Technical Information Ceraphant PTC31B, PTP31B

Process pressure measurement





Pressure switch for safe measurement and monitoring of absolute and gauge pressure

Application

The Ceraphant is a pressure switch for the measurement of absolute and gauge pressure in gases, vapors, liquids and dust. The Ceraphant can be used internationally thanks to a wide range of approvals and process connections.

Your benefits

- High reproducibility and long-term stability
- Reference accuracy: up to 0.3%
- Customized measuring ranges
 - Turn down up to 5:1
 - Sensor for measuring ranges up to 400 bar (6000 psi)
- Housing and process isolating diaphragm made of 316L
- Optionally available with IO-Link

Operation and electrical connection in accordance with VDMA 24574-1:2008



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About this document

Document function

The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.

Symbols used

Safety symbols

A DANGER

This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

WARNING

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

ACAUTION

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE

This symbol contains information on procedures and other facts which do not result in personal injury.

Electrical symbols

Protective earth (PE)

Ground terminals, which must be grounded prior to establishing any other connections. The ground terminals are located on the inside and outside of the device.

 \pm Ground connection Grounded clamp, which is grounded via a grounding system.

Symbols for certain types of information

Permitted Procedures, processes or actions that are permitted.

Sorbidden Procedures, processes or actions that are forbidden.

🚹 Tip

- Indicates additional information
- Reference to documentation
- 1., 2., 3. Series of steps

Reference to page: 🖺

Result of an individual step: L

Symbols in graphics

A, B, C ... View

1, 2, 3 ... Item numbers

1., 2., 3. Series of steps

Documentation

The following document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads):

For an overview of the scope of the associated Technical Documentation, refer to the following:
 Device Viewer (www.endress.com/deviceviewer): Enter the serial number from the nameplate

• *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

Brief Operating Instructions (KA)

Guide that takes you quickly to the 1st measured value

The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.

Operating Instructions (BA)

Your reference guide

These Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

Terms and abbreviations 1 2 3 4 0 LRL LRV URV URL MWP OPL A0029505

- 1 OPL: The OPL (over pressure limit = sensor overload limit) for the measuring device depends on the lowestrated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Observe pressure-temperature dependency. The OPL may only be applied for a short period of time.
- MWP: The MWP (maximum working pressure) for the sensors depends on the lowest-rated element, with 2 regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Observe pressure-temperature dependency. The maximum working pressure may be applied at the device for an unlimited period. The MWP can be found on the nameplate.
- 3 The maximum sensor measuring range corresponds to the span between the LRL and URL. This sensor measuring range is equivalent to the maximum calibratable/adjustable span.
- 4 The calibrated/adjusted span corresponds to the span between the LRV and URV. Factory setting: 0 to URL. Other calibrated spans can be ordered as customized spans.
- Pressure р
- LRL Lower range limit
- URL Upper range limit
- LRV Lower range value
- URV Upper range value
- TD Turn down. Example see the following section.

Turn down calculation



- Calibrated/adjusted span 1
- Zero point-based span 2
- 3 Upper range limit

Example:

- Measuring cell: 10 bar (150 psi)
- Upper range limit (URL) = 10 bar (150 psi)
- Calibrated/adjusted span: 0 to 5 bar (0 to 75 psi)
- Lower range value (LRV) = 0 bar (0 psi)
- Upper range value (URV) = 5 bar (75 psi)



In this example, the TD is 2:1. This span is based on the zero point.

Measuring principle -

process pressure

measurement

Function and system design

Devices with ceramic process isolating diaphragm (Ceraphire®)

The ceramic sensor is an oil-free sensor, i.e. the process pressure acts directly on the robust ceramic process isolating diaphragm and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process isolating diaphragm. The measuring range is determined by the thickness of the ceramic process isolating diaphragm.

Advantages:

- Guaranteed overload resistance up to 40 times the nominal pressure
- The ultrapure 99.9% ceramic (Ceraphire[®], see also "www.endress.com/ceraphire") ensures:
 Extremely high chemical durability
 - High mechanical durability
- Can be used in absolute vacuum
- Small measuring ranges



- 1 Air pressure (gauge pressure sensors)
- 2 Ceramic substrate
- 3 Electrodes
- 4 Ceramic process isolating diaphragm

Devices with metallic process isolating diaphragm

The process pressure deflects the metal process isolating diaphragm of the sensor and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Advantages:

- Can be used for high process pressures
- Fully welded sensor
- Slim, flush-mounted process connections available



- *1* Silicon measuring element, substrate
- 2 Wheatstone bridge
- 3 Channel with fill fluid
- 4 Metal process isolating diaphragm

Measuring system

A complete measuring system comprises:



1 PLC (programmable logic controller)

- 2 E.g., RMA42/RIA45 (if required)
- 3 Device

Device features Field of application

Gauge pressure and absolute pressure

Process connections

PTC31B:

- Thread
- Thread ANSI
- Thread M24 x 1.5
- Thread JIS
- PTP31B:
- Thread ISO 228, also flush mount
- Thread ASME
- Thread DIN 13
- Thread ASME
- Thread JIS

Measuring ranges

- PTC31B: from 0 to +100 mbar (0 to +1.5 psi) to 0 to +40 bar (0 to +600 psi).
- PTP31B: from 0 to +400 mbar (0 to +6 psi) to 0 to +400 bar (0 to +5800 psi).

OPL (depends on the measuring range)

- PTC31B: max. 0 to +60 bar (0 to +900 psi)
- PTP31B: max. -1 to +600 bar (-15 to +9000 psi)

MWP

Max. 1 to +400 bar (15 to +6000 psi)

Process temperature range (temperature at process connection)

- PTC31B: -25 to +100 °C (-13 to +212 °F)
- PTP31B: -40 to +100 °C (-40 to +212 °F)

Ambient temperature range

-20 to $+70\ ^\circ C$ (-4 to $+158\ ^\circ F)$ (in the range of the temperature limits with restrictions in optical properties, such as display speed and contrast)

Reference accuracy

- Standard: up to 0.5 %
- Platinum: up to 0.3 %

Supply voltage

- Analog: 10 to 30 V_{DC}
- IO-Link: 10 to 30 V_{DC} on a direct current power unit

IO-Link communication is guaranteed only if the supply voltage is at least 18 V.

Output

Devices with IO-Link: C/Q output for communication (SIO mode (switch output))

- 1 x PNP switch output (three-wire) (not with IO-Link)
- 2 x PNP switch output (four-wire), IO-Link
- 1 x PNP switch output + 4 to 20 mA output (four-wire), IO-Link

Material

PTC31B:

- Housing made of 316L (1.4404)
- Process connections made of 316L
- Process membrane made of Al₂O₃ aluminum-oxide ceramic, (Ceraphire[®]), ultrapure 99.9 % PTP31B:
- Housing made of 316L (1.4404)
- Process connections made of 316L (1.4404)
- Process membrane made of 316L (1.4435)

Options

PTC31B:

- Calibration certificate
- Cleaned of oil and grease
- Min. alarm current setting
- 3.1 Material certificates
- Cleaned for O₂ applications
- IO-Link
- PTP31B:
- Calibration certificate
- Cleaned of oil and grease
- Min. alarm current setting
- 3.1 Material certificates
- IO-Link



Overview of product design for IO-Link communication version	Item	Description
C C C C C C C C C C C C C C C C C C C	С	M12 plug Housing cap made of plastic
D	D E	Housing Process connection (sample illustration)
E		
D		

System integration

The device can be given a tag name (max. 32 alphanumeric characters).

Name	Option ¹⁾
Measuring point (TAG), see additional specifications	Z1

1) Product Configurator, order code for "Marking"

For devices with IO-Link, an IO-DD is available in the Downloads area of the Endress+Hauser website $\rightarrow \cong$ 39.

Input

Measured variable

Measured process variable

Gauge pressure and absolute pressure

Calculated process variable

Pressure

Measuring range

Ceramic process membrane

Devices for gauge pressure measurement

Sensor	Device	Maximum sensor measuring range		Smallest calibratable	lest MWP OPL ratable	OPL	Factory settings ²⁾	Option ³⁾
		lower (LRL)	upper (URL)	span '				
		[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]		
100 mbar (1.5 psi) ⁴⁾	PTC31B	-0.1 to -1.5	+0.1 (+1.5)	0.02 (0.3)	2.7 (40.5)	4 (60)	0 to 100 mbar (0 to 1.5 psi)	1C
250 mbar (4 psi) 5)	PTC31B	-0.25 (-4)	+0.25 (+4)	0.05 (1)	3.3 (49.5)	5 (75)	0 to 250 mbar (0 to 4 psi)	1E
400 mbar (6 psi) ⁶⁾	PTC31B	-0.4 (-6)	+0.4 (+6)	0.08 (1.2)	5.3 (79.5)	8 (120)	0 to 400 mbar (0 to 6 psi)	1F
1 bar (15 psi) ⁶⁾	PTC31B	-1 (-15)	+1 (+15)	0.2 (3)	6.7 (100.5)	10 (150)	0 to 1 bar (0 to 15 psi)	1H
2 bar (30 psi) ⁶⁾	PTC31B	-1 (-15)	+2 (+30)	0.4 (6)	12 (180)	18 (270)	0 to 2 bar (0 to 30 psi)	1K
4 bar (60 psi) ⁶⁾	PTC31B	-1 (-15)	+4 (+60)	0.8 (12)	16.7 (250.5)	25 (375)	0 to 4 bar (0 to 60 psi)	1M
10 bar (150 psi) ⁶⁾	PTC31B	-1 (-15)	+10 (+150)	2 (30)	26.7 (400.5)	40 (600)	0 to 10 bar (0 to 150 psi)	1P
40 bar (600 psi) ⁶⁾	PTC31B	-1 (-15)	+40 (+600)	8 (120)	40 (600)	60 (900)	0 to 40 bar (0 to 600 psi)	1S

1) Highest turn down that can be set at the factory: 5:1. The turn down is preset and cannot be changed.

Other measuring ranges (e.g.-1 to +5 bar (-15 to 75 psi)) can be ordered with customer-specific settings (see the Product Configurator, order code for "Calibration; Unit" option "U"). It is possible to invert the output signal (LRV = 20 mA; URV = 4 mA). Prerequisite: URV < LRV
 Product Configurator, order code for "Sensor range"

4) Vacuum resistance: 0.7 bar (10.5 psi) abs.

5) Vacuum resistance: 0.5 bar (7.5 psi) abs.

6) Vacuum resistance: 0 bar (0 psi) abs.

Devices for absolute pressure measurement

Sensor	Device	Maximum sensor measuring range		e calibratable	OPL	Factory settings ²⁾	Option ³⁾	
		lower (LRL)	upper (URL)	span '				
		[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]		
100 mbar (1.5 psi)	PTC31B	0	+0.1 (+1.5)	0.1 (1.5)	2.7 (40.5)	4 (60)	0 to 100 mbar (0 to 1.5 psi)	2C
250 mbar (4 psi)	PTC31B	0	+0.25 (+4)	0.25 (4)	3.3 (49.5)	5 (75)	0 to 250 mbar (0 to 4 psi)	2E
400 mbar (6 psi)	PTC31B	0	+0.4 (+6)	0.4 (6)	5.3 (79.5)	8 (120)	0 to 400 mbar (0 to 6 psi)	2F
1 bar (15 psi)	PTC31B	0	+1 (+15)	0.4 (6)	6.7 (100.5)	10 (150)	0 to 1 bar (0 to 15 psi)	2H
2 bar (30 psi)	PTC31B	0	+2 (+30)	0.4 (6)	12 (180)	18 (270)	0 to 2 bar (0 to 30 psi)	2K
4 bar (60 psi)	PTC31B	0	+4 (+60)	0.8 (12)	16.7 (250.5)	25 (375)	0 to 4 bar (0 to 60 psi)	2M
10 bar (150 psi)	PTC31B	0	+10 (+150)	2 (30)	26.7 (400.5)	40 (600)	0 to 10 bar (0 to 150 psi)	2P
40 bar (600 psi)	PTC31B	0	+40 (+600)	8 (120)	40 (600)	60 (900)	0 to 40 bar (0 to 600 psi)	2S

1) Highest turn down that can be set at the factory: 5:1. The turn down is preset and cannot be changed.

2) Other measuring ranges (e.g.-1 to +5 bar (-15 to 75 psi)) can be ordered with customer-specific settings (see the Product Configurator, order code for "Calibration; Unit" option "U"). It is possible to invert the output signal (LRV = 20 mA; URV = 4 mA). Prerequisite: URV < LRV

3) Product Configurator, order code for "Sensor range"

Maximum turn down which can be ordered for absolute pressure and gauge pressure sensors

Devices for gauge pressure measurement

• 6 bar (90 psi), 16 bar (240 psi), 25 bar (375 psi): TD 1:1 to TD 2.5:1

• All other measuring ranges: TD 1:1 to TD 5:1

Devices for absolute pressure measurement

- 100 mbar (1.5 psi), 250 mbar (4 psi), 400 mbar (6 psi): TD 1:1
- 1 bar (15 psi): TD 1:1 to TD 2.5:1
- All other measuring ranges: TD 1:1 to TD 5:1

Metallic process membrane

Devices with gauge pressure measurement

Sensor	Device	Maximum sensor measuring range		Smallest calibratable	MWP OPL	OPL	Factory settings ²⁾	Option ³⁾
		lower (LRL)	upper (URL)	span '				
		[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]		
400 mbar (6 psi) ⁴⁾	PTP31B	-0.4 (-6)	+0.4 (+6)	0.4 (6)	1 (15)	1.6 (24)	0 to 400 mbar (0 to 6 psi)	1F
1 bar (15 psi) ⁴⁾	PTP31B	-1 (-15)	+1 (+15)	0.4 (6)	2.7 (40.5)	4 (60)	0 to 1 bar (0 to 15 psi)	1H
2 bar (30 psi) ⁴⁾	PTP31B	-1 (-15)	+2 (+30)	0.4 (6)	6.7 (100.5)	10 (150)	0 to 2 bar (0 to 30 psi)	1K
4 bar (60 psi) ⁴⁾	PTP31B	-1 (-15)	+4 (+60)	0.8 (12)	10.7 (160.5)	16 (240)	0 to 4 bar (0 to 60 psi)	1M
10 bar (150 psi) ⁴⁾	PTP31B	-1 (-15)	+10 (+150)	2 (30)	25 (375)	40 (600)	0 to 10 bar (0 to 150 psi)	1P
40 bar (600 psi) ⁴⁾	PTP31B	-1 (-15)	+40 (+600)	8 (120)	100 (1500)	160 (2400)	0 to 40 bar (0 to 600 psi)	1S
100 bar (1500 psi) ⁴⁾	PTP31B	-1 (-15)	+100 (+1500)	20 (300)	100 (1500)	160 (2400)	0 to 100 bar (0 to 1500 psi)	1U
400 bar (6000 psi) ⁴⁾	PTP31B	-1 (-15)	+400 (+6000)	80 (1200)	400 (6000)	600 (9000)	0 to 400 bar (0 to 6 000 psi)	1W

1) Highest turn down that can be set at the factory: 5:1. The turn down is preset and cannot be changed.

Other measuring ranges (e.g.-1 to +5 bar (-15 to 75 psi)) can be ordered with customer-specific settings (see the Product Configurator, order code for "Calibration; Unit" option "U"). It is possible to invert the output signal (LRV = 20 mA; URV = 4 mA). Prerequisite: URV < LRV
 Product Configurator, order code for "Sensor range"

4) Vacuum resistance: 0.01 bar (0.145 psi) abs.

Devices with absolute pressure measurement

Sensor	Device	Maximum sensor meas	uring range	Smallest calibratable	MWP	OPL	Factory settings ²⁾	Option ³⁾
		lower (LRL)	upper (URL)	span ''				
		[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]		
400 mbar (6 psi)	PTP31B	0 (0)	0.4 (+6)	0.4 (6)	1 (15)	1.6 (24)	0 to 400 mbar (0 to 6 psi)	2F
1 bar (15 psi)	PTP31B	0 (0)	1 (+15)	0.4 (6)	2.7 (40.5)	4 (60)	0 to 1 bar (0 to 15 psi)	2H
2 bar (30 psi)	PTP31B	0 (0)	2 (+30)	0.4 (6)	6.7 (100.5)	10 (150)	0 to 2 bar (0 to 30 psi)	2K
4 bar (60 psi)	PTP31B	0 (0)	4 (+60)	0.8 (12)	10.7 (160.5)	16 (240)	0 to 4 bar (0 to 60 psi)	2M
10 bar (150 psi)	PTP31B	0 (0)	10 (+150)	2 (30)	25 (375)	40 (600)	0 to 10 bar (0 to 150 psi)	2P
40 bar (600 psi)	PTP31B	0 (0)	+40 (+600)	8 (120)	100 (1500)	160 (2400)	0 to 40 bar (0 to 600 psi)	2S
100 bar (1500 psi)	PTP31B	0 (0)	+100 (+1500)	20 (300)	100 (1500)	160 (2400)	0 to 100 bar (0 to 1500 psi)	2U
400 bar (6000 psi)	PTP31B	0 (0)	+400 (+6000)	80 (1200)	400 (6000)	600 (9000)	0 to 400 bar (0 to 6000 psi)	2W

1) Highest turn down that can be set at the factory: 5:1. The turn down is preset and cannot be changed.

2) Other measuring ranges (e.g. -1 to +5 bar (-15 to 75 psi)) can be ordered with customer-specific settings (see the Product Configurator, order code for "Calibration; Unit" option "U"). It is possible to invert the output signal (LRV = 20 mA; URV = 4 mA). Prerequisite: URV < LRV

3) Product Configurator, order code for "Sensor range"

Maximum turn down which can be ordered for absolute pressure and gauge pressure sensors Ranges 0.5%/0.3%: TD 1:1 to TD 5:1

Output

Output signal	Name Optio					
	PNP switch output + 4 to 20 mA output (4-wire) IO-Link (SSP Ed.2 V1.1)	А				
	2 x PNP switch output + 4 to 20 mA output (4-wire) IO-Link (SSP Ed.2 V1.1)	В				
	PNP switch output (3-wire)	4				
	PNP switch output + 4 to 20 mA output (4-wire), IO-Link	7				
	2 x PNP switch output (4-wire), IO-Link 8					
	1) Product Configurator, order code for "Output"					
Range of adjustment	 Switch output Switch point (SP): 0.5 to 100 % in increments of 0.1% (min. 1 mbar * (0.015 psi)) of t range limit (URL) switchback point (RSP): 0 to 99.5% in increments of 0.1% (min. 1 m psi)) of the upper range limit (URL) Minimum distance between SP and RSP: 0.5 % URL Analog output (if available) Lower range value (LRV) and upper range value (URV) can be set anywhere within the range (LRL - URL). Turn down for analog output up to 5:1 of upper sensor limit (URL). Factory setting (if no customer-specific setting is ordered): Switch point SP1: 90 %; switchback point RP1: 10 %; Switch point SP2: 95 %; switchback point RP2: 15 %; Analog output: LRV 0 %; URV 100 % 	he upper bar * (0.015 e sensor				
	* For measuring ranges with a negative gauge pressure up to 4 bar (60 psi), the increment when setting the switch point is min. 10 mbar (0.15 psi)					
Relay switching capacity	apacitySwitch state ON: $I_a \le 250 \text{ mA}$; switch state OFF: $I_a \le 1 \text{ mA}$ • Devices with IO-Link: Switch state ON ¹⁾ : $I_a \le 200 \text{ mA}^{2}$; Switch state OFF: $I_a \le 100 \mu \text{A}$ • Switch cycles: >10,000,000• Voltage drop PNP: $\le 2 \text{ V}$ • Overload protection: Automatic load testing of switching current;• Max. capacitance load: 14 μ F at max. supply voltage (without resistive load)• Devices with IO-Link: Max. capacitance load: 1 μ F at max. supply voltage (without resistive load)• Max. cycle duration: 0.5 s; min. t_{on} : 4 ms• Max. cycle duration: 0.5 s; min. t_{on} : 40 μ s• Periodic disconnection from protective circuit in the event of overcurrent (f = 2 Hz) and "F80 displayed					
Signal range 4 to 20 mA	3.8 to 20.5 mA					
Load (for devices with analog output)	 alog In order to guarantee sufficient terminal voltage, a maximum load resistance R_L (including line resistance) must not be exceeded depending on the supply voltage U_B of the supply unit. The maximum load resistance depends on the terminal voltage and is calculated according to the following formula: 					

¹⁾ For switch outputs "2 x PNP" and "1 x PNP + 4 to 20 mA output", 100 mA can be guaranteed over the entire temperature range. For lower ambient temperatures, higher currents are possible but cannot be guaranteed. Typical value at 20 °C (68 °F) approx. 200 mA. For switch output "1 x PNP", 200 mA can be guaranteed over the entire temperature range.

²⁾ Deviating from the IO-Link standard, larger currents are supported.



Name	Option
Min. alarm current set	IA ¹⁾
1 low ≤3.6 mA 2 high ≥21 mA 3 last current value	U ²⁾

1) Product Configurator, order code for "Service"

2) Product Configurator order code for "Calibration/unit"

Dead time, time constant

Presentation of the dead time and the time constant:



Dynamic behavior

Analog electronics

	Dead time (t_1) [ms]	Time constant (T63), t ₂ [ms]	Time constant (T90), t ₃ [ms]		
	7 ms	11 ms	16 ms		
Dynamic behavior of switch output	PNP switch output and 2	x PNP switch output: response time ≤2	20 ms		
Damping	Once the supply voltage h measured value present a	nas been applied, damping for the first always corresponds to the actual measu	measured value is at 0, i.e. the first ured value (regardless of damping).		
	A damping affects all outputs (output signal, display): Via local display infinitely variable 0 to 999.9 s Factory setting: 2.0 s				

Energy supply

WARNING

An incorrect connection compromises electrical safety!

- A suitable circuit breaker must be provided for the device in accordance with IEC/EN 61010.
- ▶ Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- ► The device must be operated with a 630 mA fine-wire fuse (slow-blow).

Terminal assignment





2 x PNP switch output R1 and R2



IO-Link: 2 x PNP switch output R1 and R2



M12 plug	Valve plug	Cable
0.63A L+ 3 4 R1 L-	-	1 0.63A L+ $2b R1$ $4 L-$ (a) $1 brown = L+$ $2a black = switch output 1$
		2b white = analog output 4 to 20 mA 3 blue = L- 4 areen/yellow = around
		(a) reference air hose

1 x PNP switch output R1 with additional analog output 4 to 20 mA (active)





Supply voltage

Supply voltage: 10 to 30 V DC at a DC power unit

Supply voltage IO-Link: 10 to 30 V DC at a DC power unit

IO-Link communication is guaranteed only if the supply voltage is at least 18 V.

Current consumption and	Intrinsic power consumption	Alarm current (for devices with analog output) 1)			
alarm signal	≤ 60 mA	≥21 mA (factory setting)			
	Devices with IO-Link: Maximum current consumption: ≤ 300 mA				
	 Setting min. alarm current ≤3.6mA can be ordered via the product order structure. Min. alarm current ≤3.6mA can be configured at the device or via IO-Link. 				
Power supply fault	 Behavior in the event of overvoltage The device works continuously up to the specified characteristics are no l Behavior in the event of undervoltage 	e (>30 V): o 34 V DC without damage. If the supply voltage is exceeded, onger guaranteed. ge:			

If the supply voltage falls below the minimum value, the device switches off in a defined manner.

Electrical connection

Degree of protection

Communication version	Connection	Degree of protection	Option ¹⁾
Analog	Cable 5 m (16 ft)	IP66/67 NEMA Type 4X enclosure	D
	Cable 10 m (33 ft)	IP66/67 NEMA Type 4X enclosure	E
	Cable 25 m (82 ft)	IP66/67 NEMA Type 4X enclosure	F
	Valve plug ISO4400 M16	IP65 NEMA Type 4X enclosure	U

	Communication version	Connection	Degree of protection	Option ¹⁾		
		Valve plug ISO4400 NPT ½	IP65 NEMA Type 4X enclosure	V		
	Analog, IO-Link	M12 plug	IP65/67 NEMA Type 4X enclosure	М		
	1) Product Configurator, order code for "E	lectrical connection"				
Cable specification (analog)	For valve plug: < 1.5 mm ² (16 AWG) and Ø 4.5 to 10 mm (0.18 to 0.39 in)					
Residual ripple	The device operates within the reference accuracy up to ± 5 % of the residual ripple of the supply voltage, within the permitted voltage range.					
Influence of power supply	≤0.005 % of URV/1 V					
Overvoltage protection	The device does not contain any special elements to protect against overvoltage ("wire to ground"). Nevertheless the requirements of the applicable EMC standard EN 61000-4-5 (testing voltage 1kV EMC wire/ground) are met.					

Performance characteristics of the ceramic process membrane

Reference conditions	 As per IEC 60770 Ambient temperature T_A = constant, in the range of: +21 to +33 °C (+70 to +91 °F) Humidity φ = constant, in the range of 5 to 80 % rH Atmospheric pressure p_A = constant, in the range of: 860 to 1060 mbar (12.47 to 15.37 psi) Position of the measuring cell = constant, in the range of: horizontal ±1° (see also "Influence of orientation" section) Zero based span Material of process membrane: Al₂O₃ (aluminum-oxide ceramic, Ceraphire[®]) Supply voltage: 24 V DC ±3 V DC Load: 320 Ω (at 4 to 20 mA output) 							
							re)	
Uncertainty of measurement for small absolute pressure ranges	 The smallest extended uncertainty of measurement that can be delivered by our standards is in the range of 1 to 30 mbar (0.0145 to 0.435 psi): 0.4 % of reading in the range of < 1 mbar (0.0145 psi): 1 % of reading. 							
Influence of orientation	→ 🖺 22							
Resolution	Current output: mi	in. 1.6	μΑ					
	Display: can be set	(facto	ry setting: presentat	tion of the	maximum a	ccuracy	of the transmitter)	
Reference accuracy	The reference accuracy includes the non-linearity [DIN EN 61298-2 3.11] including the hysteresis [DIN EN 61298-23.13] and non-repeatability [DIN EN 61298-2 3.11] in active the limit point method as per [DIN EN 60770].				ncluding the pressure 3.11] in accordance with			
	Device		% of the calibrated	span to th	e maximum t	urn dowi	n	
			Reference accuracy	, I	Non-linearity ¹⁾		Non-repeatability	
	PTC31B - standard		±0.5	=	±0.1		±0.1	
	PTC31B - platinum		±0.3	=	±0.1		±0.1	
	 The non-linearity for the 40 bar (600 psi) sensor can be up to ± 0.15% of the calibrated span up to the maximum turn down. Overview of the turn down ranges → ¹ 12 Ordering information 							
	Name					Optio	n ¹⁾	
	Platinum (on reques	st)				D		
	Standard					G		
	1) Product Config	gurator	, order code for "Refere	ence accurac	2 y "			
Thermal change of the zero output and the output span	Measuring cell	-20	to +85 °C (-4 to +185	5 °F)	-40 to - +85 to +	20 °C (–4 100 °C (+	ŧ0 to −4 °F) •185 to +212 °F)	
		% 0	f the URL for TD 1:1					
	<1 bar (15 psi)	<1			<1.2	<1.2		
	≥1 bar (15 psi)	<0.8	<0.8			<1		
T , , 1 111								
Long-term stability	1 year	5 y	rears	8 years				
				% of the U	RL			
	±0.2	±0	.4	Under de	velopment			

Switch-on time

≤2 s

For small measuring ranges, pay attention to the thermal compensation effects.

Performance characteristics of metallic process membrane

Reference conditions	 As per IEC 60770 Ambient temperature T_A = constant, in the range of: +21 to +33 °C (+70 to +91 °F) Humidity φ = constant, in the range of: 5 to 80 % rH Atmospheric pressure p_A = constant, in the range of: 860 to 1060 mbar (12.47 to 15.37 psi) Position of the measuring cell = constant, in the range of: horizontal ±1° (see also "Influence of orientation" section) Zero based span Process membrane material: AISI 316L (1.4435) Filling oil: synthetic oil polyalphaolefin FDA 21 CFR 178.3620, NSF H1 Supply voltage: 24 V DC ±3 V DC Load: 320 Ω (at 4 to 20 mA output) 							
Uncertainty of measurement for small absolute pressure ranges	The smallest externation of a state of a sta	ended w 1 to 30 r < 1 mbai	ncertainty of meas nbar (0.0145 to 0.4 r (0.0145 psi): 1 %	suremen 435 psi): of readin	t that can be 0.4 % of read g.	delive ng	red by our standards is	
Influence of orientation	→ 🖹 22							
Resolution	Current output: m	in. 1.6 µ	A					
	Display: can be set	: (factory	y setting: presentat	ion of the	e maximum ac	curacy	of the transmitter)	
Reference accuracy	The reference accu hysteresis [DIN EN the limit point me	iracy inc V 61298 thod as j	cludes the non-line -23.13] and non-re per [DIN EN 60770	arity [DIN epeatabili)].	EN 61298-2 ty [DIN EN 61	3.11] L298-2	including the pressure 2 3.11] in accordance with	
	Device		% of the calibrated span to the maximum turn down					
			Reference accuracy	I	Non-linearity	r	Non-repeatability	
	PTP31B - standard		±0.5		±0.1		±0.1	
	PTP31B - platinum		±0.3 ±0.		±0.1).1 ±0.1		
	Overview of the turn down ranges $\rightarrow \cong 12$ Ordering information							
	Name					Opti	on ¹⁾	
	Platinum (on request)						D	
	Standard					G		
	1) Product Confi	gurator, d	order code for "Refere	nce accura	cy"			
Thermal change of the zero output and the output span	Measuring cell	-20 t	:o +85 ℃ (−4 to +185	5 °F)	-40 to -2 +85 to +1	-) 3° 0°. 100 °C (40 to −4 °F) +185 to +212 °F)	
		% of	the calibrated span	for TD 1:1				
	<1 bar (15 psi)	<1			<1.2			
	≥1 bar (15 psi)	<0.8			<1			
Long-term stability	1 year	5 1/0	are	8 vears				
5		Jyc		% of the II	RI.			
	±0.2	+0.4		Under de	evelopment			
			-					
Switch-on time	≤2 s							

The following applies to IO-Link: For small measuring ranges, pay attention to the thermal compensation effects.

Mounting

Installation conditions	 Moisture must not penetrate the housing when mounting the device, establishing the electrical connection and during operation. Point the cable and connector downwards where possible to prevent moisture from entering (e.g. rain or condensation water).
Influence of orientation	Any orientation is possible. However, the orientation may cause a zero point shift, i.e. the measured value does not show zero when the vessel is empty or partially full.



PTP31B

Process membrane axis is horizontal (A)	Process membrane pointing upwards (B)	Process membrane pointing downwards (C)
Calibration position, no effect	Up to +4 mbar (+0.058 psi)	Up to -4 mbar (-0.058 psi)

PTC31B

1

Туре	Process membrane axis is horizontal (A)	Process membrane pointing upwards (B)	Process membrane pointing downwards (C)
< 1 bar (15 psi)	Calibration position, no effect	Up to +0.3 mbar (+0.0044 psi)	Up to -0.3 mbar (-0.0044 psi)
≥ 1 bar (15 psi)	Calibration position, no effect	Up to +3 mbar (+0.0435 psi)	Up to -3 mbar (-0.0435 psi)



A position-dependent zero point shift can be corrected on the device.

_

Pressure measurement

Pressure measurement in gases

Mount the device with shutoff device above the tapping point so that any condensate can flow into the process.



- 1 Device
- 2 Shutoff device

Pressure measurement in vapors

For pressure measurement in vapors, use a siphon. The siphon reduces the temperature to almost ambient temperature. Preferably mount the device with the shutoff device and siphon below the tapping point.

Advantage:

- defined water column causes only minor/negligible measuring errors and
- only minor/negligible heat effects on the device.
 Mounting above the tapping point is also permitted.
- would have the tapping point is also permitted.

Note the max. permitted ambient temperature of the transmitter!

Take the influence of the hydrostatic water column into consideration.



- 1 Device
- 2 Shutoff device
- 3 Siphon
- 4 Siphon

Pressure measurement in liquids

Mount the device with a shutoff device and siphon below or at the same height as the tapping point.

Advantage:

- defined water column causes only minor/negligible measuring errors and
- air bubbles can be released to the process.

Take the influence of the hydrostatic water column into consideration.



- 1 Device
- 2 Shutoff device
- 3 Siphon

Level measurement

- Always install the device below the lowest measuring point.
- Do not install the device at the following positions:
 - in the filling curtain
 - in the tank outlet
 - in the suction area of a pump
 - at a point in the tank which could be affected by pressure pulses from the agitator.
- A functional test can be carried out more easily if you mount the device downstream from a shutoff device.



Mounting instructions for oxygen applications

Oxygen and other gases can react explosively to oils, grease and plastics, such that, among other things, the following precautions must be taken:

- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM requirements.
- Depending on the materials used, a certain maximum temperature and a maximum pressure must not be exceeded for oxygen applications.
- The following table lists devices (devices only, not accessories or enclosed accessories), which are suitable for gaseous oxygen applications.

PTC31B

$\ensuremath{p_{max}}$ for oxygen applications	T _{max} for oxygen applications	Option ¹⁾
40 bar (600 psi)	-10 to +60 °C (+14 to +140 °F)	HB

1) Product Configurator, order code for "Service"

Environment

Ambient temperature range	 Ambient temperature range ³⁾ -20 to +70 °C (-4 to +158 °F) IO-Link: -20 to +70 °C (-4 to +158 °F) (in the range of the temperature limits with restrictions in optical properties, such as display spee and contrast) 					
Storage temperature range	–40 to +85 °C (–4	40 to +185 °F)				
Climate class	Climate class	Note				
	Class 3K5	Air temperature: -5 to +45 °C (+23 to +113 °F), relative humidity: 4 to 95 % satisfied according to IEC 721-3-3 (condensation not possible)				
Degree of protection	Communication version		Connection	Degree of protection	Option ¹⁾	
	Analog		Cable 5 m (16 ft)	IP66/67 NEMA Type 4X enclosure	D	
			Cable 10 m (33 ft)	IP66/67 NEMA Type 4X enclosure	E	
			Cable 25 m (82 ft)	IP66/67 NEMA Type 4X enclosure	F	
			Valve plug ISO4400 M16	IP65 NEMA Type 4X enclosure	U	
			Valve plug ISO4400 NPT ½	IP65 NEMA Type 4X enclosure	V	
	Analog, IO-Link		M12 plug	IP65/67 NEMA Type 4X enclosure	М	

Vibration resistance	Test standard	Vibration resistance			
	IEC 60068-2-64:2008	Guaranteed for 5 to 2000Hz: 0.05g ² /Hz			
Electromagnetic	 Interference emission as per EN 61326-1 equipment B 				
compatibility	 Interference immunity as per EN 61326-1 (industrial environment) Devices with IO-Link: For intended use, the switch output can switch to the communication n 				

for 0.2 s in the event of transient faults.NAMUR recommendation EMC (NE 21) (not for devices with IO-Link)

Maximum deviation: 1.5% with TD 1:1

For more details, please refer to the Declaration of Conformity.

³⁾ Exception: the following cable is designed for an ambient temperature range of -25 to +70 °C (-13 to +158 °F): Product Configurator, order code for "Accessory enclosed" option "RZ".

process memorane	siphon for temperature isolation when installing.Observe the process temperature range of the seal. See also the following table.									
	Seal	Notes	Process temperature range	Option						
	FKM	-	-20 to +100 °C (-4 to +212 °F)	A ¹⁾						
	FKM	Cleaned for O_2 application	-10 to +60 °C (+14 to +140 °F)	$A^{1)}$ and HB ²⁾						
	EPDM 70 - -25 to +100 °C (-13 to +212 °F)									
	1) Produ 2) Produ	 Product Configurator, order code for "Seal" Product Configurator, order code for "Service" 								
	Applications with jumps in temperature Frequent extreme changes in temperatures can temporarily cause measuring errors. Temperature compensation occurs after a few minutes. Internal temperature compensation occurs more quickly the smaller the change in temperature and the longer the time interval involved. For further information please contact your local Endress+Hauser Sales Center.									
Process temperature range for devices with metallic process membrane	−40 to +100 °C (−40 to +212 °F)Applications with jumps in temperature									
	Frequent extreme changes in temperatures can temporarily cause measuring errors. Internal temperature compensation occurs more quickly the smaller the change in temperature and the longer the time interval involved.									
	For further information please contact your local Endress+Hauser Sales Center.									
Pressure specifications	 WARN The maxin regard to For present to the present of th	ING num pressure for the measure pressure. essure specifications, see the "N a. essure Equipment Directive (20 ponds to the MWP (maximum (maximum working pressure): late. This value is based on a re device for an unlimited period ver pressure limit): The test pr ay only be applied temporarily permanent damage develops. er pressure limit (OPL) of the p , the device is set at the factory tion. If you want to use the en- lue. s with ceramic process isolating use zero point drifts. Recomme a on the process isolating diaph ering the next time steam clean agm (e.g. by blowing) has prov	ting device depends on the lowest-radius of the "Mech Measuring range" section and the "Mech D14/68/EU) uses the abbreviation "PS" working pressure) of the measuring de The MWP (maximum working pressure efference temperature of +20 °C (+68 °L of time. Observe the temperature dependence to the over pressure to ensure that the measurement is with In the case of sensor range and process rocess connection is smaller than the pro- try at the very maximum, to the OPL val tire sensor range, select a process conner g diaphragm: avoid steam hammering indation: Residue (water droplets or co aragm following CIP cleaning and can pro- ning takes place. In practice, drying the ed to prevent steam hammering.	Ated element with nanical construction" The abbreviation "PS" evice. re) is specified on the F) and may be applied endency of the MWP. re limit of the sensor thin the specifications so connections where nominal value of the ue of the process nection with a higher ! Steam hammering ndensation) may result in local steam e process isolating						

• For saturated steam applications, use a device with a metallic process membrane, or provide a

Process

-25 to +100 °C (-13 to +212 °F)

Process temperature range for devices with ceramic process membrane

Mechanical construction



For the dimensions, see the Product Configurator: www.endress.com

Search for product \rightarrow click "Configuration" to the right of the product image \rightarrow after configuration click "CAD"

The following dimensions are rounded values. For this reason, they may deviate slightly from the dimensions given on www.endress.com.

Design, dimensions Device height

The device height is calculated from

- the height of the electrical connection
- the height of the housing and
- the height of the individual process connection.

The individual heights of the components are listed in the following sections. To calculate the device height simply add up the individual heights of the components. Where applicable also take into consideration the installation distance (space that is used to install the device). You can use the following table for this purpose:



Electrical connection



Item	Designation	Material	Weight kg (lbs)	Option ¹⁾
A	M12 plug IP65/67 (Additional dimensions $\rightarrow \square 44$)	Housing cap made of plastic	0.012 (0.03)	M Plug connector with cable can be ordered as an accessory → 🗎 44
В	Cable 5 m (16 ft)	PUR (UL94V0)	0.280 (0.62)	D
В	Cable 10 m (33 ft)	PUR (UL94V0)	0.570 (1.26)	E
В	Cable 25 m (82 ft)	PUR (UL94V0)	1.400 (3.09)	F

Item	Designation	Material	Weight kg (lbs)	Option ¹⁾
С	M16 valve plug	Plastic PPSU	0.060 (0.14)	U
С	NPT ½ valve plug	Plastic PPSU	0.060 (0.14)	V

1) Product Configurator, order code for "Electrical connection"

Housing





Position	Device	Material	Weight kg (lbs)		
A	PTC31B	Stainless steel 316L	0.150 (0.33)		
B (up to 100 bar (1500 psi))	PTP31B	Stainless steel 316L	0.090 (0.20)		

Process connections with internal, ceramic process membrane

Thread ISO 228 G



Device	Position	Designation	Material	Weight	Option ¹⁾
				kg (lbs)	
PTC31B	А	Thread ISO 228 G ¼" A, EN 837	316L	0.160 (0.35)	WTJ
PTC31B	В	Thread ISO 228 G ¼" (female)	316L	0.180 (0.40)	WAJ
PTC31B	С	Thread ISO 228 G ½" A, EN 837	316L	0.180 (0.40)	WBJ
PTC31B	D	Thread ISO 228 G ¹ ⁄ ₂ " A, bore11.4 mm (0.45 in)	316L	0.180 (0.40)	WWJ

Process connections with internal, ceramic process membrane



Device	Item	Designation	Material Weight		Approval	Option ¹⁾
				kg (lbs)		
PTC31B	А	ASME ¼" MNPT, bore 3 mm (0.12 in)	316L	0.160 (0.35)	CRN	VUJ
PTC31B	В	ASME ¹ / ₂ " MNPT, ¹ / ₄ " FNPT (female)	316L	0.190 (0.42)	CRN	VXJ
PTC31B	С	ASME ¹ / ₂ " MNPT, bore 11.4 mm (0.45 in)	316L	0.190 (0.42)	CRN	VWJ

Process connections with internal, ceramic process membrane

Thread DIN13



Device	Designation	Material	Weight	Option 1)
			kg (lbs)	
PTC31B	DIN 13 M20 x 1.5, EN 837, bore 3 mm (0.12 in)	316L	0.180 (0.40)	X4J



Process connections with internal, ceramic process membrane

Thread JIS B0203



Device	Designation	Material	Weight	Option ¹⁾
			kg (lbs)	
PTC31B	JIS B0203 R 1/2 (male)	316L	0.180 (0.40)	ZJJ



Position	Device	Description	Material	Nominal value to 100 bar (1500 psi)		Nominal valu 400 bar (600		Option ¹⁾		
				Weight	Jht Height C SW/		Weight	Height C	SW/	
				kg (lbs)		AF	kg (lbs)		AF	
А	PTP31B	Thread ISO 228 G ¼" A, EN 837	316L	0.200 (0.44)	57 (2.24)	32	0.240 (0.53)	69 (2.72)	27	WTJ
В	PTP31B	Thread ISO 228 G ¼" (female)	316L	0.220 (0.49)	57 (2.24)	32	0.260 (0.57)	69 (2.72)	27	WAJ
С	PTP31B	Thread ISO 228 G ½" A, EN 837	316L	0.220 (0.49)	65 (2.56)	32	0.270 (0.60)	77 (3.03)	27	WBJ
D	PTP31B	Thread ISO 228 G 1/2" A, bore11.4 mm (0.45 in)	316L	0.220 (0.49)	62 (2.44)	32	0.260 (0.57)	74 (2.91)	27	WWJ



Engineering unit mm (in)

Item	Device	Designation	Material	Nominal valueNUp to 100 bar (1500 psi)4		Nominal valu 400 bar (600	ie 0 psi)	Approval	Option ¹⁾		
				Weight	Height C	SW/	Weight	Height C	SW/		
				kg (lbs)		AF	kg (lbs)				
A	PTP31B	ASME ¼" MNPT, bore 3 mm (0.12 in)	316L	0.200 (0.44)	55 (2.17)	32	0.240 (0.53)	67 (2.64)	27	CRN	VUJ
В	PTP31B	ASME ½" MNPT, ¼" FNPT (female)	316L	0.230 (0.51)	67 (2.64)	32	0.260 (0.57)	79 (3.11)	27	CRN	VXJ
С	PTP31B	ASME ½" MNPT, bore 11.4 mm (0.45 in)	316L	0.230 (0.51)	67 (2.67)	32	0.270 (0.60)	79 (3.11)	27	CRN	VWJ



Description	Device	Material	Nominal valu to 100 bar (1	Nominal value to 100 bar (1500 psi)		Nominal valu 400 bar (600		Option ¹⁾	
			Weight	Height C	SW/	Weight	Height C	leight C SW/	
			kg (lbs)		AF	kg (lbs)		AF	
DIN 13 M20 x 1.5, EN 837, bore 3 mm (0.12 in)	PTP31B	316L	0.220 (0.49)	65 (2.56)	32	0.260 (0.57)	77 (3.03)	27	X4J

1) Product Configurator, order code for "Process connection"





Description	Device	Material	Nominal value to 100 bar (1500 psi)			Nominal value 400 bar (6000 p		Option ¹⁾	
			Weight	Height C	SW/	Weight	Height C	SW/	
			kg (lbs)		AF	kg (lbs)		AF	
JIS B0203 R ½" (male)	PTP31B	316L	0.230 (0.51)	65 (2.56)	32	0.260 (0.57)	77 (3.03)	27	ZJJ

Process connections with flush mount, metal process membrane

Thread ISO 228 G



Device	Designation	Material	Nominal value to 100 bar (1500) psi)		Nominal value 400 bar (6 000 p	si)		Option ¹⁾
			Weight	Height C SW/	Weight	Height C	SW/		
		kg (lbs)		AF	kg (lbs)		AF		
PTP31B	Thread ISO 228 G ½" A DIN3852, shape E	316L	0.140 (0.31)	41 (1.61)	32	0.120 (0.26)	35 (1.38)	32	WJJ

1) Product Configurator, order code for "Process connection"



Device 1)	Designation	Material	Weight	Option ²⁾
			kg (lbs)	
PTP31B	Thread ISO 228 G ½" A O-ring seal, flush-mounted	316L	0.150 (0.33)	WUJ

1) Suitable for weld-in adapter 52002643 and 52010172

Materials in contact with process

NOTICE

 Device components in contact with the process are listed in the "Mechanical construction" and "Ordering information" sections.

TSE Certificate of Suitability

The following applies to all device components in contact with the process:

- They do not contain any materials derived from animals.
- No additives or operating materials derived from animals are used in production or processing.

Process connections

Endress+Hauser supplies a threaded connection made of stainless steel in accordance with AISI 316L (DIN/ EN material number 1.4404 or 1.4435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2001 Tab. 18. The chemical composition of the two materials can be identical.

Process isolating diaphragm

Description	Material
Ceramic process isolating diaphragm	Al ₂ O ₃ aluminum-oxide ceramic, Ceraphire [®] FDA, ultrapure 99.9 % (see also www.endress.com/ceraphire) The US Food & Drug Administration (FDA) has no objections to the use of ceramics made from aluminum oxide as a surface material in contact with foodstuffs. This declaration is based on the FDA certificates of our ceramic suppliers.
Metal process isolating diaphragm	AISI 316L (DIN/EN material number 1.4435)

Seals

See the specific process connection.





Item number	Component	Material
1	Housing with valve plug connection	 Seal: NBR Plug: PA Screw: V2A Adapter plate: PBT/PC Housing: PBT/PC
2	Housing prepared for M12 plug connection	 Adapter plate: PBT/PC For other materials, see the "Accessories" section Housing: PBT/PC
3	Housing with cable connection	 Pressure screw: PVDF Seal: TPE-V Cable: PUR (UL 94 V0) Adapter plate: PBT/PC Housing: PBT/PC
4	Design element	PBT/PC
5	Nameplates	Plastic foil (attached to housing) or directly lasered onto the housing
6	Housing	316L (1.4404)
7	Pressure compensation element	PBT/PC

Filling oil

Device	Filling oil
PTP31B	Synthetic oil polyalphaolefin FDA 21 CFR 178.3620, NSF H1

Cleaning

Device	Description	Option ¹⁾
PTC31B PTP31B	Cleaned from oil+grease	НА
PTC31B	Cleaned for oxygen service	НВ

1) Product Configurator, order code for "Service"

IO-Link

Operability

Operating concept for devices with IO-Link

Operator-oriented menu structure for user-specific tasks

Operation with local display	Overview
	https://ioddfinder.io-link.com/ Search by • Manufacturer • Article number • Product type
	 http://www.endress.com/download Select "Software" as the media type. Select "Device Driver" as the software type. Select IO-Link (IODD). In the "Text Search" field enter the device name.
	IO-Link download
	 Physical layer, the measuring device supports the following features: IO-Link specification: Version 1.1 IO-Link Smart Sensor Profile 2nd Edition SIO mode: Yes Speed: COM2; 38.4 kBaud Minimum cycle time: 2.5 msec. Process data width: Without Smart Sensor Profile: 32 bit Without Smart Sensor Profile: 48 bit (float32 + 14-bit vendor spec. + 2 bits SSC) IO-Link data storage: Yes Block configuration: Yes
	IO-Link is a point-to-point connection for communication between the measuring device and an IO- Link master. The measuring device features an IO-Link communication interface type 2 with a second IO function on pin 4. This requires an IO-Link-compatible assembly (IO-Link master) for operation. The IO-Link communication interface enables direct access to the process and diagnostic data. It also provides the option of configuring the measuring device while in operation.
	IO-Link information
	Remedial measuresSimulation options
	Efficient diagnostics increase measurement reliability
	Operation in the following languages: Via IO-Link: English
	Reliable operation

A 1-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, fault messages and information messages and therefore supports the user through each operating step.

During measuring operation, the display shows measured values, fault messages and notice messages. In addition, it is possible to switch to menu mode via the operating keys.



- 1 Operating keys
- 2 Status LED
- 3 Switch output LEDs
- 4 Measured value
- 5 Unit

The second switch output is not used for the device version with current output.

Functions:

- 4-digit measured value display and decimal point
- Simple and complete menu guidance due to breakdown of parameters into several levels and groups
- Possibility to configure the display in accordance with individual wishes and requirements
- Comprehensive diagnostic functions (fault and warning message, peak-hold indicators, etc.)
- Quick and safe commissioning
- The device also signals the status via LEDs.

Information on the operational states

Operational states	Function of status-LED and onsite display
Operation	 Status LED is lit green LEDs of switch output 1 and switch output 2 signal the status of each switch output No activity of LED for switch output 2 if current output is active White background lighting
Problem	 Status LED lit steady red Red display background LED of switch output 1 and switch output 2 off (switch output is deactivated)
Warning	 Status LED flashing red White display background LEDs of switch output 1 and switch output 2 signal the status of each switch output
For Device Search	 The green LED is lit (= operational) on the device and starts to flash with increased luminosity. Flash frequency U U U U U U U U LEDs of switch output 1 and switch output 2 signal the status of each switch output Display background depending on the device status
IO-Link communication	 Status LED flashes green as per IO-Link specification (regardless of measuring operation, error or warning). Flash frequency UUUUU Display background depending on the device status The state of switch output 1 is also indicated via the LED of switch output 1 at the same time as the process data are displayed

Device Search (IO-Link)

The Device Search parameter is used to uniquely identify the device during installation.

Certificates and approvals

CE mark	The device meets the legal requirements of the relevant EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.
RoHS	The measuring system complies with the substance restrictions of the Restriction on Hazardous Substances Directive 2011/65/EU (RoHS 2).
RCM marking	The supplied product or measuring system meets the ACMA (Australian Communications and Media Authority) requirements for network integrity, interoperability, performance characteristics as well as health and safety regulations. Here, especially the regulatory arrangements for electromagnetic compatibility are met. The products bear the RCM marking on the nameplate.
	A0029561
Pressure Equipment	Pressure equipment with permitted pressure \leq 200 bar (2900 psi)
Directive 2014/68/EU (PED)	Pressure equipment (maximum allowable pressure PS \leq 200 bar (2 900 psi)) can be classified as pressure accessories in accordance with the Pressure Equipment Directive 2014/68/EU. If the maximum allowable pressure is \leq 200 bar (2 900 psi) and the pressurized volume of the pressure equipment is \leq 0.1 l, the pressure equipment is subject to the Pressure Equipment Directive (see Pressure Equipment Directive 2014/68/EU, Article 4, point 3). The Pressure Equipment Directive only requires that the pressure equipment shall be designed and manufactured in accordance with the "sound engineering practice of a Member State".
	Reasons:
	 Pressure Equipment Directive (PED) 2014/68/EU Article 4, point 3 Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05 + A-06
	Note:
	A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).
	Pressure equipment with allowable pressure > 200 bar (2900 psi)
	Pressure equipment designated for application in every process fluid having a pressurized volume of <0.1 l and a max. allowable pressure PS > 200 bar (2 900 psi) must satisfy the essential safety requirements set out in Annex I of the Pressure Equipment Directive 2014/68/EU. According to Article 13 pressure equipment shall be classified by category in accordance with Annex II. Taking into account the low volume specified above, the pressure instruments can be categorized as category I pressure equipment. They must then bear a CE mark.
	Reasons:
	 Pressure Equipment Directive 2014/68/EU, Article 13, Annex II Pressure equipment directive 2014/68/EU, Commission's Working Group "Pressure", Guideline A-05
	Note:
	A partial examination shall be performed for pressure instruments that are part of safety equipment for the protection of a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).
	The following also applies:
	PTP31B with threaded connection and internal process membrane PN > 200 :
	Suitable for stable gases in group 1, category I, module A

Other standards and guidelines	The applicable European guidelines and standards can be found in the relevant EU Declarations of Conformity. The following were also applied:				
	DIN EN 60770 (IEC 60770):				
	Transmitters for use in industrial process control systems Part 1: Methods for performance evaluation				
	Methods for evaluating the performance of transmitters for control and regulation in industrial process control systems.				
	DIN 16086:				
	Electrical pressure measuring instruments, pressure sensors, pressure transmine measuring instruments, concepts, specifications on data sheets	itters, pressure			
	Procedure for writing specifications in data sheets for electrical pressure meas pressure sensors and pressure transmitters.	suring instruments,			
	EN 61326-X:				
	EMC product family standard for electrical equipment for measurement, contr	col and laboratory use.			
	EN 60529:				
	Degrees of protection provided by enclosures (IP code)				
	NAMUR - User association of automation technology in process industries.				
	NE21 - Electromagnetic Compatibility (EMC) of Industrial Process and Laboratory Control Equipment.				
	NE43 - Standardization of the Signal Level for the Failure Information of Digital Transmitters.				
	NE44 - Standardization of Status Indicators on PCT Instruments with the Help of Light Emitting Diodes				
	NE53 - Software of Field Devices and Signal-processing Devices with Digital Electronics				
	NE107 - Self-monitoring and Diagnosis of Field Devices				
	VDMA 24574-1:2008-04				
	Fluid technology terms, menu navigation and electrical connection for fluid se switches	ensors, Part 1: Pressure			
CRN approval	A CRN approval is available for some device versions. A CRN-approved process CSA approval must be ordered for a CRN-approved device. The CRN-approved the registration number 0F18141.5C.	s connection with a devices are assigned			
	Ordering information: Product Configurator, order code for "Process connectio connections are indicated in the "Mechanical construction" section.)	n" (the CRN process			
Calibration unit	Designation	Option ¹⁾			
	Sensor range; %	A			
	Sensor range; mbar/bar	В			
	Sensor range; kPa/MPa	С			
	Sensor range; psi	F			
	Switch 1; see additional spec.	S			
	Switch 1 + 2; see additional spec.	Т			
	Switch, analog output; see additional spec.	U			

1) Product Configurator, order code for "Calibration; unit"

Calibration

Designation	Option ¹⁾
3-point certificate of calibration ²⁾	F3

1) Product Configurator, order code for "Calibration"

2) No final test report for PNP outputs.

Inspection certificates	Device	Designation	Option ¹⁾
	PTC31B PTP31B	3.1 Material documentation, wetted metal parts, EN10204-3.1 inspection certificate	JA

1) Product Configurator, order code for "Test, certificate"

Documentation currently available on the Endress+Hauser website: www.endress.com \rightarrow Downloads or with the serial number of the device under Online Tools in the Device Viewer.

Service

Printed product documentation

A printed (hard copy) version of test reports, declarations and inspection certificates can optionally be ordered via order code 570 "Service", option I7 "Printed product documentation". The documents are then provided with the device upon delivery.

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate"
 -> Select your country -> Click "Products" -> Select the product using the filters and search field ->
 Open product page -> The "Configure" button to the right of the product image opens the Product
 Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com
 - Product Configurator the tool for individual product configuration
 - Up-to-the-minute configuration data
 - Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
 - Automatic verification of exclusion criteria
 - Automatic creation of the order code and its breakdown in PDF or Excel output format
 - Ability to order directly in the Endress+Hauser Online Shop

Scope of delivery

- Measuring device
- Optional accessories
- Brief Operating Instructions
- Certificates

Accessories

Weld-in adapter

Various weld-in adapters are available for installation in vessels or pipes.

Device	Description	Option ¹⁾	Order number
PTP31B	Weld-in adapter G½, 316L	QA	52002643
PTP31B	Weld-in adapter G½, 316L 3.1 EN10204-3.1 material, inspection certificate	QB	52010172
PTP31B	Weld-in tool adapter G½, brass	QC	52005082

1) Product Configurator, order code for "Accessory enclosed"

If installed horizontally and weld-in adapters with a leakage hole are used, ensure that the leakage hole is pointing down. This allows leaks to be detected as quickly as possible.

M12 plug-in jack	Plug	Degree of protection	Material	Option ¹⁾	Order number
	M12 (self-terminated connection at M12 plug)	IP67	Union nut: Cu Sn/NiBody: PBTSeal: NBR	R1	52006263
	070 53 (2.09) A0024475				
	M12 90 degrees with 5m (16 ft) cable	IP67	Union nut: GD Zn/NiBody: PURCable: PVC	RZ	52010285
	2 2 40 (1.57) A0024476		Cable colors • 1 = BN = brown • 2 = WT = white • 3 = BU = blue • 4 = BK = black		
	M12 90 degrees (self-terminated connection at M12 plug) 28	IP67	 Union nut: GD Zn/Ni Body: PBT Seal: NBR 	RM	71114212
	20 (0.79) A0024478				

1) Product Configurator, order code for "Accessory enclosed"

Field of activities	Pressure measurement, powerful instruments for process pressure, differential pressure, level and flow:		
	FA00004P		
Technical Information	 TI00241F: EMC Test Procedures TI00426F: Weld-in adapters, process adapters and flanges (overview) 		

Documentation

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