
Type 4141A1...50
Type 4142A1...50

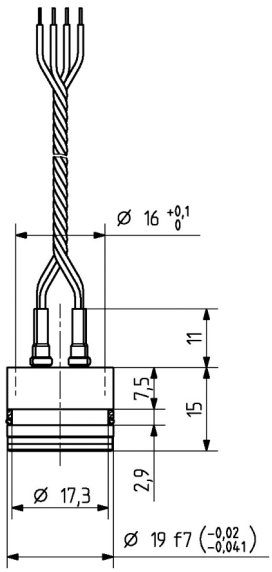

Fig. 4: Type 4140A100/200
Type 4141A100/200
Type 4142A100/200

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Mounting

It is essential to comply with the following points when installing the sensor:

- Check whether the housing, into which the sensor is to be mounted, will withstand the required pressure rating
- Ensure that the O-ring seal and support ring (100/200 bar) is inserted and that it is compatible with the medium
- As far as possible, protect the diaphragm, which is very thin and must on no account be damaged
- Always install the sensor into a suitable hole ø19 H7
- Note the sensor connections

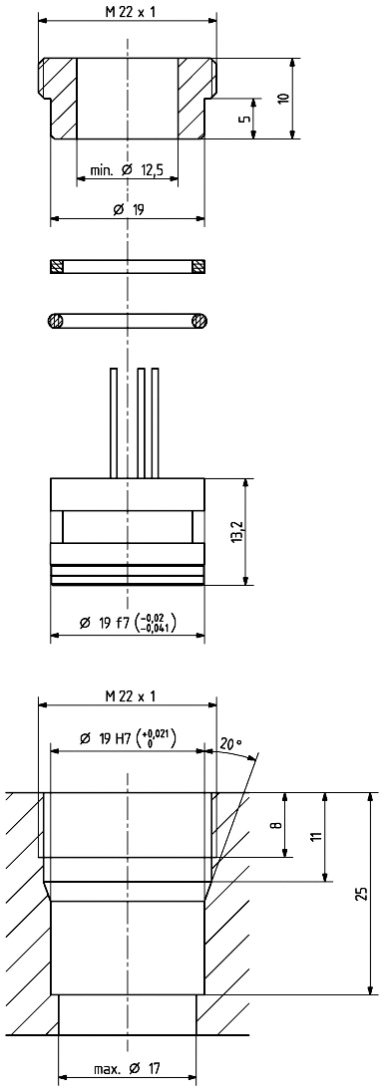

Fig. 5: Mounting with threaded ring

Included Accessories	Type/Art.No.
• O-ring (mounted)	5.110.126
• support ring (mounted for 100/200 bar)	1100A69
• calibration certificate	–

Ordering Key

Type 41 ☐ ☐ A ☐ ☐

Measuring Principle

Relative pressure	**3**
Absolute pressure	**4**

Compensation

Full temperature compensation	**0**
External temperature compensation[1]	**1**
Sensor for digital compensation[1]	**2**

[1] on request

Version	**A**

Measuring Range

0,2 bar	**0,2**
0,5 bar	**0,5**
1 bar	**1**
2 bar	**2**
5 bar	**5**
10 bar	**10**
20 bar	**20**
50 bar [2]	**50**
100 bar [2]	**100**
200 bar [2]	**200**

[2] only absolute pressure

Material

Standard, steel diaphragm 1.4435	–
Diaphragm of Hastelloy-C [3]	**V61**
Sensor of Hastelloy-C [3]	**V62**
Customized version [3]	**Vxxx**

[3] on request

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