

Differential pressure transmitter PASCAL Ci4 Delta P for diaphragm seal operation Type series CI4330



Application area

- General process engineering
- Chemical and petrochemical industry
- General process technology

Application

The digital differential pressure transmitter PASCAL Ci4 Delta P has been specially designed for the mounting of diaphragm seals with a volume reduced differential pressure chamber. Due to this design the transmitter is suitable for various applications, e.g. for the level measurement of pressure vessels.

Features

- Differential pressure transmitter for diaphragm seal operation
- Stainless steel case in sturdy design, degree of protection IP 65/67
- Accuracy 0.1 %
- High-resolution display with intuitive 4-button operation and backlight
- Comprehensive parameterising functions
- Comprehensive simulation and diagnostic functions
- Quick access to device data
- Development according to SIL2
- Nominal ranges 0.25 to 16 bar
- Turndown up to 100:1
- Measuring rate up to 100 Hz
- Output signal 4...20 mA with HART® protocol
- Configuration memory
- Digital communication via PDM, FDT/DTM, 375/475 Field Communicator
- Output functions: linear, invers, square root, table function with up to 64 support points
- Media temperature -90...400 °C
- Wetted parts stainless steel
- Various process connections with diaphragm seal technology
- Approved according to NAMUR 95

Options

- Labom REconnect quick coupling device for easy and safe separation and connection of diaphragm seal systems; Type series MK1000, see data sheet DB_D6-022
- Approvals/Certificates
 - Explosion protection (ATEX/IECEx/UKEX) for gases and dust
 - Classification per SIL2
 - Material certificate per EN 10204-3.1
 - Calibration certificate per EN 10204-3.1
- As per UKCA regulations
- Operating software LAB4Level for level measurements
- Removable display and control unit
- Degree of protection IP 69K

Technical data

Measuring ranges

Up to a turndown of 100:1 the measuring span can be freely selected.

| Nominal range | Measuring span | | Overload capacity | | Static excess pressure | Lower measuring range limit * |
|------------------|----------------|-----------|-------------------|------------|------------------------|-------------------------------|
| | min. span | max. span | plus-side | minus-side | both sides | |
| -0.25...0.25 bar | 0.0025 bar | 0.5 bar | 10 bar | 5 bar | 75 bar | 750 mbar abs |
| -1...1 bar | 0.01 bar | 2 bar | 20 bar | 10 bar | 75 bar | 30 mbar abs |
| -1...4 bar | 0.04 bar | 5 bar | 50 bar | 25 bar | 75 bar | 30 mbar abs |
| -1...16 bar | 0.16 bar | 17 bar | 100 bar | 75 bar | 100 bar | 30 mbar abs |
| -1...40 bar | 0.4 bar | 41 bar | 100 bar | 75 bar | 100 bar | 30 mbar abs |

* Vacuum-proof designs are available upon request

Constructional design / case

Design: Two-chamber case, continuously rotatable by $\pm 170^\circ$
Case surface blasted

Material case:

- Stainless steel mat.no. 1.4301/1.4305 (304/303)
- Stainless steel mat.no. 1.4404 (316L)

Material front cover:

- Stainless steel mat.no. 1.4305 (303)
- Stainless steel mat.no. 1.4404 (316L)
- Polypropylene, black

Gaskets: Silicone / NBR

Degree of protection per EN 60529: IP 65 / IP 67
Option: IP 69K

Climatic category: 4K4H per EN 60721 3-4

Vibration resistance per EN 61298-3: 10...60 Hz: ± 0.35 mm
60...1000 Hz: 5 g

Material window:

- Macrolon
- Non-splintering glass (requires front cover of stainless steel)

Elec. connection:

- Circular connector M12
- Cable gland M16x1.5, PA black
- Cable gland M16x1.5, stainless steel
- Cable gland M20x1.5, PA black
- Cable gland M20x1.5, stainless steel
- 1/2" NPT, PA black

Further connections upon request

Terminal blocks:

- Spring clamp terminals up to 1.5 mm²
- Pole terminals up to 2.5 mm²
- Screw terminals up to 2.5 mm²

Weight: approx. 1.4 kg (without diaphragm seal)

Type plate: Laser marking

Process connection

Design: Volume reduced differential pressure chamber, suitable for the direct mounting of diaphragm seals with capillary connection.
Diaphragm seals see product group D5.

Material wetted parts

Material: see product group D5

Measuring system

Sensor: piezoresistive

System filling: Due to the application there are different system fillings available, see Technical Instruction TA_031.

Measuring accuracy

Reference cond. per EN 61298-1: $T_U = \text{const. (15...25) } ^\circ\text{C}$
 $\varphi = \text{const. (45...75) \% r.F.}$
 $p_U = \text{const. (860...1060) mbar}$
 $U_B = 24 \text{ V DC } (\pm 3 \text{ V DC})$
 $R_B = 50 \text{ } \Omega$, HART: 250 Ω
Ground connected
MBA = 0 bar

Calibration position: Process connection bottom: vertical

Deviation of characteristic: Refer to the adjusted measuring span (Limit point method per DIN 16086)

Nominal range 1-40 bar

Turndown 5:1 0.1 %

Turndown > 5:1 0.02 % x TD

Nominal range 0.25 bar

Turndown 5:1 0.15 %

Turndown > 5:1 0.03 % x TD

Long-term drift: Refer to nominal range
 $\leq 0.1 \text{ \% / year}$

Operational availability < 12 s

| | |
|--|---|
| Response time t_{90} at current output | for 20 Hz measuring rate: typically 120 ms for 100 Hz measuring rate: typically 50 ms |
| Temperature influence, case: | Refer to nominal range Ambient temperature -20...80 °C: Nominal range 1-40 bar 0.1 %/10K, max. 0.3 % Nominal range 0.25 bar 0.15 %/10K, max. 0.4 % Ambient temperature -40...-20 °C: Typical 0.2 %/10K |
| Temperature influence, process connection: | The temperature influence depends on several parameters, e.g. diaphragm diameter, diaphragm material, capillary length, capillary diameter, system filling, etc. We provide a detailed error analysis upon request. |
| Influence static pressure: | Refer to nominal range 0.25 bar 0.12 % x stat. pressure [bar] x TD 1 bar 0.03 % x stat. pressure [bar] x TD 4 bar 0.02 % x stat. pressure [bar] x TD 16 bar 0.002 % x stat. pressure [bar] x TD 40 bar 0.001 % x stat. pressure [bar] x TD |

Indication

| | |
|-----------------------|--|
| Display: | - High-resolution graphic display with backlight - 4-button operation - Freely configurable display modes - continuously rotatable - Optional: Remote display and control unit (max. 10 m) |
| Configuration memory: | All parameterisation data can be copied from the device into the configuration memory in the display module. The data is permanently stored there, even in the event of power failure. The parameters can be transferred simply and quickly to other devices. |

Output

| | | |
|------------------------|---------------------|----------------------------|
| Signal: | 2-wire technology | 4...20 mA |
| | Lower limit | 3.8...4 mA |
| | Upper limit | 20...21 mA |
| | Lower alarm current | < 3.6 mA |
| | Upper alarm current | > 21 mA |
| | Current limitation | 22 mA |
| Digital communication: | | HART ® protocol, version 7 |

Device driver:

- EDD für SIMATIC PDM
- DTM for PACTware or compatible systems (FDT compliance)
- EDD for 375 / 475 Field Communicator

| | |
|-----------|---|
| Function: | <ul style="list-style-type: none"> ■ linear ■ inverse response ■ by square root ■ table function with up to 64 support points |
|-----------|---|

| | |
|-----------------------|--|
| Turndown: | Max. 100:1 |
| Damping: | 0...999.9 s selectable in steps of 0.1 s |
| Measuring rate: | 20 Hz, switchable to 100 Hz |
| Resolution: | 0.5 µA |
| Current sensing func. | 3.55...21.5 mA selectable in steps of 0.001 mA |
| Load R: | $R \leq (U-12V DC)/0.022 A [\Omega]$ U = supply voltage for HART ® communication $R \geq 230 \Omega$ |

Supply voltage

| | |
|-------------------|---|
| Functional range: | 12...30 V DC, protected against polarity reversal |
| Ripple: | < 5 % |

Temperature ranges

| | |
|----------|---|
| Ambient: | -40...80 °C (Display visibility is limited at temperatures below -30 °C) |
| Media: | -90...400 °C* |
| Storage: | -40...80 °C |

* depending on the design of the diaphragm seal and the system filling

Tests and certificates

Ex approvals

| | |
|--------|--|
| ATEX: | TÜV 13 ATEX 120264 X ⊕ II 1/2G Ex ia IIC TX Ga/Gb ⊕ II 1/2D Ex ia IIIC Txx °C Da/Db ⊕ II 2G Ex ia IIC TX Gb ⊕ II 2D Ex ia IIIC Txx °C Db |
| IECEX: | IECEX TUN 13.0018X Ex ia IIC TX Ga/Gb Ex ia IIIC Txx °C Da/Db Ex ia IIC TX Gb Ex ia IIIC Txx °C Db |
| UKEX: | CML 21UKEX21179X ⊕ II 1/2G Ex ia IIC TX Ga/Gb ⊕ II 1/2D Ex ia IIIC Txx °C Da/Db ⊕ II 2G Ex ia IIC TX Gb ⊕ II 2D Ex ia IIIC Txx °C Db |

For more detailed information see Ex Safety Instruction XA_011.

| | |
|--------|--|
| EMC : | per EN 61326-1, NAMUR NE21 |
| SIL 2: | Functional safety per EN 61508, classification per SIL2 For detailed information see SIL instruction SA_001 |
| NAMUR: | Approved according to NE95, Test report TP14033 available upon request |

Parameterisation, simulation and adjustment

Parameterisation

| Parameter | Values | Default setting |
|---|--|--------------------------------------|
| Device | | |
| device ID | 16 digits, freely selectable | LABOM PASCAL Ci4 |
| lower range value | at any value within nominal range | 0 bar respectively 0 bar abs. |
| upper range value | at any value within nominal range | end of nominal range |
| measuring rate | 20 Hz, 100 Hz | 20 Hz |
| damping | 0.0...999.9 s | 0.0 s |
| Display and control unit | | |
| pressure unit | mbar, bar, Pa, hPa, kPa, MPa, g/cm ² , kg/cm ² , psi, atm, Torr, mmH ₂ O, mH ₂ O, inH ₂ O, ftH ₂ O, mmHg, inHg | bar |
| temperature unit | °C, °F, °R, K | °C |
| lighting | on, off | on |
| language | English, German | German |
| | English, Chinese | as ordered |
| | English, Spanish, French | as ordered |
| | English, Polish, German | as ordered |
| | English, Turkish, German | as ordered |
| decimal point | auto, x.xxxx, xx.xxx, xxx.xx, xxxx.x, xxxxx | auto |
| display mode | five values, four values, three values, two values, big display | four values |
| main value | pressure, current (%), current (mA) | pressure |
| secondary values | pressure, current (%), current (mA), sensor temperature, device ID, HART-TAG, HART descriptor, <empty> | current (%), current (mA), device ID |
| Current output | | |
| output function | linear, inverse response, by square root, table function | linear |
| table function | % of m.r., output current | depends on device |
| number of table points | 2...64 | 2 (0 % ≙ 4 mA, 100 % ≙ 20 mA) |
| lower current limit | 3.8...4.0 mA | 3.8 mA |
| upper current limit | 20...21 mA | 20.5 mA |
| alarm current | low (<3.6 mA), high (> 21.0 mA) | low (<3.6 mA) |
| position correction (mounting position) | on, off | off |
| Maintenance counter | | |
| maintenance interval | 0...9999 days | 0 days |
| status | on, off | off |
| HART data | | |
| HART address | 0...63 | 0 |
| number of response preambels | 5...20 | 5 |
| current mode | proportional, constant | proportional |

Diagnostic functions

| Self- diagnosis | Description | Value range |
|--------------------------------------|--|----------------|
| RAM-Test | Permanent check of the read/write memory | / |
| ROM-Test | Permanent check of the checksum via the program memory | / |
| Bridge circuit test | Permanent check of the bridge circuit | / |
| CRC parameterisation test | Permanent check of the checksum via the parameter memory | / |
| Electronics temperature monitoring | Permanent check of the electronics temperature | / |
| Process diagnostics | | |
| Maintenance timer | Check of the maintenance cycles | / |
| Operating hours counter | Capture of operating hours | / |
| Min/Max values | For process pressure and sensor temperature | / |
| Measuring circuit diagnostics | | |
| loop-test | Setting of a fixed current value at the output | 3.55...21.5 mA |
| pressure simulation | Setting a fixed pressure value, it also considers damping and tabular function unlike the current simulation | Nominal range |

Adjustment

| Type | Description |
|-----------------------|---|
| zero point correction | adjusts reading to zero at ambient pressure (for differential and gauge pressure devices) |
| position correction | adjusts reading of mounted device to zero at ambient pressure |
| lower adjustment | adjusts reading to applied pressure (affects zero point + span) |
| upper adjustment | adjusts reading to applied pressure (affects span only) |
| current adjustment | adjusts current output to achieve 4 resp. 20 mA at the end of the measurement chain |

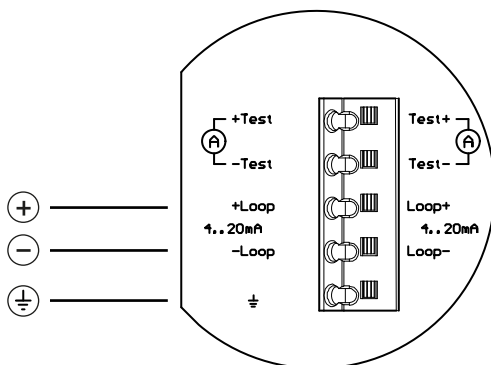
Alternative and additional possibilities of parameterisation for devices with level software LAB4Level

| Parameter | Values | Default setting |
|---------------------------------|--|--|
| Display and control unit | | |
| filling height unit | mm, cm, m, ft, in, yd | m |
| volume unit | l, hl, m ³ , in ³ , ft ³ , gal | l |
| weight unit (mass) | g, kg, t, lb | kg |
| density unit | g/cm ³ , kg/cm ³ , t/m ³ , kg/l, lb/in ³ , lb/ft ³ | g/cm ³ |
| display mode | level 4 values, level 2 values, five values, four values, three values, two values, big display | level 4 values |
| main value | filling height, volume, weight, pressure, current in %, current in mA | filling height |
| secondary values | filling height, volumen, weight, pressure, static pressure, current in %, current in mA, sensor temperature, density, device ID, HART-TAG, HART-Descriptor, <leer> | current in %, current in mA, device ID |
| Level | | |
| density | 0.1...20 g/cm ³ | 1 g/cm ³ |
| offset height | max 99.999 m | 0 m |
| tank shape table | on/off | off (= linear) |
| table function | 64 support points (filling heights/volume) | |
| Current output | | |
| measured value | height, volume, weight, pressure (equal 4...20 mA) | height |
| number of table points | 0 / 2...64 | 0 |

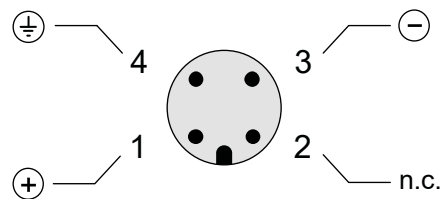
Diagnostic functions

| Measuring circuit diagnostics | | |
|-------------------------------|---|---|
| simulation function | pressure, filling height, volume, weight (mass), current | / |
| min/max values | for process pressure, sensor temperature, filling height, volume and weight | / |

Connection diagram



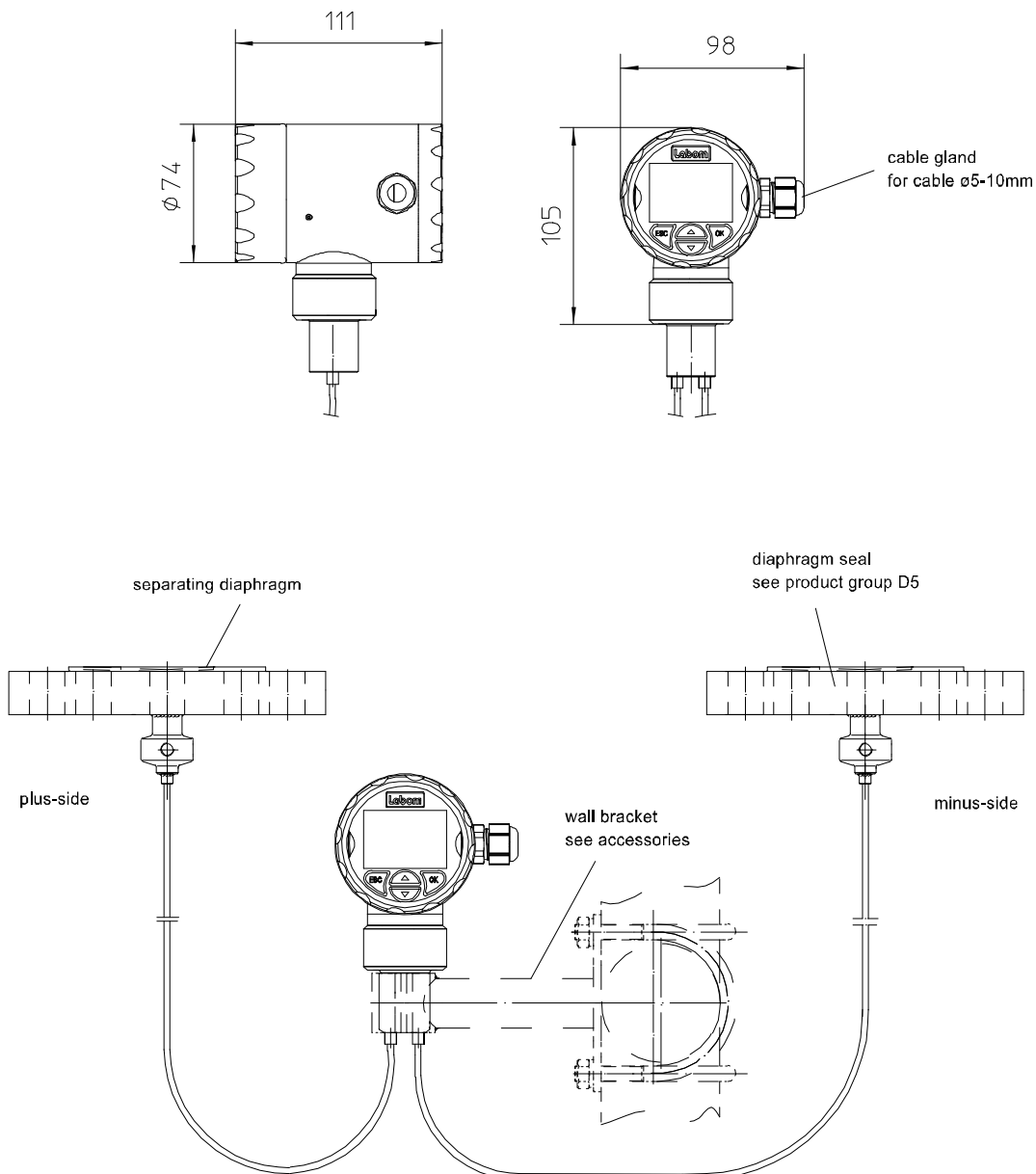
Cable gland



Circular connector M12 x 1

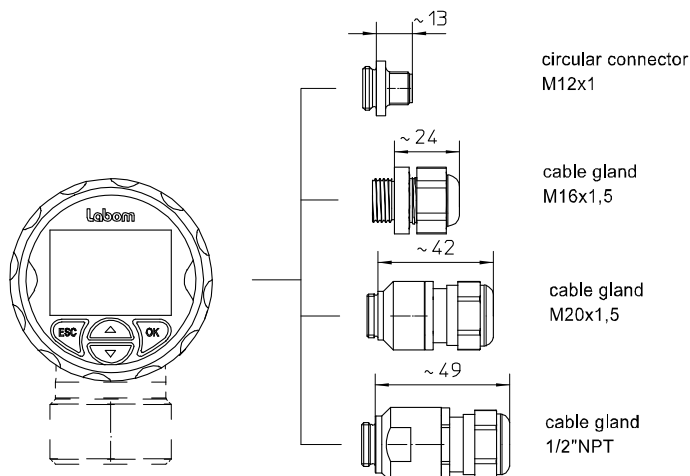
Dimensions

Case and process connections



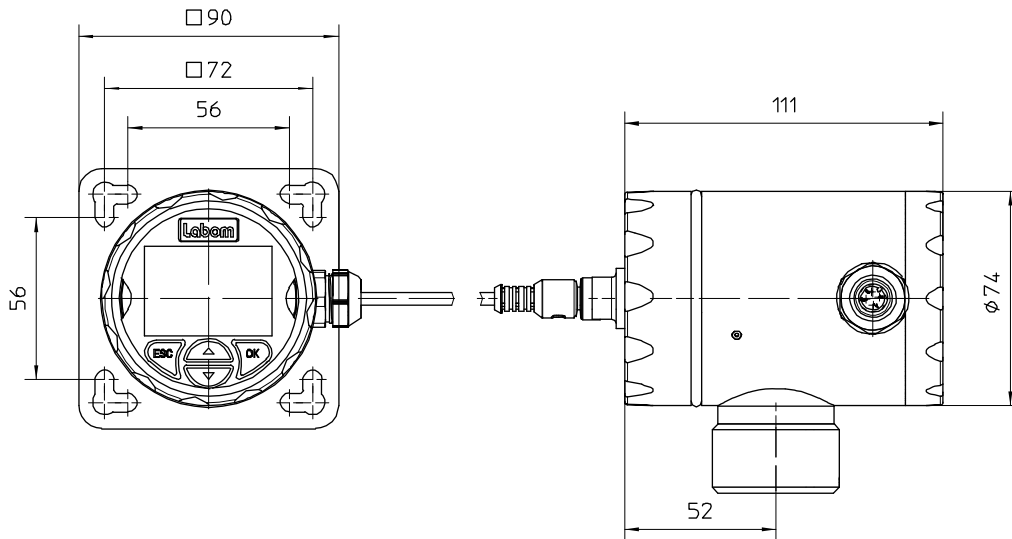
All dimensions are in mm

Electrical connections



All dimensions are in mm

Remote display and control unit (Type series MC1140)

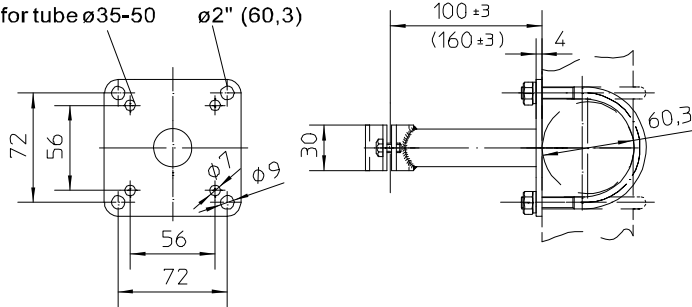


All dimensions are in mm

Wall bracket for wall and pipe mounting (Type series MM1110)

drilling diagram

for tube $\varnothing 35-50$ $\varnothing 2''$ (60,3)



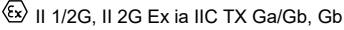
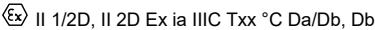

All dimensions are in mm

Order details

Differential pressure transmitter PASCAL Ci4 Delta P for diaphragm seal operation Type series CI4330

| Order details PASCAL Ci4 Delta P CI4330 | | | | |
|---|---|---|--|--------------------------|
| CI4330 | Differential pressure transmitter PASCAL Ci4 Delta P for diaphragm seal operation | | | |
| A1078 | measuring range | 0.25 bar | | |
| A1053 | | 1 bar | | |
| A1056 | | 4 bar | | |
| A1059 | | 16 bar | | |
| A1061 | | 40 bar | | |
| F1 | parameterisation | factory settings (standard) | | |
| F2 | | as per customer's specification (pls. specify) | | |
| H21 | output signal | 4...20 mA, with HART-protocol | | |
| Y1. | material case | stainless steel mat.-no. 1.4301/1.4305 (304/303) | | |
| Y2. | | stainless steel mat.-no. 1.4404 (316L) | | |
| 1 | material front cover | polypropylene (black), window Macrolon | | |
| 2 | | stainless steel (see case), window non-splintering glass | | |
| 3 | | stainless steel (see case), closed, without window | | |
| | | | default language | available language |
| M21.1 | display | high-resolution graphic display with backlight, intuitive 4-button operation, quick access to device data | German (standard) | English, German |
| M22.1 | | | English | |
| M22.2 | | | English | English, Chinese |
| M23.1 | | | Chinese | |
| M23.2 | | | English | English, Spanish, French |
| M23.3 | | | Spanish | |
| M25.1 | | | French | |
| M25.2 | | | English | English, Polish, German |
| M25.3 | | | Polish | |
| M26.1 | | | German | |
| M26.2 | | | English | English, Turkish, German |
| M26 | | | Turkish | |
| M13 | | | German | |
| M13 | | | without display | |
| T20. | electrical connection | cable gland | M16 x 1.5 polyamide, for cable Ø 4.5-10 | |
| T22. | | | M16 x 1.5 stainless steel, for cable Ø 5-9.5 mm | |
| T15. | | | M20 x 1.5 polyamide, for cable Ø 7-13 mm | |
| T17. | | | M20 x 1.5 stainless steel, for cable Ø 8-13 mm | |
| T27. | | | 1/2" NPT polyamide, for cable Ø 6-12 mm | |
| 0 | | cable clamps | spring clamp terminals up to 1.5 mm ² | |
| 5 | | | pole terminals 2.5 mm ² | |
| 6 | screw terminals 2.5 mm ² | | | |
| T30 | circular connector M12 x 1 (4-polig) | | | |

Process connections (diaphragm seal) see product group D5

| Additional features (to be indicated if required) | | | | |
|---|---|--|--|--|
| S62 | Ex marking ¹ | ATEX |  | |
| S77 | | | IECEX |  |
| S87 | | UKEX | |  |
| T4 | | | degree of protection | IP 69K ¹ |
| X4 | operating software LAB4Level for level applications | | | |
| W1020 | material certificate | per DIN EN 10204-3.1, wetted parts | | |
| W1201 | calibration certificate | per DIN EN 10204-3.1, 5 measuring points | | |
| W2602 | functional safety per EN 61508, classification per SIL2 | | | |
| W2660 | as per UKCA regulations ² | | | |

| Accessories | | |
|-------------------|--|--|
| MM1110 | Device bracket per DIN 16281, model A, for wall and pipe-mounting, stainless steel mat.-no. 1.4571 (316Ti) | |
| A10 | design | for wall mounting |
| A11 | | for pipe diameter 35-50 mm |
| A12 | | for pipe diameter 2" (60,3 mm) |
| MC1140 | PASCAL Ci4 remote display and control unit including device holder material stainless steel, incl. front ring with seal and blind cap with circular connector M12x1 | |
| A1. | connection cable | length: 10 m, material: PUR, with circular connector M12 x1 (further lengths upon request) |
| 1 | internal cable clamps | spring clamp terminals up to 1.5 mm ² |
| 2 | | pole terminals 2.5 mm ² |
| 3 | | screw terminals 2.5 mm ² |
| T1 | degree of protection | IP 65 / IP 67 (standard) |
| MZ8120-A11 | mounting set for device holder | 2 mounting brackets for pipe and frame mounting Ø 30-50 mm, incl. nuts and washers |
| MZ8120-A12 | | 2 mounting brackets for pipe and frame mounting Ø 40-64 mm, incl. nuts and washers |

Order detail (example): **CI4330 – A1056 – F1 – H21 – Y12 – T200 – - ...**

¹ Requires front cover of stainless steel

² Not possible with inline diaphragm seals