

## 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

### 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
- EAC declaration (upon request)

### Options

- Approvals/Certificates
  - Explosion protection for gases and dust
  - Classification per SIL2
  - Certificate of measuring equipment for Russian Federation
  - Material certificate per EN 10204
  - Calibration certificate per 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.

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## 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 both sides
	min. span	max. span	plus-side	minus-side	
0.25 bar	0.0025 bar	0.5 bar	10 bar	5 bar	75 bar
1 bar	0.01 bar	2 bar	20 bar	10 bar	75 bar
4 bar	0.04 bar	5 bar	50 bar	25 bar	75 bar
16 bar	0.16 bar	17 bar	100 bar	75 bar	100 bar
40 bar	0.4 bar	41 bar	100 bar	75 bar	100 bar

### Constructional design / case

Design:	Two-chamber case, continuously rotatable by $\pm 170^\circ$ Case surface blasted
Material case:	<ul style="list-style-type: none"> <li>■ Stainless steel mat.no. 1.4301/1.4305 (304/303)</li> <li>■ Stainless steel mat.no. 1.4404 (316L)</li> </ul>
Material front cover:	<ul style="list-style-type: none"> <li>■ Polypropylene, black</li> <li>■ Stainless steel mat.no. 1.4305 (303)</li> <li>■ Stainless steel mat.no. 1.4404 (316L)</li> </ul>
Gaskets:	Silicone / NBR
Degree of protection per EN 60529:	<ul style="list-style-type: none"> <li>■ IP 65 / IP 67</li> <li>■ IP 69K</li> </ul>
Climatic category per EN 60721 3-4:	4K4H
Vibration resistance per EN 61298-3:	10...60 Hz: $\pm 0.35$ mm 60...1000 Hz: 5 g
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> <p>Further connections upon request</p>
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>■ Screw 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. Diaphragm seals see product group D5.
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### Material wetted parts

Material:	see product group D5
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### Measuring system

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

### Accuracy

Reference cond. per EN 61298-1:	$T_U = \text{const. (15...25) } ^\circ\text{C}$ $\varphi = \text{const. (45...75) \% r.F.}$ $p_U = \text{const. (860...1060) mbar}$ $U_B = 24 \text{ V DC } (\pm 3 \text{ V DC})$ $R_B = 50 \Omega, \text{ HART: } 250 \Omega$ Ground connected $MBA = 0 \text{ bar}$
Calibration position:	Process connection bottom: vertical
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      0.15 % Turndown > 5:1    0.03 % x TD
Long-term drift:	Refer to nominal range $\leq 0.1 \text{ \% / year}$
Operational availability	< 12 s

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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 1-16 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 by  $\pm 170$  (detent every  $90^\circ$ )
  - Optional: Remote display and control unit, can be used up to 10 m away from measuring point

- 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 <sup>®</sup> protocol, version 7

Communication via:

- Siemens PDM
- Pactware or compatible systems (FDT/DTM)
- 375 / 475 Field Communicator

- Function:
- 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  $\mu$ A

Current sensing func. 3.55...21.5 mA selectable in steps of 0.001 mA

Load  $R_B$ :  $R_B \leq (U_V - 12V \text{ DC}) / 0.022 \text{ A [Ohm]}$

$U_V$  = supply voltage

for HART communication  $R_B \geq 230 \Omega$

### 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

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

- EAC declaration upon request
- Certificate of measuring equipment for Russian Federation

## Parameterisation, simulation and adjustment

### 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	0 bar
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	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 in %, current in mA	pressure
secondary values	pressure, current in %, current in mA, sensor temperature, device ID, HART-TAG, HART-Descriptor, <empty>	current in %, current in mA, device ID
<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

### Diagnostic functions

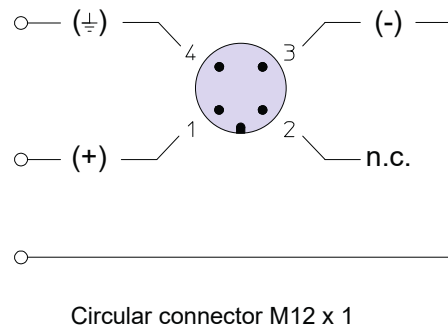
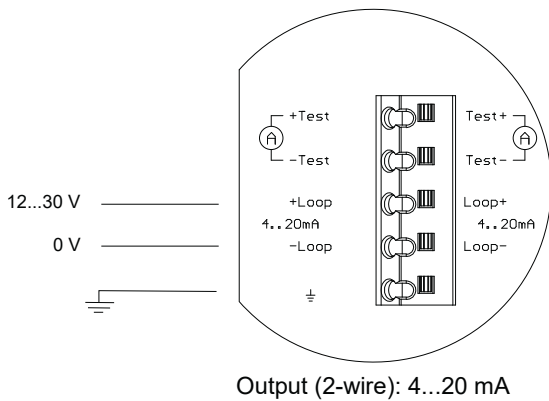
Self- diagnosis	Description	Value range
RAM-Test	Permanent check of the read/write memory	/
ROM-Test	Permanent check of the checksum via the program memory	/
Bridge circuit test	Permanent check of the bridge circuit	/
CRC parameterisation test	Permanent check of the checksum via the parameter memory	/
Electronics temperature monitoring	Permanent check of the electronics temperature	/
<b>Process diagnostics</b>		
Maintenance timer	Check of the maintenance cycles	/
Operating hours counter	Capture of operating hours	/
Min/Max values	Check of minimum and maximum process pressure and sensor temperature	/
<b>Measuring circuit diagnostics</b>		
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 dampingk and tabular function unlike the current simulation	Nominal range

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## Adjustment

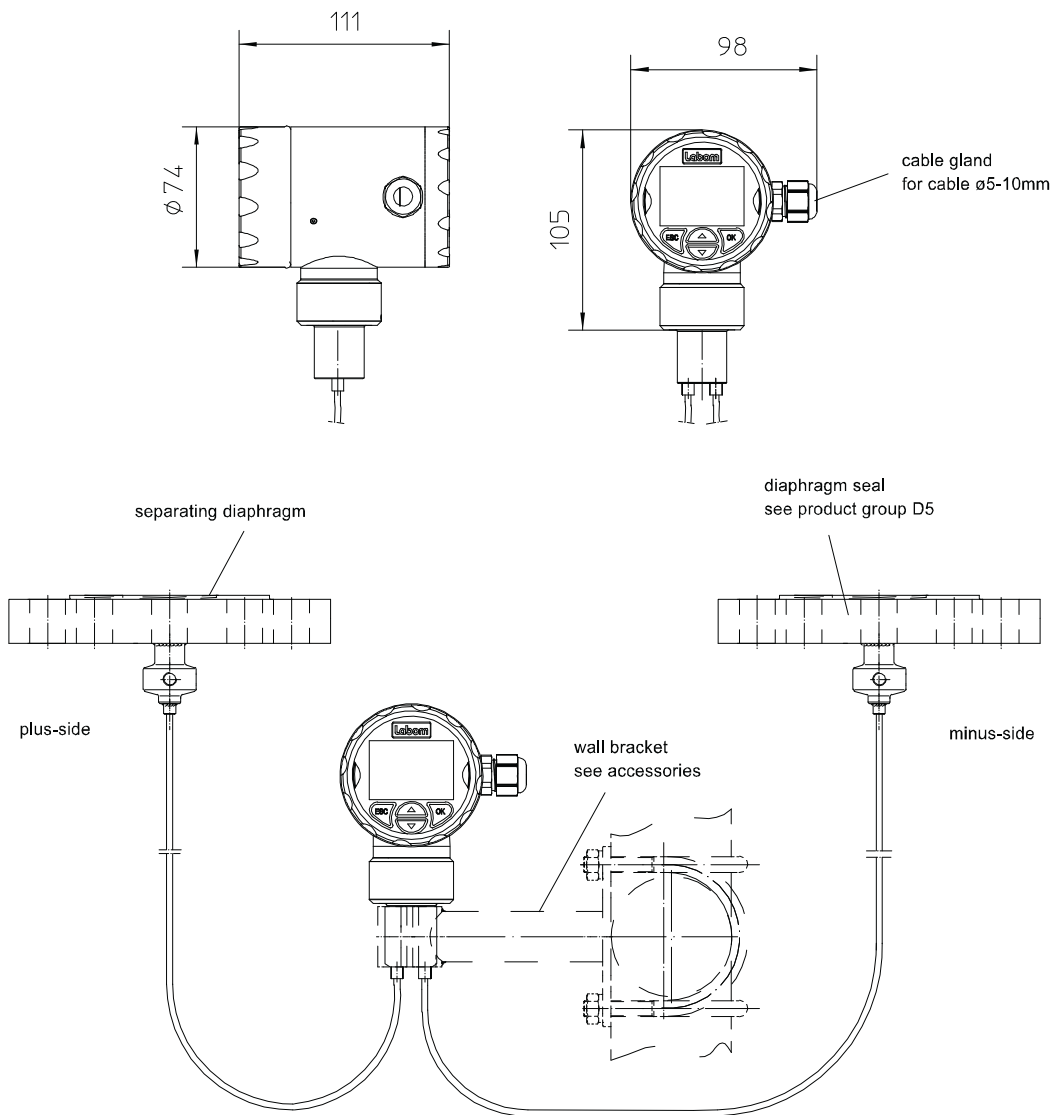
Type	Description
zero point correction	adjusts reading to 0 bar at same pressure on both connections
position correction	adjusts reading of 0 bar at same pressure on both connections and installed conditions
lower adjustment	adjusts reading to applied pressure (affects zero point + span)
upper adjustment	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

## Connection diagram



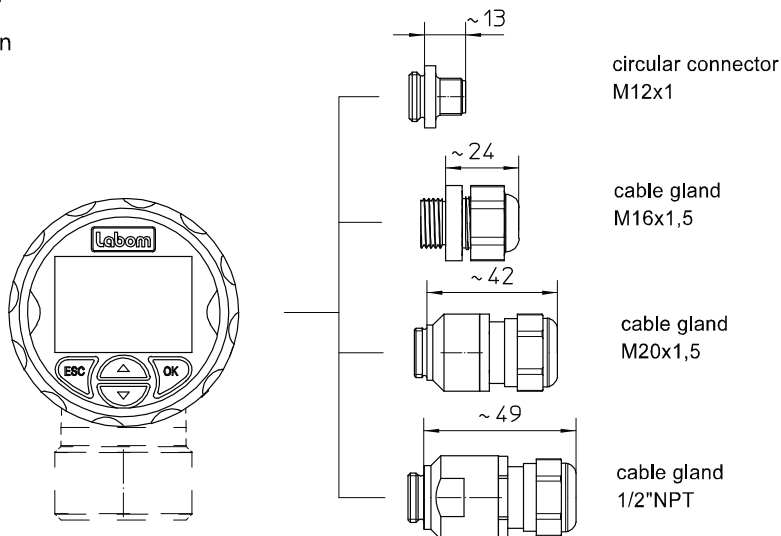
## Dimensions

### Case and process connections



All dimensions are in mm

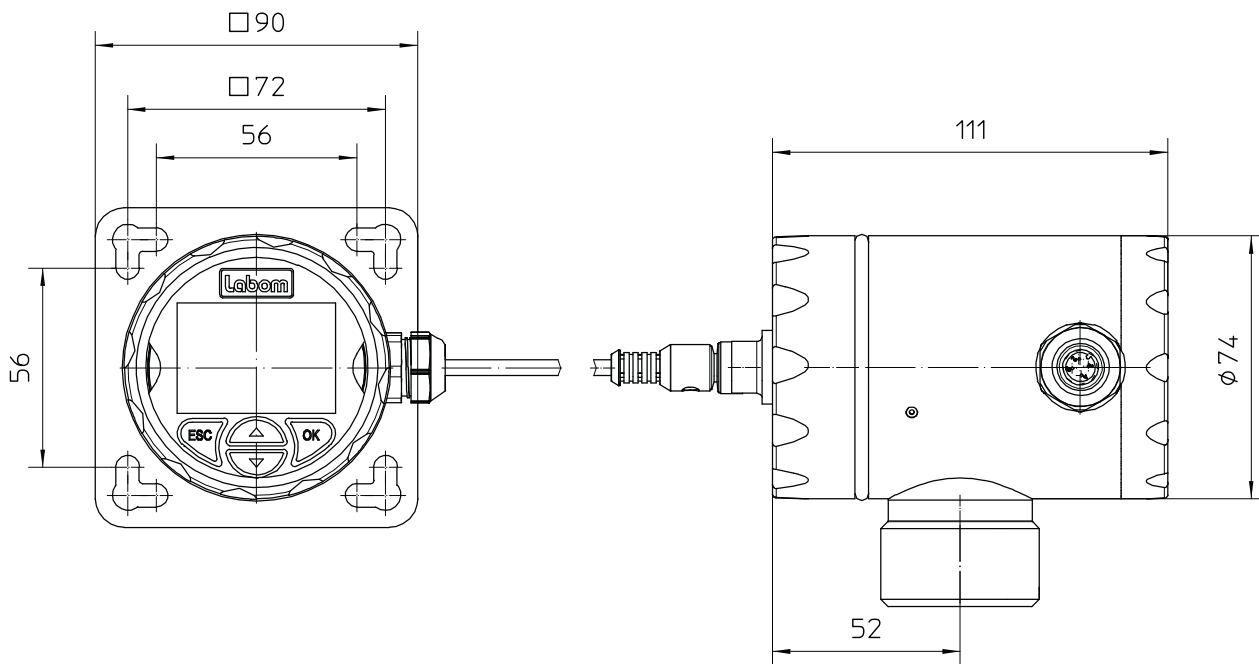
### Electrical connection



all dimensions are in mm

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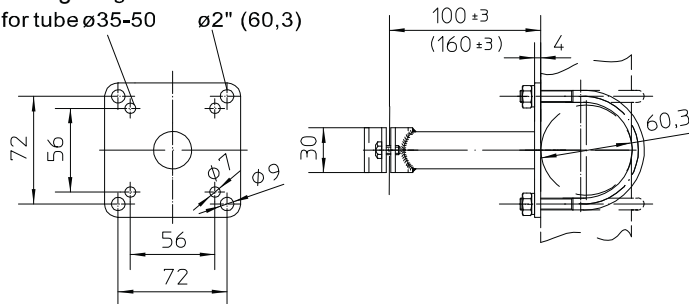
**Remote display and control unit (Type series MC1140)**



All dimensions are in mm

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

drilling diagram  
for tube  $\varnothing 35-50$



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				without display	German	
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 <sup>2</sup>				
5		pole terminals 2.5 mm <sup>2</sup>				
6		screw terminals 2.5 mm <sup>2</sup>				
T30	circular connector M12 x 1 (4-polig)					
<b>Process connections (diaphragm seal) see product group D5</b>						

Additional features (to be indicated if required)			
S62	Ex marking <sup>1</sup>	ATEX	⊕ II 1/2G, II 2G Ex ia IIC TX Ga/Gb, Gb
			⊕ II 1/2D, II 2D Ex ia IIIC Txx °C Da/Db, Db
S77		IECEX	Ex ia IIC TX Ga/Gb, Gb
			Ex ia IIIC Txx °C Da/Db, Db
T4	degree of protection	IP 69K <sup>1</sup>	
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		
W2673	certificate of measuring equipment for Russian Federation <sup>2</sup>		

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 <sup>2</sup>	
2		pole terminals 2.5 mm <sup>2</sup>	
3		screw terminals 2.5 mm <sup>2</sup>	
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	
MC1020	HART-Modem	RS 232 -interface	
MC1040		USB-interface	
MC1041		USB-interface, Ex	

Order detail (example): C14330 – A1056 – F1 – H21 – Y12 – T200 – - - ...

<sup>1</sup> Requires front cover of stainless steel