

# High Pressure OEM Sensor RHU50

Type RHU50...

## for Absolute 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 4620A...)
- Excellent long term stability
- High accuracy

### Description

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.

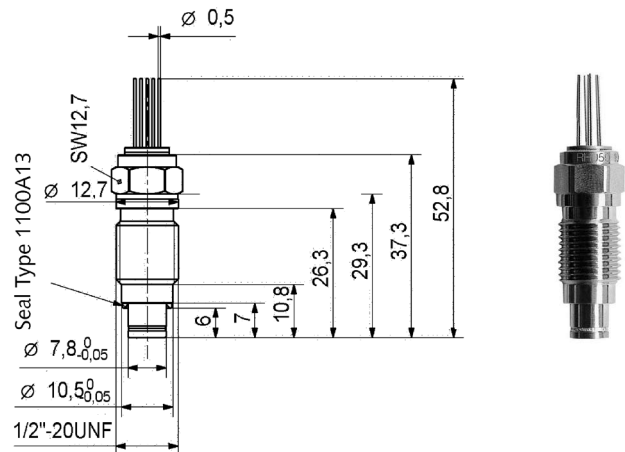
The sensors are designed as small as possible to fit a large variety of fittings and can be mounted easily into many applications.

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 4620A... (digital compensation) or Type 4618A... (analog compensation) the output signal of the transducer can be converted into an industrial 0 ... 10 V and/or 4 ... 20 mA output signal.

### Application

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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**Technical Data**

Type RHU50...		...B01...	...B02...	...B05...	...B10...	...B20...	...B30...
Ranges	bar abs.	0 ... 100 <sup>2)</sup>	0 ... 200 <sup>2)</sup>	0 ... 500	0 ... 1 000	0 ... 2 000	0 ... 3 000 <sup>3)</sup>
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

**Temperature**

Compensated temperature range	°C	25 ... 225					
Option L (Low)	°C	25 ... 120					
Option H (High)	°C	25 ... 300					
Reference temperature	°C	25					
Operating temperature at diaphragm	°C	-10 ... 300					
Storage temperature range	°C	-40 ... 100					
Max. temperature at GFT	°C	300					
Max. temperature GFT pins	°C	depends on selected wiring technique -> customer's 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 <sup>1)</sup>	%FS	±0,2					
Pressure hysteresis <sup>1)</sup>	%FS	±0,3					
Thermal hysteresis, typical <sup>1)</sup>	%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)					

<sup>1)</sup> Values for standard compensated temperature range.

<sup>2)</sup> 100 bar and 200 bar types only supplied with amplifier Type 4620A2.

<sup>3)</sup> 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.

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 <sup>2)</sup>	0 ... 200 <sup>2)</sup>	0 ... 500	0 ... 1 000	0 ... 2 000	0 ... 3 000
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**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			

<sup>2)</sup> 100 bar and 200 bar types only supplied with amplifier Type 4620A2.

**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  $S = \text{signal [V]}$  and  $Ub = \text{bridge voltage [V]}$ .

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.

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  $T = f(Ub)$ .

**Example of RH Pressure Transducer Digitally Compensated with Polynomial of 3<sup>rd</sup> Order**

**Specifications for all Pressure Ranges**

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

**Standard Compensated Temperature Range 25 ... 225 °C**

Data points temperature [°C]	25	100	175	225	
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**Compensated temperature Option L: 25 ... 120 °C**

Data points temperature [°C]	25	50	85	120	
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**Compensated temperature Option H: 25 ... 300 °C**

Data points temperature [°C]	25	150	225	300	
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<sup>2)</sup> 100 bar and 200 bar types only supplied with amplifier Type 4620A2.

<sup>3)</sup> 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.

<sup>4)</sup> 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 RHSYS\_000-086e for detailed ordering information.

**Mounting Examples**

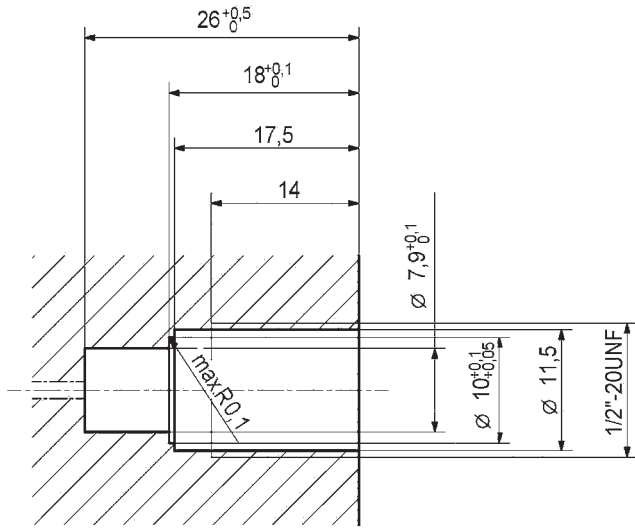


Fig. 1: Mounting bore Type RHU50...

**Connection**

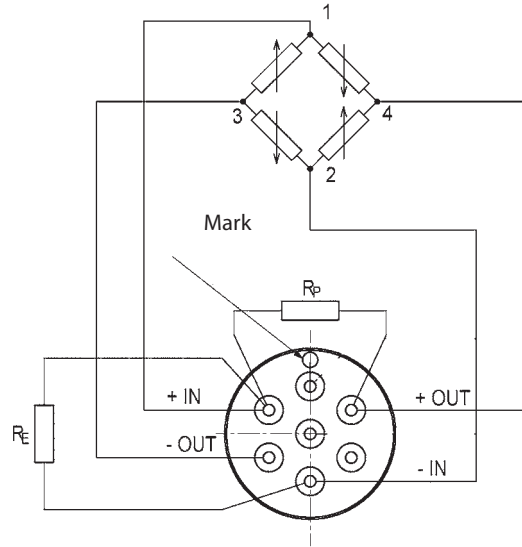
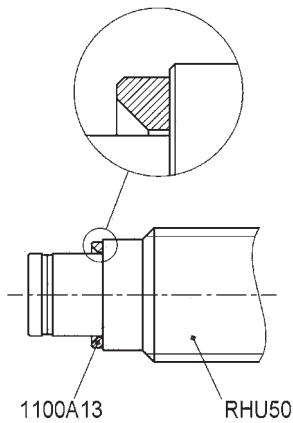


Fig. 3: Electrical connections Type RHU50...



**Tightening Torque**  
RHU50...: 30 N·m

Fig. 2: Seal mounting Type RHU50...

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**Included Accessories**

None

**Optional Accessories**

- Flat seal  $\varnothing 10/8 \times 1$  mm for RHU50...

**Type/Art. No.**  
1100A13

**Ordering Key**

**Bold** = Standard Types

$1/2$ -20 UNF-2A	<b>U50</b>
Other connections on request	xxx

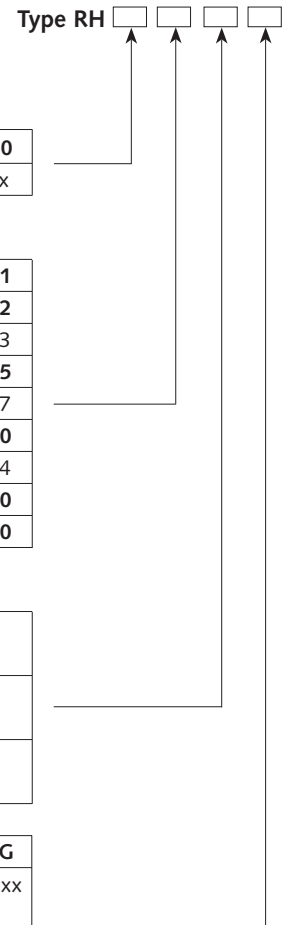
**Measuring Ranges**

Measuring range 100 bar	<b>B01</b>
Measuring range 200 bar	<b>B02</b>
Measuring range 350 bar	B03
Measuring range 500 bar	<b>B05</b>
Measuring range 700 bar	B07
Measuring range 1 000 bar	<b>B10</b>
Measuring range 1 400 bar	B14
Measuring range 2 000 bar	<b>B20</b>
Measuring range 3 000 bar	<b>B30</b>

**Temperature**

Compensated standard temperature range 25 ... 225 °C	<b>S</b>
Low compensated temperature range 25 ... 120 °C	L
High compensated temperature range 25 ... 300 °C	H

OEM sensor module	<b>V9G</b>
Costumized version e.g. special digital compensation with polynomial of higher degrees or other temperature compensation (on request only)	V0xxx



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