



#### Application area

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

#### Features

- Differential pressure transmitter for diaphragm seal operation
- High-resolution display with backlight
- Intuitive 4-button operation
- 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
- Accuracy 0.1 %
- Output signal 4...20 mA with HART® protocol
- Digital communication via PDM, FDT/DTM, 375/475 Field Communicator
- Output functions: linear, invers, square root, table function
- Table function with up to 64 support points
- Stainless steel case in sturdy design, degree of protection IP 65/67
- Media temperature -40...100 °C
- Wetted parts stainless steel
- Various process connections with diaphragm seal technology

#### Options

- Approvals/Certificates
  - GOST-R certificate of conformity and declaration
  - Certificate of measuring equipment for Russian Federation
  - Material per DIN EN 10204
  - Calibration certificate per DIN EN 10204
- Removable display and control unit
- Degree of protection IP 69K
- Front cover of stainless steel with window of non splintering glass

#### 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.

## Technical data

### Measuring ranges

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

| Nominal range | Measuring range       | Measuring span |           | Overload capacity |            | Static excess pressure both sides |
|---------------|-----------------------|----------------|-----------|-------------------|------------|-----------------------------------|
|               |                       | min. span      | max. span | plus-side         | minus-side |                                   |
| 0.25 bar rel. | -0.25...0.25 bar rel. | 0.0025 bar     | 0.5 bar   | 10 bar rel.       | 5 bar      | 75 bar                            |
| 1 bar rel.    | -1...1 bar rel.       | 0.01 bar       | 2 bar     | 20 bar rel.       | 10 bar     | 75 bar                            |
| 4 bar rel.    | -1...4 bar rel.       | 0.04 bar       | 5 bar     | 50 bar rel.       | 25 bar     | 75 bar                            |
| 16 bar rel.   | -1...16 bar rel.      | 0.16 bar       | 17 bar    | 50 bar rel.       | 25 bar     | 75 bar                            |

### Constructional design / case

|                       |  |
|-----------------------|--|
| Design:               | Two-chamber case, continuously rotatable by $\pm 170^\circ$  |
| Material case:        | Stainless steel mat.no. 1.4301 (304)<br>Case surface blasted   |
| Material front cover: | <ul style="list-style-type: none"> <li>■ Polypropylene, black</li> <li>■ Stainless steel</li> </ul>  |
| Degree of protection: | <ul style="list-style-type: none"> <li>■ IP 65 / IP 67 per DIN EN 60529</li> <li>■ IP 69K</li> </ul>   |
| Material window:      | <ul style="list-style-type: none"> <li>■ Macrolon</li> <li>■ Non splintering glass (requires front cover of stainless steel)</li> </ul>  |
| Elec. connection:     | <ul style="list-style-type: none"> <li>■ Circular connector M12</li> <li>■ Cable gland M16x1.5, PA black</li> <li>■ Cable gland M16x1.5, stainless steel</li> <li>■ Cable gland M20x1.5, PA black</li> <li>■ Cable gland M20x1.5, stainless steel</li> <li>■ 1/2" NPT, PA black</li> </ul> |
| Terminal blocks:      | <ul style="list-style-type: none"> <li>■ Spring clamp terminals up to 1.5 mm<sup>2</sup></li> <li>■ Pole terminals up to 2.5 mm<sup>2</sup></li> <li>■ Screwed terminals up to 2.5 mm<sup>2</sup></li> </ul>   |
| 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.<br>Diaphragm seals see product group D5 |
|---------|--|

### Material wetted parts

Depending on the design of the diaphragm seal different materials are available:

- stainless steel 316L
- duplex
- stainless steel with PFA or PTFE-coating
- tantalum
- hastelloy
- monel

Additional materials upon request.

### Measuring system

|                  |  |
|------------------|--|
| Sensor:          | piezoresistive   |
| Systeme filling: | Due to the application there are different systeme fillings available, see Technical Instruction TA_031. |

### Accuracy

|                              |   |
|------------------------------|---|
| Reference cond.:             | Per DIN EN 60770-1  |
| Calibration position:        | Vertical mounting   |
| Deviation of characteristic: | Refer to the adjusted measuring span (Limit point method per DIN 16086) |
|                              | <b>Nominal range 1-16 bar</b>   |
|                              | Turndown 5:1      0.1 %   |
|                              | Turndown > 5:1      0.02 % x TD   |
|                              | <b>Nominal range 0.25 bar</b>   |
|                              | Turndown 5:1      0.2 %   |
|                              | Turndown > 5:1      0.04 % x TD   |
| Long-term drift:             | Refer to nominal range<br>$\leq 0.1$ %/year                             |

Temperature influence, case:

Refer to nominal range

**Ambient temperature -20...80 °C:**

Nominal range 1- 16 bar 0.1 % /10K, max. 0.3 %

Nominal range 0.25 bar 0.2 % /10K, max. 0.6 %

**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.

Function:

Adjustable:

- 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: 1 µA

Current sensing func. 3.55...21.5 mA selectable in steps of 0.01 mA

Load  $R_B$ :  $R_B \leq (U_V - 12V DC) / 22mA$  [Ohm]  
 $U_V$  = supply voltage

### Indication

Display:

- High-resolution graphic display with backlight
- 4-button operation
- Freely configurable display modes
- continuously rotatable by  $\pm 170$  (detent every  $90^\circ$ )
- Optional: Remote display and control unit, can be used up to 10 m away from measuring point

### 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 |

Communication via:

- PDM version 6 and 8
- Pactware or compatible systems (FDT/DTM)
- 375 / 475 Field Communicator

### Supply

Functional range: 12...30 V DC

### Temperature ranges

Environment: -40...80 °C

Media: -90...400 °C\*

Storage: -40...80 °C

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

### Tests and certificates

EMC: Per EN 61326-1

SIL 2: Development according to SIL 2

- GOST:
- GOST-R certificate of conformity and declaration
  - Certificate of measuring equipment for Russian Federation

## Parameterisation, simulation and calibration

### Parameterisation

| Parameter                               | Values   | Default setting                       |
|---|--|---------------------------------------|
| <b>Device</b>                           |  |                                       |
| device ID                               | 16 digits, freely selectable   | LABOM PASCAL Ci4                      |
| lower range value                       | at any value within nominal range  | start of nominal range                |
| 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                                 |
| <b>Display and control unit</b>         |  |                                       |
| pressure unit                           | mbar, bar, Pa, hPa, kPa, MPa, g/cm <sup>2</sup> , kg/cm <sup>2</sup> , psi, atm, torr, mmH <sub>2</sub> O, mH <sub>2</sub> O, inH <sub>2</sub> O, ftH <sub>2</sub> O, mmHg, inHg | bar                                   |
| temperature unit                        | ° C, ° F, ° R, K   | °C                                    |
| lighting                                | on, off  | on                                    |
| language                                | german, english  | german                                |
| 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                              | ΔP, ΔP in mA, ΔP in %, temperature   | ΔP                                    |
| secondary values                        | ΔP, ΔP in mA, ΔP in %, temperature, device ID, HART-TAG, HART-Descriptor   | ΔP in %, ΔP in mA, device ID, <empty> |
| <b>Current output</b>                   |  |                                       |
| output function                         | linear, inverse response, by square root, table function   | linear                                |
| 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                                   |
| <b>Maintenance counter</b>              |  |                                       |
| maintenance interval                    | 0...9999 days  | 0 days                                |
| status                                  | on, off  | off                                   |
| <b>HART data</b>                        |  |                                       |
| HART address                            | 0...63   | 0                                     |
| number of response preambels            | 5...20   | 5                                     |
| current mode                            | proportional, constant   | proportional                          |

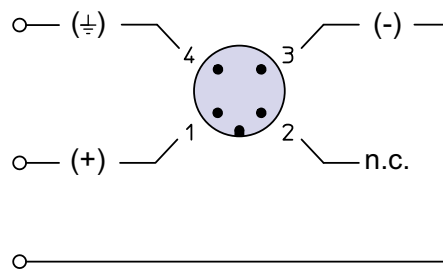
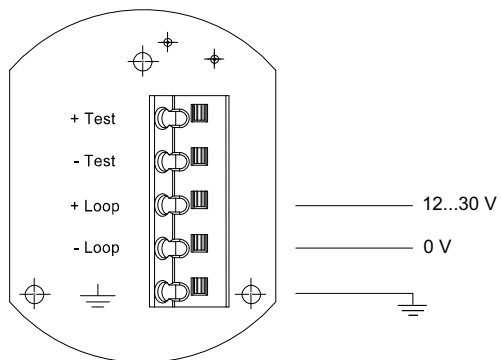
### Simulation

| Type                | Description  | Value range   |
|---------------------|--|---------------|
| loop-test           | adjustment of fixed output signal  | 3.55...2.5 mA |
| pressure simulation | assumes constant pressure value, contrary to loop-test the table function is also taken into consideration | nominal range |

### Calibration

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

## Connection diagram

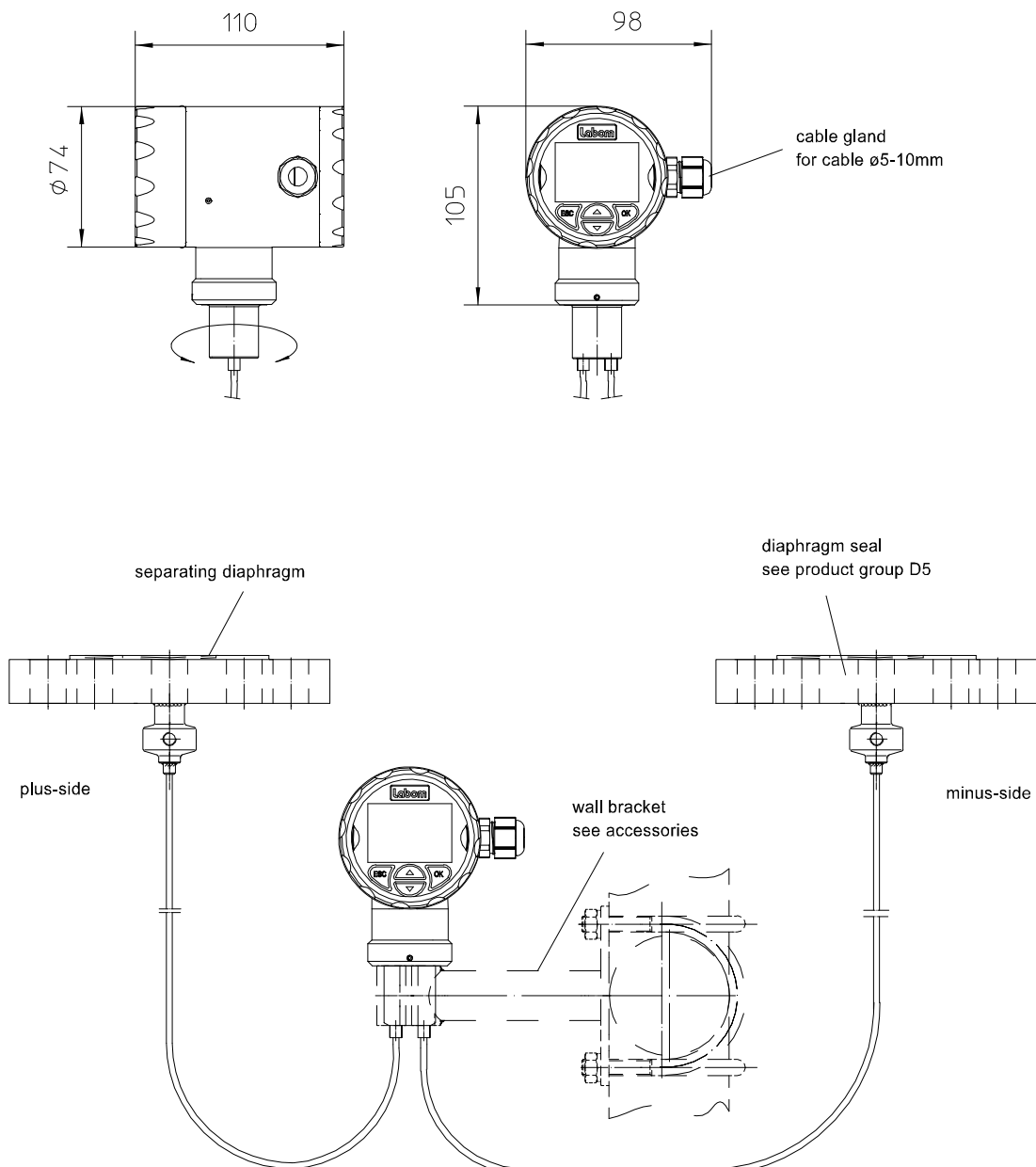


Output (2-wire): 4...20 mA

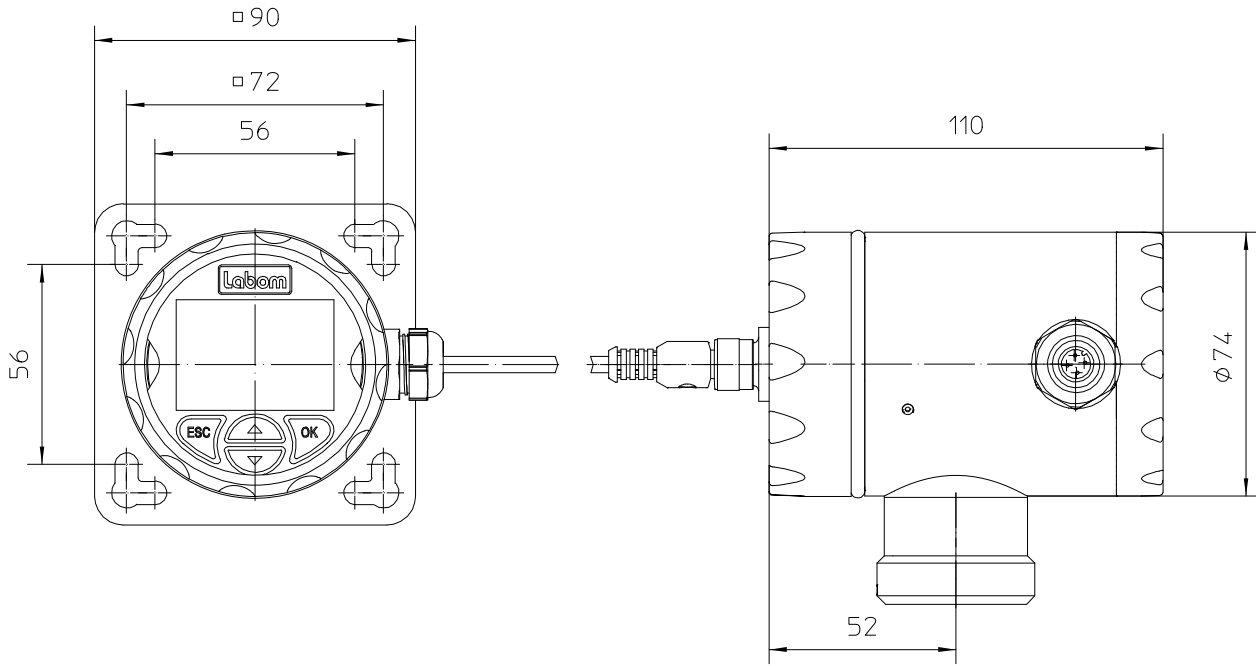
Circular connector M12 x 1

## Dimensions

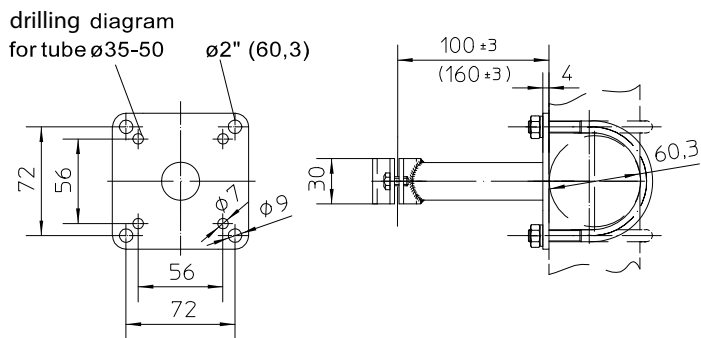
### Case and process connections



**Remote display and control unit (Type series MC1140)**



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



## Order details

### Pressure transmitter PASCAL Ci4 Delta P for diaphragm seal operation Type series CI4330

| Order detail PASCAL Ci4 Delta P CI4330                            |  |  |  |
|---|--|--|--|
| CI4330  | 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   |  |
| F1  | parameterisation   | factory settings (standard)                              |  |
| F2  |  | as per customer's specification (pls. specify)           |  |
| H21   | output signal  | 4...20 mA, with HART-Protokoll                           |  |
| Y1.   | material case  | stainless steel mat.-no. 1.4301 (304)                    |  |
| 1   | material front cover   | polypropylene (black), window Macrolon                   |  |
| 2   |  | stainless steel, window non splintering glass            |  |
| T20.  | electrical connection  | cable gland M 16 x 1,5 PA for cable Ø 4,5-10             |  |
| T22.  |  | cable gland M16 x 1.5 stainless steel, for cable Ø 5-9.5 |  |
| T15.  |  | cable gland M20 x 1.5 polyamide, for cable Ø 7-13        |  |
| T17.  |  | cable gland M20 x 1.5 stainless steel, for cable Ø 8-13  |  |
| T27.  |  | cable gland 1/2" NPT polyamide, for cable Ø 6-12         |  |
| 0   |  | cable clamps   | spring clamp terminals up to 1.5 mm <sup>2</sup> |
| 5   |  |  | pole terminals 2.5 mm <sup>2</sup>               |
| 6   | screwed terminals 2.5 mm <sup>2</sup>                                |  |  |
| T30   |  | circular connector M12 x 1 (4 pin)                       |  |
| <b>process connections (diaphragm seals) see product group D5</b> |  |  |  |

| Additional features (to be indicated in case of need, only) |                         |   |
|---|-------------------------|---|
| T4  | degree of protection    | IP 69K  |
| M1  | display                 | without display   |
| W1020   | material certificate    | per DIN EN 10204-3.1, wetted parts                        |
| W1201   | calibration certificate | per DIN EN 10204-3.1, 5 measuring points                  |
| W2670   | GOST                    | GOST-R certificate of conformity and declaration          |
| W2672   |                         | certificate of measuring equipment for Russian Federation |

| 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 wall bracket<br>material stainless steel, incl. front ring with seal and blind cap with circular connector M12x1 |  |
| A1.         | connection cable  | length: 10 m, material: PUR, with connector M12 x1                                 |
| 1           | Internal cable clamps   | spring clamp terminals up to 1.5 mm <sup>2</sup>                                   |
| 2           |   | pole terminals 2.5 mm <sup>2</sup>   |
| 3           |   | screwed terminals 2.5 mm <sup>2</sup>  |
| T1          | degree of protection  | IP 65 / IP 67 (standard)   |
| T4          |   | IP 69K   |
| MZ8120-A11  | mounting set for wall bracket   | 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 |
| MC1020      | HART-Modem  | RS 232 -interface  |
| MC1040      |   | USB-interface  |

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