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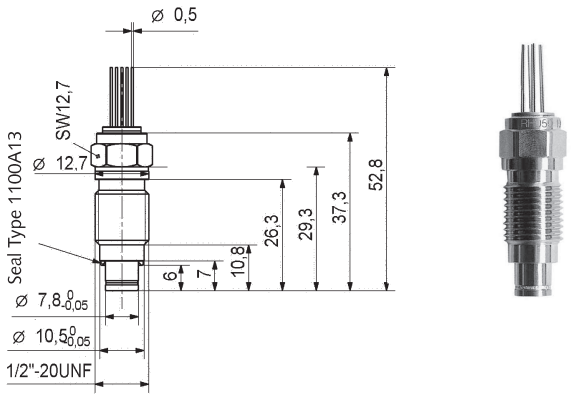
High Pressure OEM Sensor

Type RHU50...

for Pressures from 100 ... 3 000 bar

Unlike many other pressure transducers, the series RH high pressure/high temperature sensors can directly measure pressure in media up to 300 °C. Due to the unique design of the silicon measuring cell it does not require any toxic or unstable liquid fills. The pressure transducer's rugged diaphragm makes the series RH suitable for the toughest conditions in hydraulics and process control. The outstanding stability and high accuracy as well as its high natural frequency gives added advantages and allows the measurement of static and dynamic pressure changes.



- Pressure ranges up to 3 000 bar
- Temperature range up to 300 °C
- High lifetime and overload capabilities
- Temperature output (with amplifier Type 4620)
- Excellent long term stability
- High accuracy

The transducers are available as absolute pressure types with closed Wheatstone bridge output with pressure ranges from 0 ... 100 to 3 000 bar. For improved accuracy and thermal compensation they can also be supplied with a set of coefficients for digital sensor compensation.
The sensors are designed as small as possible to fit a large variety of fittings and can be mounted easily into many applications.
Optionally it is possible to provide a temperature output signal by use of the change in bridge resistance (constant current supply) and by using a digital sensor compensation.
Combined with an amplifier Type 4620 (digital compensation) or Type 4618 (analog compensation) the output signal of the transducer can be converted into an industrial 0 ... 10 V and/or 4 ... 20 mA output signal.

Applications
The RH-series transducers can be used for a wide range of important applications in process control applications.

Examples
- Equipment and apparatus manufacturing
  High pressure hydraulic and process control
- Instruments for Off-Shore industry, oil and gas exploration
- Food and dairy applications
- Chemical, petrochemical and pharmaceutical applications
- High pressure pumps
- Hydraulic machine tools
- High pressure reactors
- Down hole tools
- Food extrusion
- Paint, resins and glue processing

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This information corresponds to the current state of knowledge. Kistler reserves the right to make technical changes. Liability for consequential damage resulting from the use of Kistler products is excluded.

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Technical Data

Type RHU50...		...B01...	...B02...	...B05...	...B10...	...B20...	...B30...
Ranges	bar abs.	0 ... 100[2)]	0 ... 200[2)]	0 ... 500	0 ... 1 000	0 ... 2 000	0 ... 3 000[3)]
Overload	bar abs.	250	500	1 100	2 500	3 000	3 500
Sensitivity of transducer, typical (±20 %)	mV@2 mA	150	225	300	350	450	850

Compensated Temperature Range		
Standard	°C	25 ... 225
Option L (Low)	°C	25 ... 120
Option H (High)	°C	25 ... 300
Reference temperature	°C	25
Operating temp. at diaphragm	°C	–10 ... 300
Storage temp. range	°C	–40 ... 100
Max. temperature at GFT	°C	300
Max. temperature GFT pins	°C	depends on selected wiring technique –› customers choice

General Data		
Zero offset signal of sensor, typical	mV@2 mA	100 ... 250 @25 °C
Output impedance at 25 / 300 °C, typ.	Ω	3 200/7 000 ±10 %
Repeatability[1)]	%FS	±0,2
Pressure hysteresis1[1)]	%FS	±0,3
Thermal hysteresis, typical[1)]	%FS	±1
Natural frequency	kHz	≥100
Shock resistance	g	≥1 000
Acceleration error (100 Hz ... 10 kHz)	mbar/g	<10
Electrical connection		7-pin Glass Feed Through (GDF)
Process connection		1/2-20 UNF-2A other process connection available on request
Degree of protection		IP65, NEMA 4
Material of wetted parts		17-4PH/1.4542
Terminology as per		ANSI/ISA-Standard, ST 37.1-1975 (R1982)

Installation and operating instructions for RH-sensors are described in 002-354m.

Temperature Compensation

To perform over a wide temperature range of 25 ... 300 °C within the specified limits, the sensors require temperature compensation. All our sensors are individually tested and measured.

Because of the well-known and excellent sensor characteristics of silicon pressure measuring elements, it is possible to compensate these individually over the operating temperature range. The constant current supply to the sensors is a preferred method of temperature compensation, because of the auto-compensation effect thereby obtained. Much of the temperature effect will be counteracted this way.

Normally, the remaining temperature dependence of the sensor is compensated by a resistance network connected to the Wheatstone bridge. This takes account of the influence of temperature on the zero and sensitivity but not on the linearity. If the accuracy of this compensation is insufficient, then digital compensation must be used.

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Analog Compensation with Amplifier for Example Type 4618Ax

Range	bar abs.	0 ... 100[2)]	0 ... 200[2)]	0 ... 500	0 ... 1 000	0 ... 2 000	0 ... 3 000
Standard Compensated Temperature Range		**25 ... 225 °C**					
Thermal zero shift	%FS typ./max.	±5/8	±5/5	±2/4	±2/4	±2/4	±2/4
Thermal sensitivity shift	%FS typ./max.	±1/3	±2/2	±1/2	±1/2	±1/2	±1/1
Compensated temperature **Option L**:		**25 ... 120 °C**					
Thermal zero shift	%FS typ./max.	±4/6	±4/4	±2/3	±2/3	±2/3	±2/3
Thermal sensitivity shift	%FS typ./max.	±1/2	±2/2	±1/1	±1/1	±1/1	±1/1
Compensated temperature **Option H**:		**25 ... 300 °C**					
Thermal zero shift	%FS typ./max.	±6/10	±8/8	±3/5	±3/5	±3/5	
Thermal sensitivity shift	%FS typ./max.	±2/4	±3/3	±1/2	±1/2	±1/2	
Linearity (end point)	%FS typ./max.	±0,5/1,0					

Digital Compensation

Detailed research work has revealed that the graph of temperature influences on the sensor can be mathematically expressed as a polynomial p = f (S, Ub) with S = signal [V] and Ub = bridge voltage [V]. An evaluation program has been specifically developed to ascertain the polynomial coefficient necessary for compensation. This includes not only the effect of temperature but also the linearity of the sensor. Model accuracies of <0,1% are thereby possible depending on the order of the polynomial, temperature and pressure range.

At the same time as compensation of the pressure, the temperature can also be compensated using the familiar function of the bridge resistance and reproduced as a linear output signal. The output signal can therefore be reproduced as function T = f (Ub).

Examples of RH Pressure Transducer Digitally Compensated with Polynomial of 3rd Oorder

Specifications for all pressure ranges

Range	bar abs.	0 ... 100[2)]	0 ... 200[2)]	0 ... 500	0 ... 1 000	0 ... 2 000	0 ... 3 000[3)]
Data points pressure	% of FS	0	25	50	75	100	
Thermal zero shift[4)]	%FS	±0,1					
Thermal sensitivity shift[4)]	%FS	±0,1					
Linearity[4)] (end point)	%FS	±0,1					

Standard Compensated Temperature Range	**25 ... 225 °C**				
Data points temperature [°C]	25	100	175	225	
Compensated temperature **Option L**: **25 ... 120 °C**					
Data points temperature [°C]	25	50	85	120	
Compensated temperature **Option H**: **25 ... 300 °C**					
Data points temperature [°C]	25	150	225	300	

1) Values for standard compensated temperature range.
2) 100 bar and 200 bar types only supplied with amplifier 4620A2.
3) For a safe operation of the sensor, precautions must be taken to select the type of sensor and corresponding gasket/seal according to the measured medium, pressure and temperature ranges.
   For transducers with pressure ranges >2 000 bar the operating temperature is limited to 225 °C
4) Model behavior (calculation of digital compensation) at data points selected by Kistler.
   For other technical data related to digital compensation of silicon pressure sensors consult data sheet 000-280e.

Note: Kistler supplies complete matched measuring systems comprising of the RH sensor, cable Type 4790Ax and amplifier Type 4620A2 or Type 4618Ax. Please consult data sheet 00_086e for detailed ordering information.

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Installation

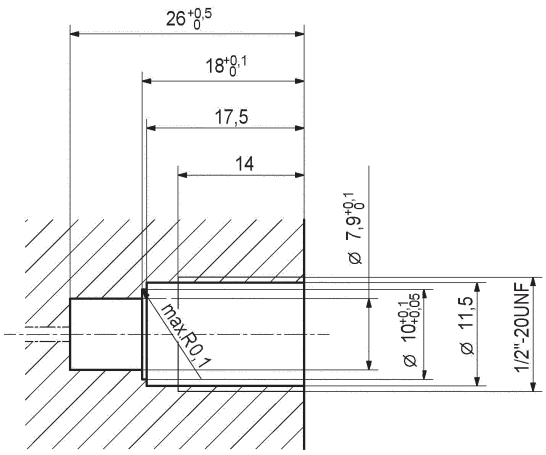


Fig. 1: Mounting bore Type RHU50...

Connections

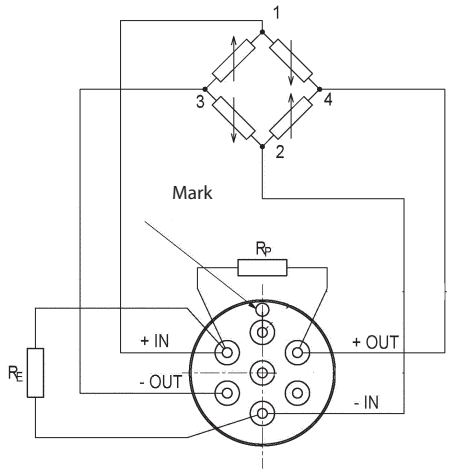
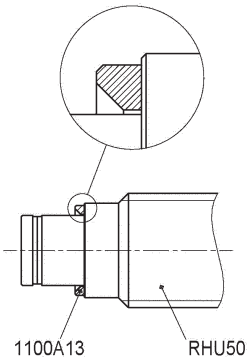


Fig. 3: Electrical connections Type RHU50...



Tightening Torque
RHU50...: 30 N·m

Fig. 2: Seal mounting Type RHU50...

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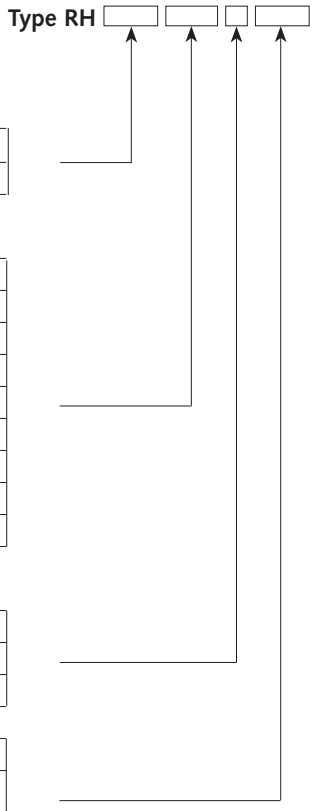
Included Accessories	Type/Art. No.	Optional Accessories	Type/Art. No.
None		• Flat seal ø 10/8 x 1 mm for RHU50...	1100A13

Ordering Key

Bold = Standard Types



1/2-20 UNF-2A	**U50**
Other connections on request	xxx

Measuring Ranges

Measuring ranges 100 bar	**B01**
Measuring ranges 200 bar	**B02**
Measuring ranges 350 bar	B03
Measuring ranges 500 bar	**B05**
Measuring ranges 700 bar	B07
Measuring ranges 1 000 bar	**B10**
Measuring ranges 1 400 bar	B14
Measuring ranges 2 000 bar	**B20**
Measuring ranges 3 000 bar	**B30**

Temperature

Compensated standard temperature range 25 ... 225 °C	**S**
Low compensated temperature range 25 ... 120 °C	L
High compensated temperature range 25 ... 300 °C	H

OEM Sensor Moduls standard	**V9G**
Costumized version e.g. special digital compensation with polynominal of higher degrees or other temperature compensation (on request only).	V0xxx

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