

Pressure sensor module

From 0.4 to 1,600 bar

Model TI-1

WIKA data sheet PE 81.57

Applications

- Integration into data loggers, pressure controllers and hand-helds
- Basis for pressure sensors

Special features

- Digital or analogue output signals
- Non-linearity to 0.125 % of span
- Measuring range 0 ... 0.4 to 0 ... 1,600 bar [0 ... 10 to 0 ... 15,000 psi]
- Common international process connections



Examples for the model TI-1 pressure sensor module

Description

Optimal basis

The model TI-1 pressure sensor module serves as the core for the widest variety of products such as pressure sensors, data loggers, pressure controllers or as components in hand-held measuring instruments.

WIKA uses the model TI-1 as the basis of pressure measuring instruments for the highest industrial requirements. This guarantees a reliability of supply over many years.

As a customer, you profit from our long experience in the field of sensor manufacturing and compensation.

State-of-the-art manufacturing

The pressure sensor module is manufactured on state-of-the-art production equipment, enabling the greatest flexibility and fast lead times. The manufacturing concept offers continuous traceability for each produced unit, down to an individual component level.

Individual designs

A wide range of designs in the area of process connections and mechanical connections to the case is already available.

On request, further customisations can be developed in order to meet customer demands to the full extent.

Technical aspects

As output signals, digital signals such as UART, I²C and SPI or an analogue voltage signal are available.

Via the digital interface, the sensor unit can provide further information, e.g. the sensor temperature.

Following assembly, a zero point and span correction can be carried out.

Specifications

Optionally the model TI-1 is available with an improved non-linearity. Depending on the selected non-linearity the following values result:

Accuracy specifications	Non-linearity $\leq \pm 0.5$ % of span	Non-linearity $\leq \pm 0.25$ % of span	Non-linearity $\leq \pm 0.125$ % of span ¹⁾
Non-linearity per IEC 61298-2			
Per BFSL	$\leq \pm 0.5$ % of span	$\leq \pm 0.25$ % of span	$\leq \pm 0.125$ % of span
Per terminal method	$\leq \pm 1$ % of span	$\leq \pm 0.5$ % of span	$\leq \pm 0.25$ % of span
Accuracy	→ See “Max. measured error per IEC 61298-2”		
Max. measured error per IEC 61298-2	$\leq \pm 1$ % of span	$\leq \pm 0.5$ % of span	$\leq \pm 0.25$ % of span

1) Restrictions for the non-linearity of 0.125 % BFSL or 0.25 % per terminal method:
 Available output signals: 4 ...20 mA and DC 0 ... 10 V
 Available measuring ranges: All measuring ranges specified in the data sheet
 Other output signals or measuring ranges on request

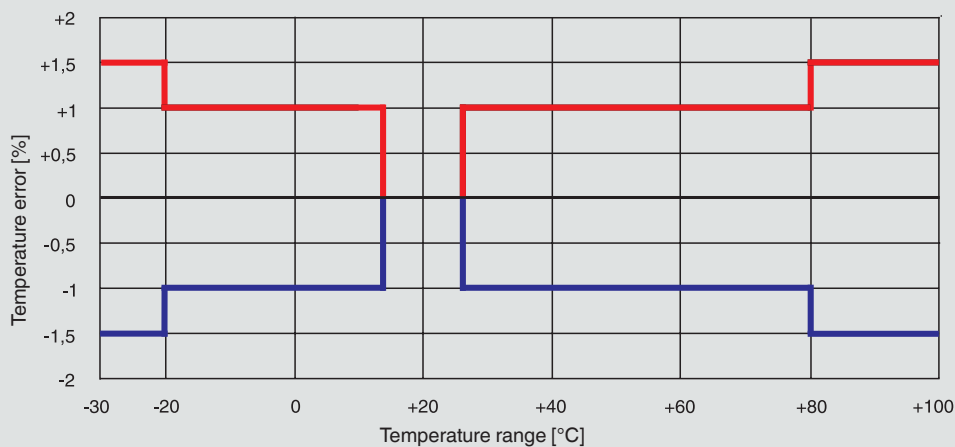
Further details on: Accuracy specifications

Adjustability

Zero point	$\pm 0 \dots 20$ %
Span	$\pm 0 \dots 20$ %
Temperature error	→ See below
Long-term drift per IEC 61298-2	For measuring ranges < 1 bar ≤ 0.1 % of span
	For measuring ranges ≥ 1 bar ≤ 0.2 % of span
Reference conditions	Per IEC 61298-1

Temperature error

For measuring ranges < 1 bar, special measuring ranges and instruments with an increased overpressure limit the respective temperature error increases by 0.5 % of span.



Measuring ranges, gauge pressure

bar	
0 ... 0.4	0 ... 40
0 ... 0.6	0 ... 60
0 ... 1	0 ... 100
0 ... 1.6	0 ... 160
0 ... 2.5	0 ... 250
0 ... 4	0 ... 400
0 ... 6	0 ... 600
0 ... 10	0 ... 1,000
0 ... 16	0 ... 1,600
0 ... 25	

psi	
0 ... 10	0 ... 500
0 ... 15	0 ... 600
0 ... 25	0 ... 750
0 ... 30	0 ... 1,000
0 ... 50	0 ... 1,500
0 ... 60	0 ... 2,000
0 ... 100	0 ... 3,000
0 ... 150	0 ... 4,000
0 ... 160	0 ... 5,000
0 ... 200	0 ... 6,000
0 ... 250	0 ... 7,500
0 ... 300	0 ... 10,000
0 ... 400	0 ... 15,000

Measuring ranges, absolute pressure

bar abs.	
0 ... 0.4	0 ... 6
0 ... 0.6	0 ... 10
0 ... 1	0 ... 16
0 ... 1.6	0 ... 25
0 ... 2.5	0 ... 40
0 ... 4	

psi abs.	
0 ... 10	0 ... 150
0 ... 15	0 ... 160
0 ... 25	0 ... 200
0 ... 30	0 ... 250
0 ... 50	0 ... 300
0 ... 60	0 ... 400
0 ... 100	0 ... 500

Vacuum and +/- measuring ranges

bar	
-0.4 ... 0	-1 ... +5
-0.6 ... 0	-1 ... +9
-1 ... 0	-1 ... +15
-1 ... +0.6	-1 ... +24
-1 ... 1.5	-1 ... +39
-1 ... +3	-1 ... +59

psi	
-30 inHg ... 0	-30 inHg ... +100
-30 inHg ... +15	-30 inHg ... +160
-30 inHg ... +30	-30 inHg ... +200
-30 inHg ... +45	-30 inHg ... +300
-30 inHg ... +60	-30 inHg ... +500

Other measuring ranges on request.

Further details on: Measuring range

Overpressure limit

- | | |
|-------------------------------------|---|
| Measuring ranges < 10 bar [150 psi] | <input type="checkbox"/> 3 times
<input type="checkbox"/> 5 times |
| Measuring ranges ≥ 10 bar [150 psi] | <input type="checkbox"/> 2 times ¹⁾
<input type="checkbox"/> 3 times ^{2) 3)} |

The overpressure limit is based on the sensor element used. A higher overpressure limit will result in a higher temperature error.

Vacuum resistance

Yes

1) Restriction: max. 60 bar [870 psi] with absolute pressure

2) Only possible for gauge pressure measuring ranges ≤ 400 bar [5,800 psi]

3) Only possible for absolute pressure measuring ranges < 16 bar [220 psi]

Process connection					
Standard	Thread size	Max. measuring range	Overpressure limit	Optional pressure port	Sealing
EN 837	G 1/8 B	400 bar [5,800 psi]	572 bar [8,290 psi]	-	■ Copper ■ Stainless steel
	G 1/4 B ¹⁾	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in] ■ 6 mm [0.24 in] ²⁾	
	G 1/4 female thread	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	-	-
	G 1/2 B ¹⁾	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in]	■ Copper ■ Stainless steel
	G 3/8 B	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	-	
DIN EN ISO 1179-2 (formerly DIN 3852-E)	G 1/4 A ¹⁾	600 bar [8,700 psi]	858 bar [12,440 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in]	■ NBR ■ FPM/FKM
		1,000 bar [15,000 psi]	1,480 bar [21,400 psi]		
	G 1/2 A	600 bar [8,700 psi]	858 bar [12,440 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in] ■ 12 mm [0.48 in] ²⁾	■ NBR ■ FPM/FKM
	M14 x 1.5	600 bar [8,700 psi]	858 bar [12,440 psi]	-	■ NBR ■ FPM/FKM
DIN 16288	M20 x 1.5	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in]	■ Copper ■ Stainless steel
	M12 x 1.5	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in]	
SAE J514 E	7/16-20 UNF BOSS	600 bar [8,700 psi]	858 bar [12,440 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in] ■ 6 mm [0.24 in] ²⁾	■ NBR ■ FPM/FKM
	7/16-20 UNF J514 sealing cone 74°	800 bar [11,600 psi]	1,144 bar [16,500 psi]	-	-
	9/16-18 UNF BOSS	600 bar [8,700 psi]	858 bar [12,440 psi]	-	■ NBR ■ FPM/FKM
ANSI/ASME B1.20.1	1/8 NPT	400 bar [5,800 psi]	572 bar [8,290 psi]	-	-
	1/4 NPT	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in] ■ 6 mm [0.24 in] ²⁾	
	1/4 NPT female thread	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	-	
	1/2 NPT ¹⁾	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in] ■ 12 mm [0.48 in] ²⁾	
KS	PT 1/4 ¹⁾	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in] ■ 6 mm [0.24 in] ²⁾	-
	PT 3/8	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	-	
	PT 1/2	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	-	
ISO 7	R 1/4 ¹⁾	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	■ 0.3 mm [0.01 in] ■ 0.6 mm [0.02 in] ■ 6 mm [0.24 in] ²⁾	-
	R 3/8	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	-	
	R 1/2	1,000 bar [15,000 psi]	1,480 bar [21,400 psi]	-	

1) For medium temperatures up to 150 °C [302 °F] or 200 °C [392 °F] available with cooling section.

2) Wider pressure port with 6 mm [0.24 in] or 12 mm [0.48 in] only available for measuring ranges up to and including 0 ...40 bar [0 ... 500 psi].

Other process connections and sealings on request.

Further details on: Process connection	
Max. measuring range	→ See above
Overpressure limit	→ See above
Sealing	→ See above
Possible limitations	Depending on the sealing on the process connection, there may be limitations in the medium and ambient temperatures and in the overpressure limit.
NBR	-20 ... +100 °C [-4 ... +212 °F]
FPM/FKM	-15 ... +125 °C [-5 ... +257 °F]
Copper	-40 ... +125 °C [-40 ... +257 °F]
Stainless steel	-40 ... +125 °C [-40 ... +257 °F]

Output signal		
Signal type		
Digital	<ul style="list-style-type: none"> ■ I²C ■ SPI ■ UART ■ Switching output 	
Analogue	DC 0.3 ... 2.7 V	
Communication		
Pulse frequency/ baud rate	SPI	Max. 400 kHz
	I ² C	Max. 45 kHz
	UART	<ul style="list-style-type: none"> ■ 38,400 Bd (standard) ■ 19,200 Bd ■ 9,600 Bd ■ 4,800 Bd
Voltage supply		
Supply voltage	<ul style="list-style-type: none"> ■ DC 3 V ±1 % ■ DC 2.7...3.6 V (has influence on the overall accuracy) 	
Current supply	SPI	2.7 mA (typical)
		3.7 mA (maximum)
	I ² C	2.7 mA (typical)
		3.7 mA (maximum)
	UART	2.1 mA (typical)
Voltage/ switching signal	2.8 mA (typical)	
	3.7 mA (maximum)	
Dynamic behaviour		
Settling time per IEC 61298-2	Max. 15.5 ms	
Switch-on time	Max. 300 ms	
Start-up drift	Max. 5 s	

Electrical connection	
Connection type	ERNI - Microstac 0.8 mm Mezzanine connector system

Other electrical connections on request.

Pin assignment

Pin	Description	UART	SPI	I ² C
X1.1	Chip-Select	-	CS	-
X1.2	Serial Clock	-	-	-
X1.3	Master Out Slave In	-	-	-
X1.4	Master In Slave Out	-	-	-
X1.5	Serial Clock	-	SCLK	SCL
X1.6	Serial Data	-	MOSI	SDA
X2.1	Analogue Supply Voltage	AVDD	AVDD	AVDD
X2.2	Analogue/Digital Ground	GND	GND	GND
X2.3	Digital Supply Voltage	DVDD	DVDD	DVDD
X2.4	GPIO/DAC	Voltage or switching signal ¹⁾	MISO	-
X2.5	Serial UART Transmit	TxD	-	-
X2.6	Serial UART Receive	RxD	-	-

1) Optional

Operating conditions

Medium temperature limit	-40 ... +125 °C [-40 ... +257 °F]
Ambient temperature limit	-40 ... +125 °C [-40 ... +257 °F]
Storage temperature limit	-40 ... +70 °C [-40 ... +158 °F]

Optional temperature output

Output signal	Only for digital output signals	
Max. measuring deviation		
For measuring ranges between -30 ... +100 °C [-22 ... +212 °F]	Typical	4 K
	Maximum	12 K

Packaging and instrument labelling

Packaging	<ul style="list-style-type: none"> ■ Individual packaging ■ Multiple packaging (up to 40 pieces possible)
Instrument labelling	<ul style="list-style-type: none"> ■ WIKA product label, lasered ■ Customer-specific product label on request

Manufacturer's information

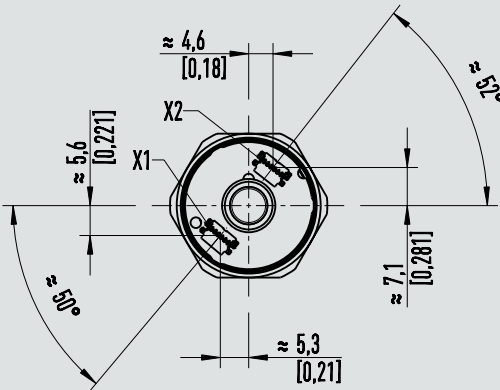
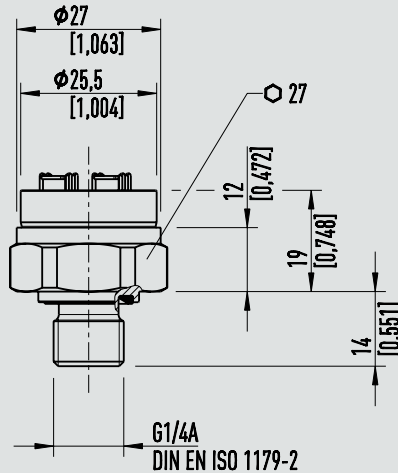
Logo	Description
-	China RoHS directive

Test report

Test report	
Non-linearity $\leq \pm 0.5$ % of span	3 measuring points
Non-linearity $\leq \pm 0.25$ % of span	5 measuring points
Non-linearity $\leq \pm 0.125$ % of span	5 measuring points

Dimensions in mm [in]

Example,
 DIN EN ISO 1179-2, G 1/4 A



Ordering information

Measuring range / Overpressure limit / Supply voltage / Output signal / Process connection

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