

Pressure transmitter PASCAL Ci4 for food/pharmaceutical/biotechnology, Type series CI4110



Application area

- Pharmaceutical industry
- Food industry
- Biotechnology

Application

The digital pressure transmitter PASCAL Ci4 is suitable for measuring the relative and absolute pressure of gases, vapors and liquids. Due to the design and various process connections the transmitter is suitable for the hygienic requirements of the food and pharmaceutical industry.

Features

- Pressure transmitter for the measuring of relative and absolute pressures of gases, vapors and liquids in applications for food and pharmaceutical industry
- Stainless steel case in hygienic design, degree of protection IP 65/67
- Accuracy 0.1 %
- High-resolution graphic 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 range 0.25 bar to 40 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 up to 160 ° C
- Wetted parts stainless steel
- Case design:
 - process connection bottom
 - process connection back
- Various hygienic process connections
- 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
- Active temperature compensation (ATC technology)
- Removable display and control unit
- Degree of protection IP 69K
- Front cover of stainless steel with window of non-splintering glass
- Wetted parts electropolished

Data sheet D4-016-2 Rev. 1A8

Technical data

Measuring ranges

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

Nominal range	Measuring span		Overload capacity	Lower measuring range limit **	Sensor type
	min	max			
-0.25...0.25 bar rel.	0.0025 bar	0.5 bar	1 bar rel.	750 mbar abs	Piezoresistive
0...1 bar *	0.01 bar	2 bar	3 bar rel.	100 mbar abs	
0...4 bar rel. *	0.04 bar	5 bar	10 bar rel.	100 mbar abs	
0...16 bar rel. *	0.16 bar	17 bar	60 bar rel.	100 mbar abs	
0...40 bar rel. *	0.4 bar	41 bar	100 bar rel.	100 mbar abs	
-1...1 bar rel.	0.01 bar	2 bar	20 bar rel.	30 mbar abs	
-1...4 bar rel.	0,04 bar	5 bar	50 bar rel.	30 mbar abs	
-1...16 bar rel.	0.16 bar	17 bar	60 bar rel.	30 mbar abs	
-1...40 bar rel.	0.4 bar	41 bar	150 bar rel.	30 mbar abs	
0...1 bar abs	0.01 bar abs.	1 bar abs.	3 bar abs.	30 mbar abs	
0...4 bar abs	0.04 bar abs.	4 bar abs.	10 bar abs.	30 mbar abs	
0...16 bar abs	0.16 bar abs.	16 bar abs.	60 bar abs.	30 mbar abs	

* Short term or sporadic measurement in vacuum range permitted up to lower measuring limit. Lower range value up to -1 bar rel. adjustable.

** 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:**
- Polypropylene, black
 - Stainless steel mat.no. 1.4305 (303)
 - Stainless steel mat.no. 1.4404 (316L)
- Gaskets:** Silicone / NBR
- Degree of protection per EN 60529:**
- IP 65 / IP 67
 - IP 69K
- Climatic category per EN 60721 3-4:** 4K4H
- 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

- Position:**
- bottom
 - back

Design: See order details

Material wetted parts

Material: See order details

Hygienic design

The wetted surfaces made of stainless steel are executed according to EHEDG Doc.8 and ASME BPE SF3 (Code: HY).

We guarantee the following surface roughness values:

Diaphragm foil: Ra \leq 0.38 μ m

Laser welds: Ra \leq 0.76 μ m

Turned parts: Ra \leq 0.76 μ m

Further versions of hygienic design upon request.

Measuring system

Sensor: Piezoresistive measuring element

System filling: Synthetic oil, free of silicone FD1, FDA listed

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
 Process connection back: horizontal

Deviation of characteristic:

Refer to the adjusted measuring span (Limit point method per DIN 16086)
Nominal range 1-40 bar, 1-16 bar abs.

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 1-16 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:

Depending on design

diaphragm diameter [mm]	temp.error device [mbar/10K]	temperature compensated* [mbar/10K]
15.5	18.0	2.0
22.6	7.2	1.5
24	4.2	1.2
27	3.0	1.0
30	2.4	0.9
34	1.5	0.8
40	0.8	-
46	0.5	-
48	0.4	-
51	0.35	-
58	0.3	-

* Active compensation of process temperatures (ATC-Technology, see General Technical Advices TA_041)

Indication

Display:

- High-resolution graphic display with backlight
- 4-button operation
- Freely configurable display modes
- continuously rotatable by ± 170 (detent every 90°)
- 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® 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 μA

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

Load R: $R \leq (U-12\text{V DC})/0.02 \text{ A } [\Omega]$
 $U = \text{supply voltage}$
 for HART communication $R \geq 230 \ \Omega$

Supply voltage

Functional range: 12...30 V DC, protected against polarity reversal

Ripple: < 5 %

Data sheet D4-016-2 Rev. 1A8

Temperature ranges

Ambient:	-40...80 °C (Display visibility is limited at temperatures below -30 °C)
Media:	-20...160 °C at $T_a = \max. 70 \text{ °C}$, > 500 mbar abs with temperature decoupler up to 200 °C $T_a = \text{ambient temperature}$ <u>Vacuum application:</u> 10...500 mbar abs: -20...120 °C < 10 mbar abs upon request
Storage:	-40...80 °C

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

Please note:

For all nominal ranges, except:
-1...1 bar rel. bis -1...40 bar rel.
more detailed information can be found in Ex Safety Instruction XA_010.

For the nominal ranges:

-1...1 bar rel. bis -1...40 bar rel.:

more detailed information can be found in Ex Safety Instruction XA_011.

EMC *: Per DIN EN 61326-1, NAMUR NE21

* A deviation of accuracy due to EMC influence up to 0.25 % is impossible for a design with process connection at the back.

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
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
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

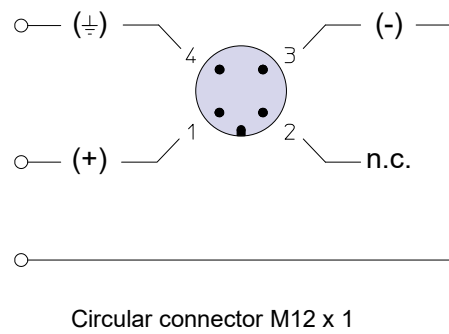
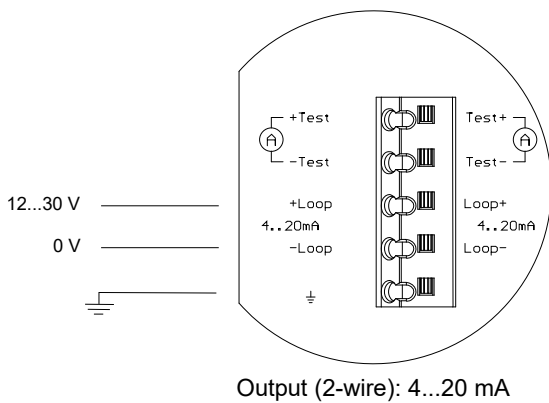
Self- diagnosis	Description	Value range
RAM-Test	Permanent check of the read/write memory	/
ROM-Test	Permanent check of the checksum via the program memory	/
Bridge circuit test	Permanent check of the bridge circuit	/
CRC parameterisation test	Permanent check of the checksum via the parameter memory	/
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	Check of minimum and maximum 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

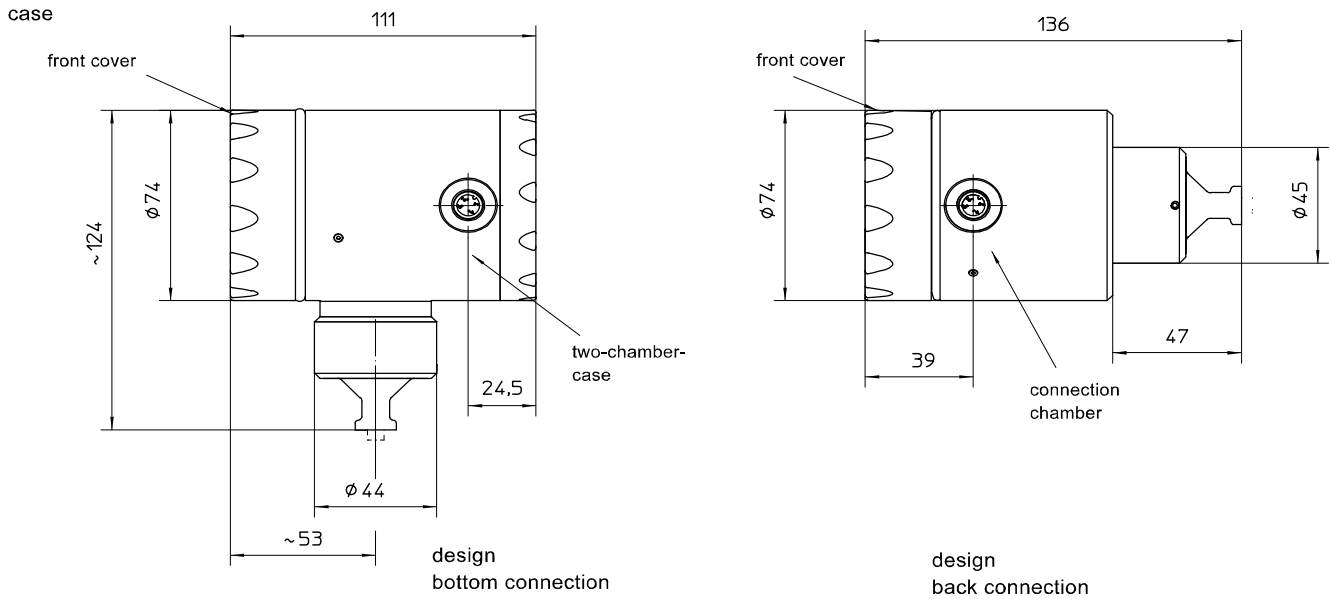
* Operating software LAB4Level for intuitive parameterisation of level measurements upon request

Connection diagram

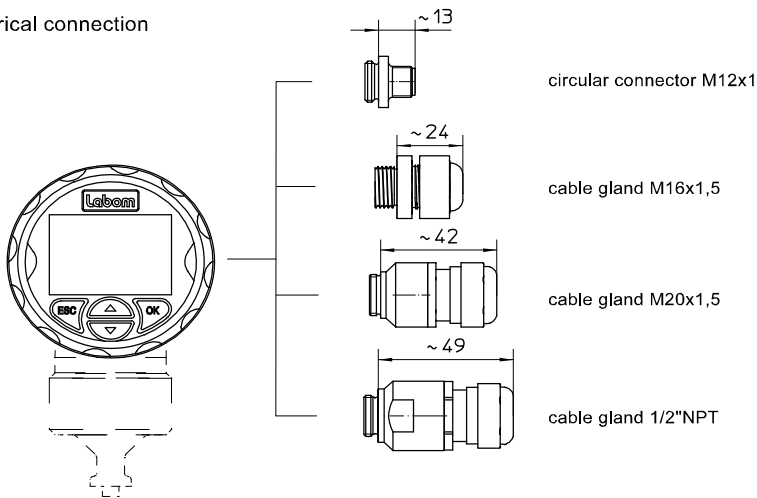


Dimensions

Case

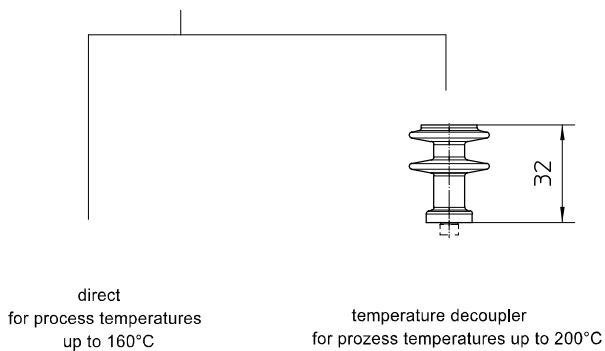


Electrical connection



All dimensions are in mm

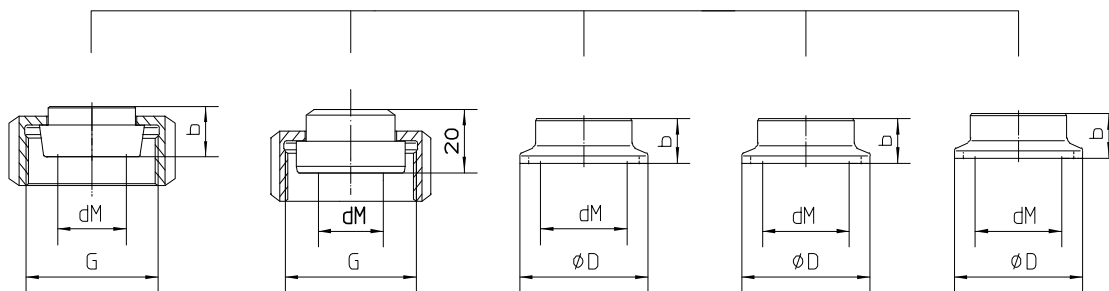
Connection



All dimensions are in mm

Data sheet D4-016-2 Rev. 1A8

Process connection



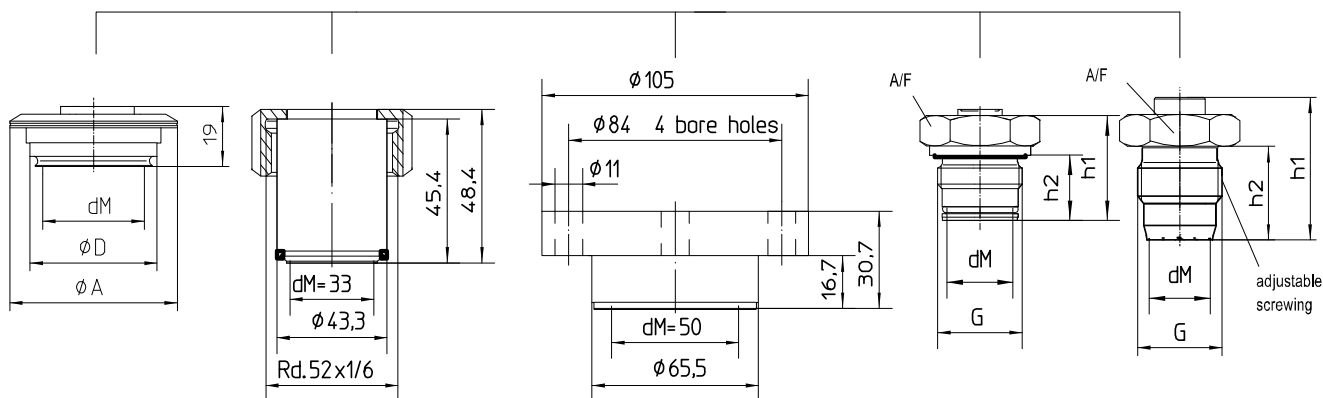
sanitary connection with coupling nut per DIN 11851

aseptic screw joint collar connection with union nut per DIN 11864-1 type A

clamp connection per ISO 2852

clamp connection per DIN 32676

Tri-clamp connection



Varivent connection

HYGENIC-Tubus $\phi 43,3$ with screwing DN25/PN40
weld-in adapter see data-sheet D6-037

DRD-connection DN50 PN40
weld-in adapter see data-sheet D6-037

Screw-in thread G1A with o-ring-gasket
weld-in adapter see data-sheet D6-037

HYGENIC-screw-in thread G1A no gasket
weld-in adapter see data-sheet D6-037

All dimensions are in mm

Sanitary pipe connection with union nut per DIN 11851

DN	PN	dM	b	G
25	40	27	16	Rd.52x1/6"
32	40	30	16	Rd.58x1/6"
40	40	34	16	Rd.65x1/6"
50	25	48	17	Rd.78x1/6"

Aseptic screw joint collar connection with union nut per DIN 11864-1 type A

DN	PN	dM	G
25	40	24	Rd.52x1/6"
32	40	30	Rd.58x1/6"
40	40	34	Rd.65x1/6"
50	25	48	Rd.78x1/6"

Clamp connection per DIN 32676 model A (metric) for pipes per EN 10357 (DIN 11850)

DN	PN	dM	b	D
25	25	22.6	14	50.5
32	25	27	12	50.5
40	25	34	12	50.5
50	16	46	14	64

Clamp connection per DIN 32676 model B (OD, ISO) for pipes per DIN EN ISO 1127

DN	PN	dM	b	D
26.9	25	22.6	14	50.5
33.7	25	27	12	50.5
42.4	25	34	12	64
48.3	16	46	14	64

Clamp connection per DIN 32676 model C (Tri-Clamp) for pipes per ASME BPE

DN	PN	dM	b	D
3/4"	25	15.5	15	25
1"	25	22.6	14	50.5
1 1/2"	25	34	12	50.5
2"	16	46	14	64

Clamp connection per ISO 2852 for pipes per ISO 2037

DN	PN	dM	b	D
25	16	22.6	14	50.5
38	16	34	12	50.5
51	16	46	14	64

Data sheet D4-016-2 Rev. 1A8

Varivent connection

DN / Zoll	PN	dM	A	D
25 / 1"	25	40	66	50
40-80/ 1 1/2" - 3"	25	58	84	68
100 / 4"	20	58	84	68
125 / 6"	10	58	84	68

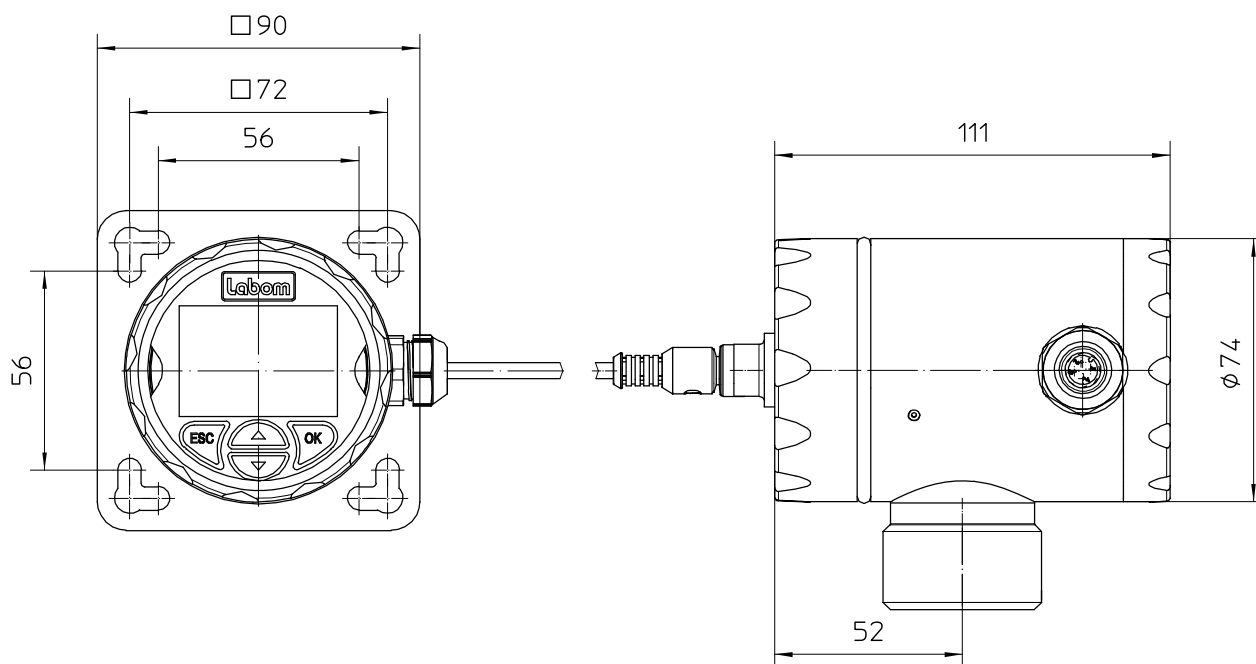
HYGIENIC screw-in thread, sealing without elastomer

G	PN (bar)	dM	h1	h2	SW
G1 A	50	24	45	28.5	36

Screw-in thread with O ring sealing

G	PN (bar)	dM	h1	h2	SW
G1/2 A		15.5	33	20.5	27
G1 A	50	24	33	20.5	41

Remote display and control unit (Type series MC1140)



All dimensions are in mm

Order details

Pressure transmitter PASCAL Ci4 for food/pharmaceutical/biotechnology Type series CI4110

Order details pressure transmitter PASCAL CI411. for food/pharmaceutical/biotechnology

CI4110	process connection bottom					
CI4113	process connection back					
	nominal range	turndown	overload limit [bar]	sensor type		
A1078	-0.25...0.25 bar rel.	TD up to 100:1	1	piezoresistive		
A1053	0...1 bar rel.		3			
A1056	0...4 bar rel.		10			
A1059	0...16 bar rel.		60			
A1061	0...40 bar rel.		100			
A1053.1	-1...1 bar rel.		20			
A1056.1	-1...4 bar rel.		50			
A1059.1	-1...16 bar rel.		60			
A1061.1	-1...40 bar rel.		150			
B1053	0...1 bar abs.		3			
B1056	0...4 bar abs.		10			
B1059	0...16 bar abs.		60			
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)				
Y2.		stainless steel mat.-no. 1.4404 (316)				
1	material front cover	polypropylene (black), window Macrolon				
2		stainless steel, window non splintering glass				
3		stainless steel, 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			Chinese	English, Chinese		
M23.1			English			
M23.2			Spanish	English, Spanish, French		
M23.3			French			
M25.1			English	English, Polish, German		
M25.2			Polish			
M25.3			German			
M26.1			English	English, Turkish, German		
M26.2			Turkish			
M26.3			German			
M1				without display		
T20.			electrical connection	cable gland	M16 x 1.5 polyamide, for cable Ø 4.5-10 mm	
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		screwed terminals 2.5 mm ²				
T30		circular connector M12 x 1 (4 pin)				

Continuation order code			
K1085	design	standard	
K2085		with temperature decoupler	
K102	process connection material: ASTM 316L	sanitary pipe connection with union nut per DIN 11851	DN 25
K103			DN 32
K104			DN 40
K105			DN 50
K162			DN 25
K163		DN 32	
K165		DN 40	
K166		DN 50	
K124		clamp connection per ISO 2852 for pipes per ISO 2037	DN 25 (1")
K126			DN 38 (1 1/2")
K127			DN 51 (2")
K144		clamp connection per DIN 32676, model A (metric) for pipes per EN 10357 (DIN 11850)	DN 25
K146			DN 32
K147			DN 40
K148			DN 50
K213		clamp connection per DIN 32676, model B (OD, ISO) for pipes per DIN EN ISO 1127	DN 26,9
K214			DN 33,7
K215			DN 42,4
K216			DN 48,3
K134		clamp connection per DIN 32676, model C (Tri-Clamp) for pipes per ASME BPE	DN 3/4" ¹
K136			DN 1"
K137			DN 1 1/2"
K138			DN 2"
K152		Varivent	D= 50 for Varivent DN 25 and 1"
K153			D= 68 for Varivent DN 40...125 and 1 1/2" ...6"
K172		HYGIENIC Tubus	Ø 43,3 mm with screwing DN 25/PN 40
K185		DRD connection	nominal width DN 50 / nominal pressure PN 40
K195	screw-in thread	G 1 A with O-ring seal	
K80		G 1 A with hygienic process connection (elastomer-free)	
	surface roughness	standard	
HY	(wetted parts)	Hygienic version as per EHEDG Doc.8 and ASME BPE SF3	

Additional features (to be indicated if required)			
S66	Ex marking ^{2,4}	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
S76		IECEX	Ex ia IIC TX Ga/Gb, Gb
			Ex ia IIIC Txx°C Da/Db, Db
S62	Ex marking ^{2,5}	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
X1	vacuum application	negative pressure service	temperature limits see TA_038 Pressure Transmission Fluids
X2		vacuum service	
X3	Active Temperature Compensation (ATC) ³		
T4	degree of protection	IP 69K ²	
W4035	elektropolishing	wetted parts	
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 ⁶		

Accessories		
MC1140	PASCAL Ci4 remote display and control unit including wall bracket	
	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		screwed terminals 2.5 mm ²
T1	degree of protection	IP 65 / IP 67 (standard)
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
MC1041		USB-interface, Ex

Order code (example): **CI4110 – A1056 – F1 – H21 – Y12 – T200 – K1085 – K102 - ...**

- ¹ for a function calculation and optimim system design it is necessary to specify the operation temperature
- ² Requires front cover of stainless steel
- ³ only for devices directly welded
- ⁴ for all nominal ranges except: -1...1 bar rel. bis -1...40 bar rel.
- ⁵ only for the nominal ranges: -1...1 bar rel. bis -1...40 bar rel.
- ⁶ not for devices with Ex-protection