

Electronic differential pressure transmitter In primary and secondary circuits Model DPT-EL

WIKA data sheet PE 86.23



for further approvals,
see models IPT-2x and
CPT-2x



Applications

- Chemical and petrochemical industries
- Process engineering
- Pharmaceutical industry
- Food and beverage industry
- Hazardous areas

Special features

- Simple, uncomplicated installation
- Mounting possible without diaphragm seal
- Elimination of capillaries, that can easily kink
- For applications to SIL 2 (SIL 3)
- Can be combined with two different designs of transmitters from model IPT-2x and/or model CPT-2x



Fig. left: Model IPT-20, as secondary instrument
Fig. right: Model CPT-21, as primary instrument with display

Description

In the process industry, differential pressure measurement using primary and secondary circuits has several advantages over conventional differential pressure methods. The measuring locations, which are usually several metres apart, are connected via a flexible and easily routed cable. This eliminates the need for capillaries, which are complex to install and susceptible to temperature changes.

Flexible configuration

Two identical or two different instruments can be combined. The prerequisite is that one of the instruments is used as the primary instrument.

This processes the measured values supplied by both individual instruments. An internal calculation determines the pressure difference and relays it to the controller via the current loop or the bus system. The secondary instrument only supplies the measured values to the primary instrument via a bus line.

The possibilities for combination and the flexible connection often enable a configuration in which diaphragm seals are no longer needed for process separation. For example, a flush system can be used at the bottom of the vessel, while an open process connection in the upper part of the tank poses no problem for measurement in the superimposed gas.

Insensitive to temperature fluctuations

Especially with vessels that are often outdoors, it is problematic when the sun shines on the capillaries. An increase in pressure due to the effects of temperature often falsifies the measuring result.

The cable used for electronic differential pressure measurement has almost no influence on the measuring result when heated.

Specifications

Available measuring instruments

Model	Description
Models IPT-20 and IPT-21	Process transmitter with metal measuring cell with open pressure port or with flush process connection
Models CPT-20 and CPT-21	Process transmitter with ceramic measuring cell with open pressure port or with flush process connection

The arrangement for differential pressure measurement consists of a primary and a secondary instrument. For this purpose, the models IPT-2x and CPT-2x can be combined as desired.

One important prerequisite must be met: Both instruments must measure the same type of pressure. The primary instrument and the secondary instrument must therefore both measure either gauge or absolute pressure.

All technical specifications and instructions from the data sheets of the transmitters used must be observed:

Data sheet IPT-2x: PE 86.06

Data sheet CPT-2x: PE 86.07

Measuring range

The purpose of the configuration is to measure differential pressures. Unlike differential pressure transmitters, these are calculated from the measurements of two separate measuring instruments. It is therefore important to know the exact process conditions for both instruments.

The following prerequisites are necessary in order to select the suitable versions:

- Both transmitters measure the same type of pressure.
- The secondary instrument is ordered configured for electronic differential pressure measurement.
- The primary instrument is set for electronic differential pressure measurement via firmware.
When the combination is ordered ex-works, this setting is already made. However, since the primary instrument can also be used "stand alone", the setting must be checked during commissioning.
- The primary instrument measures the higher pressure.

In addition, the following information is required:

- Maximum total pressure; in order to determine the measuring range of the primary transmitter to be ordered
- Minimum adjustable differential pressure
The pressure range for the secondary instrument results from the operating pressure minus the differential pressure. This is also referred to as the static pressure.

Instrument selection

If the ratio of total pressure to differential pressure is too high, this measuring solution should not be used. The primary instrument would then have to work with a very high scaling factor (large turndown), so that the error caused by the turndown becomes large.

A maximum pressure ratio of 20 is recommended.

Calculation example

- Suitable ratio:
Total pressure / Differential pressure = 16 bar / 2 bar = Turndown 8:1
→ Expected error through TD = 0.16 % with a basic accuracy of 0.1 %
- Unsuitable ratio:
Total pressure / Differential pressure = 40 bar / 1.6 bar = Turndown 25:1
→ Expected error through TD = 0.5 % with a basic accuracy of 0.1 %

The user decides which measuring instrument configuration is sensible to use based on the expected errors. The advantages of the electronic differential pressure system can be lost due to unfavourable pressure conditions.

Signal cable

A shielded four-core cable is supplied, ready-made in the desired length, when ordering the primary and secondary measuring assembly. Mounting is very easy via the spring-clip terminals. The two instruments can thus first be installed in the system and then electrically connected.

Data transfer: Digital (I²C bus)

Connecting cable between primary and secondary instrument

Mechanical data

Construction	Wires, strain relief, braided screen, metal foil, sheath
Standard length	5 m [16.4 ft]
Max. length	25 m [82.02 ft]
Min. bending radius (at 25 °C [77 °F])	25 mm [0.985 in]
Diameter	■ Approx. 8 mm [0.315 in] ■ Approx. 6 mm [0.236 in]
Material	PE, PUR
Colour	Black

Electrical data

Wire cross-section	0.34 mm ² (AWG 22)
Wire resistance	< 0.05 Ω/m [0.015 Ω/ft]

Output signal

Output signal

Signal types	■ 4 ... 20 mA ■ 4 ... 20 mA with a superimposed HART® communication signal (option: SIL qualification) ■ HART® specification: 7.3 ■ FOUNDATION™ Fieldbus ■ PROFIBUS® PA
Load in Ω	$(U_B - U_{Bmin}) / 0.022 \text{ A}$ <small>U_B = Applied supply voltage (→ see table "Supply voltage") U_{Bmin} = Minimum supply voltage (→ see table "Supply voltage")</small>
Damping	0 ... 999 s, adjustable After the set damping time the instrument outputs 63 % of the applied pressure as output signal. Example: A pressure impulse increases from 0 to 10 bar with a damping of 2 seconds. After the 2 seconds a pressure of 6.3 bar is displayed.
Step response time	< 80 ms (= dead time < 25 ms + rise time 10 ... 90 % < 55 ms)

Accuracy specifications

The specifications for accuracy should be taken from the information on the individual instruments used.

For use in hydrogen applications, observe the Technical information IN 00.40 at www.wika.com regarding long-term stability.

Voltage supply

Supply voltage (non-Ex and Ex d)

Signal type	Backlighting	
	Inactive	Active
4 ... 20 mA	DC 12 ... 35 V	DC 16 ... 35 V
4 ... 20 mA with a superimposed HART® communication signal	DC 12 ... 35 V	DC 16 ... 35 V
FOUNDATION™ Fieldbus	DC 12 ... 32 V	DC 16 ... 32 V
PROFIBUS® PA	DC 12 ... 32 V	DC 16 ... 32 V

Supply voltage (Ex ia)

Signal type	Backlighting	
	Inactive	Active
4 ... 20 mA	DC 12 ... 30 V	DC 16 ... 30 V
4 ... 20 mA with a superimposed HART® communication signal	DC 12 ... 30 V	DC 16 ... 30 V
FOUNDATION™ Fieldbus	DC 12 ... 24 V (DC 12 ... 17.5 V Fisco)	DC 16 ... 24 V (DC 16 ... 17.5 V Fisco)
PROFIBUS® PA	DC 12 ... 24 V (DC 12 ... 17.5 V Fisco)	DC 16 ... 24 V (DC 16 ... 17.5 V Fisco)

Process connection

Diaphragm seal

If desired, a diaphragm seal can be attached to both transmitters. Combinations such as in the following example are also possible:

A diaphragm seal is used when the primary sensor comes into contact with the medium, e.g. with vessel measurement. At the secondary sensor, which, for example, comes into contact with the superimposed gas, an unprotected sensor with an open process connection is used without a diaphragm seal.

It is precisely the combination possibilities that distinguish this differential pressure system.

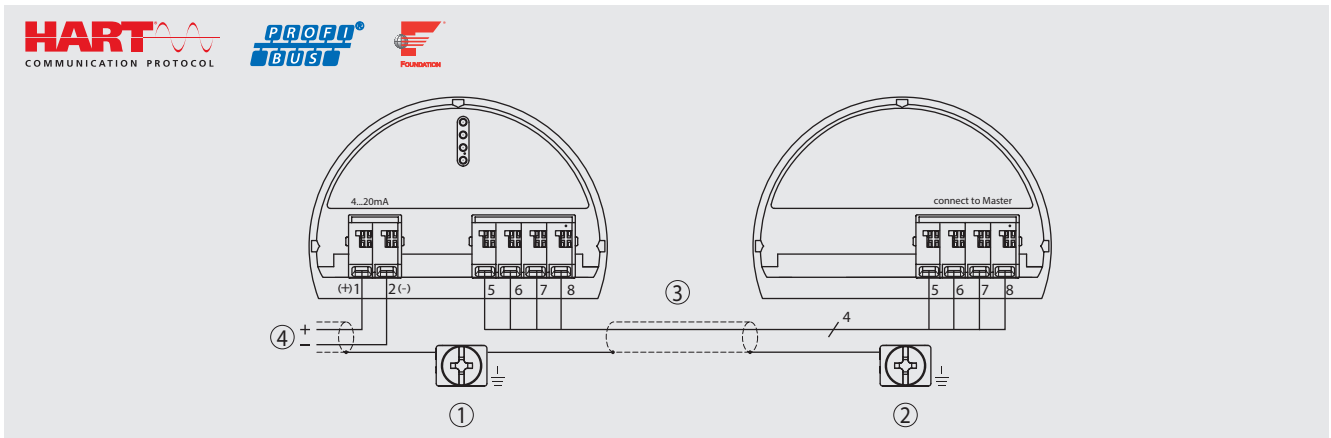


Material	
Case, primary instrument	
Single chamber case, plastic	PBT, polyester
Single chamber case, aluminium	Die-casting AlSi10Mg, powder-coated on PE basis
Single chamber case, cast stainless steel	Stainless steel 316L
Single chamber case, electropolished stainless steel, deep-drawn	Stainless steel 316L
Double chamber case, plastic	PBT, polyester
Double chamber case, aluminium	Die-casting AlSi10Mg, powder-coated on PE basis
Double chamber case, cast stainless steel	Stainless steel 316L
Case, secondary instrument	
Single chamber case, plastic	PBT, polyester
Single chamber case, aluminium	Die-casting AlSi10Mg, powder-coated on PE basis
Single chamber case, cast stainless steel	Stainless steel 316L
Single chamber case, electropolished stainless steel, deep-drawn	Stainless steel 316L

Secondary instrument not possible with display, thus no double chamber case selectable.

Electrical connection

Differential pressure measurement, primary/secondary system

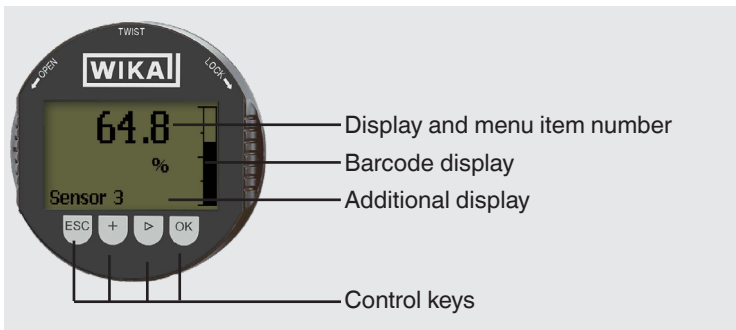


Primary/secondary system

- | | |
|---|---|
| ① | Primary instrument |
| ② | Secondary instrument |
| ③ | 4-core connection cable (included in delivery)
(standard cable length 5 m [16.4 ft], maximum cable length 25 m [82.02 ft]) |
| ④ | Voltage supply / signal output (primary instrument) (→ see “Voltage supply”) |

Display and operating unit (option)

Display and operating unit can only be used on primary instrument.




In the menu item Advanced operation → Commissioning → Application, the primary transmitter is set to the differential pressure function. When this function is switched off, the secondary transmitter then has no function and the primary transmitter works as an ordinary process transmitter for gauge or absolute pressure.

Approvals

→ For approvals and certificates, see website

Manufacturer's information and certificates

Logo	Description
	SIL 2 (option) ¹⁾ Functional safety <ul style="list-style-type: none">■ 1-channel operation up to SIL 2■ Multi-channel operation (homogeneous, redundant) up to SIL 3
-	NAMUR recommendations NE21 - Electrical compatibility of equipment NE43 - Signal level for failure information NE53 - Compatibility of field instruments NE107 - Self-monitoring and diagnostics

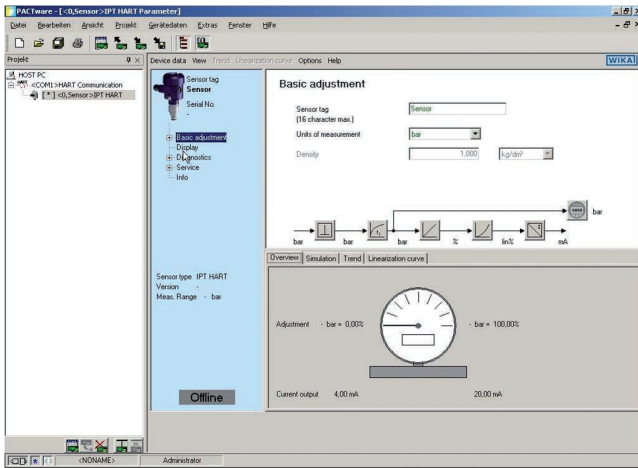
1) Only for output signal 4 ... 20 mA with HART® and with SIL
Max. turndown for SIL applications 10:1

Certificates (option)

- Test certificate for the measurement accuracy included in delivery (5 measuring points in the scaled range)
- 2.2 test report
- 3.1 inspection certificate
- Manufacturer's declaration regarding regulation (EC) 1935/2004
- Manufacturer's declaration regarding regulation (EC) 2023/2006 (GMP)
- DAkkS calibration certificate (traceable and accredited in accordance with ISO/IEC 17025)

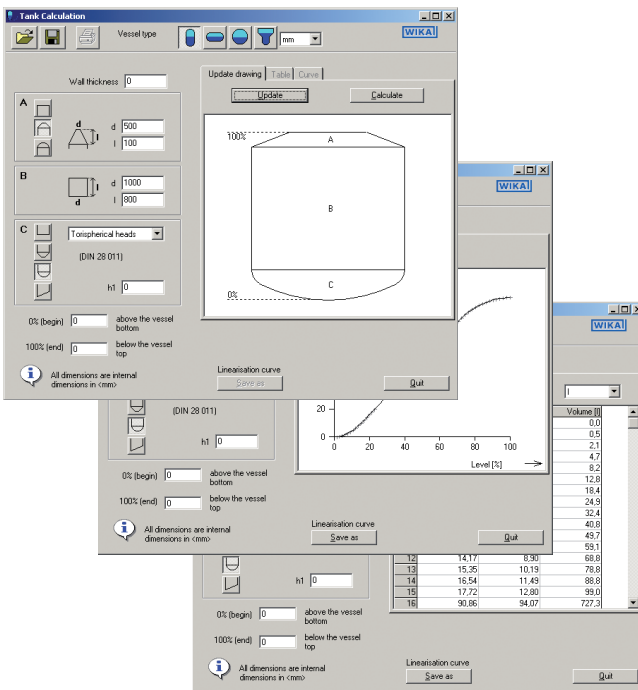
→ For approvals and certificates, see website

User interface DTM



For HART®, PROFIBUS® PA and FF output signals, a DTM is available in accordance with the FDT standard. The DTM provides a self-explanatory and clear user interface for all setup and control processes of the transmitter. For testing purposes, it is also possible to simulate process values and archive the parameter data.

Recording of the measured values is available for diagnostic purposes.



Tank volume calculation

The additional tank volume calculation of the DTM function can be used to reproduce any optional tank geometry. The corresponding linearisation table is generated automatically. The linearisation table can be transferred directly to the transmitter.

Accessories

Description	Order number
 <p>Display module, model DIH52-F 5-digit display, 20-segment bar graph, without separate power supply, with additional HART® functionality. Automatic adjustment of measuring range and span. Secondary-master functionality: Setting the measuring range and unit of the connected transmitter possible using HART® standard commands. Optional: Explosion protection per ATEX</p>	On request
 <p>HART® modem for USB interface, specifically designed for use with notebooks (model 010031) HART® modem for RS-232 interface (model 010001) HART® modem for Bluetooth interface Ex ia IIC (model 010041) PowerXpress HART® modem, with optional power supply (model 010031P)</p>	11025166 7957522 11364254 14133234
 <p>Welding socket for process connection G ½ flush Welding socket for process connection G 1 flush Welding socket for process connection G 1 ½ flush Welding socket for process connection G 1 hygienic flush</p>	1192299 1192264 2158982 2166011
 <p>Instrument mounting bracket for wall or pipe mounting, stainless steel</p>	14309985
 <p>Overvoltage limit for transmitters, 4 ... 20 mA, ½ NPT, series connection, Ex i and Ex d Overvoltage limit for transmitters, 4 ... 20 mA, M20 x 1.5, series connection, Ex i and Ex d Overvoltage limit for transmitters, FF / PROFIBUS, ½ NPT, series connection, Ex i and Ex d</p>	14013656 14002489 14013658
 <p>Model DI-PT-R display and operating module, case cover aluminium with window Model DI-PT-R display and operating module, case cover electropolished cast stainless steel with window Model DI-PT-R display and operating module, case cover plastic with window Model DI-PT-R display and operating module, case cover cast stainless steel with window for single chamber case Model DI-PT-R display and operating module, case cover cast stainless steel with window for double chamber case</p>	12298884 13315269 13315277 12298906 14045598
 <p>Model DI-PT-E external display and operating module, aluminium case Model DI-PT-E external display and operating module, cast stainless steel case Model DI-PT-E external display and operating module, plastic case</p>	12354954 12355101 14134247

Ordering information

Primary model / Primary case / Output signal / Primary measuring range / Minimum adjustable differential pressure / Secondary model / Secondary case / Secondary measuring range / Certificates

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