

Differential pressure transmitter PASCAL Ci4 Delta P

for high static working pressure,
Type series CI4340



Application area

- General process engineering
- Chemical industry
- Petrochemical industry
- General process technology
- Power generation
- Environmental engineering
- Water / wastewater

Features

- High-resolution graphic display with intuitive operation and backlight
- Reference accuracy 0.07 %
- Long-term stability 0,1 % within 5 years
- Stainless steel case in sturdy design, degree of protection IP 65/67
- Maximum working pressure 400 bar
- Simultaneous display of differential pressure and static pressure
- Comprehensive parameterising functions
- Comprehensive simulation and diagnostic functions
- Quick access to device data
- Nominal range 10 mbar bar to 16 bar
- Turndown up to 100:1
- Measuring rate up to 50 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
- Wetted parts stainless steel
- Operating software LAB4Level for intuitive parameterisation of level measurements (upon request)

Options and additional features

- Approvals / Certificates
 - Explosion protection (ATEX/IECEx/UKEX) for gases and dust
 - Classification per SIL2 (in preparation)
 - Material certificate per EN 10204-3.1
 - Calibration certificate per EN 10204-3.1
 - Material certificate per NACE MR0175/ISO 15156-3
- As per UKCA regulations
- Removable display and control unit
- Degree of protection IP 69K
- Diaphragm of stainless steel with gold coating or of Hastelloy C276

Application

The digital differential pressure transmitter PASCAL Ci4 Delta P for high static working pressure is suitable for the use in sturdy ambient conditions for the measurement of differential pressure in filters and pumps. Is also suitable for deriving values as flow and filling level.

Technical data

Measuring ranges

Up to the max. turndown the measuring span can freely selected.

Nominal range	max. turndown	Static excess pressure and overload limit
		one sided (+/-) / double-sided
-10...10 mbar	20 : 1	40 bar
-30...30 mbar	30 : 1	40 bar
-100...100 mbar	100 : 1	160 bar
-500...500 mbar		160 bar oder 400 bar *
-3...3 bar		160 bar oder 400 bar *
-16...16 bar		160 bar oder 400 bar *

Minimal permissible static pressure: 5 mbar abs (at reference conditions)

* See order details

For information on definitions of terms regarding the Pressure Equipment Directive, see Technical Instruction TA_068.

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: $\pm 0.35 \text{ mm}$
60...1000 Hz: 5 g

Material window: ■ Non-splintering glass (requires front cover of stainless steel)
■ Polycarbonate

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 mm^2
■ Pole terminals up to 2.5 mm^2
■ Screw terminals up to 2.5 mm^2

Weight: approx. 2.9 kg

Type plate: Laser marking

Process connection

Design: Process flange with connection dimension per EN 61518 and with mounting thread 7/16 – 20 UNF

- Process connection 1/4 – 18 NPT
- Cutting ring fitting stainless steel per DIN 2353
 - for pipe $\varnothing 6 \text{ mm}$, mounted
 - for pipe $\varnothing 8 \text{ mm}$, mounted
 - for pipe $\varnothing 10 \text{ mm}$, mounted
 - for pipe $\varnothing 12 \text{ mm}$, mounted
- Process connection 1/2 – 14 NPT via oval flange (see accessories)

Further process connections upon request.

Ventilation: ■ without, with sealing plug 1/4" NPT
■ with ventilation valve 1/4" NPT

Gasket: ■ EPDM
temperature range $-40...85^\circ\text{C}$ (not for PN400)
■ FKM
temperature range $-20...85^\circ\text{C}$

Material wetted parts

Process flange: Stainless steel mat.no. 1.4404 (316L)

Diaphragm: ■ Stainless steel mat.-no. 1.4404 (316L)
■ Stainless steel mat.-no. 1.4404 (316L), gold coating $6 \mu\text{m}$
■ Hastelloy C276

Gasket: EPDM or FKM

Oval flange: Stainless steel mat.-no. 1.4404 (316L)

Ventilation valve: Stainless steel mat.-no. 1.4404 (316L)

Sealing plug: Stainless steel mat.-no. 1.4404 (316L)

Measuring system

Sensor: Piezoresistive measuring element

System filling: Silicone oil

Accuracy

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

Calibration position: Process connection bottom: vertical

Reference accuracy:

Per EN 61298-2 incl. non-linearity, hysteresis and repeatability refer to the adjusted measuring span:

Nominal range	turndown < 5:1	turndown > 5:1	max. turn-down
-10...10 mbar	$\leq \pm 0.1 \%$	$\leq \pm (0.02 \% \times \text{TD} + 0.0025 \%)$	20 : 1
-30...30 mbar			30 : 1
Nominal range	turndown < 10:1	turndown > 10:1	max. turn-down
-100...100 mbar	$\leq \pm 0.07 \%$	$\leq \pm (0.01 \% \times \text{TD} - 0.0325 \%)$	100 : 1
-500...500 mbar		$\leq \pm (0.005 \% \times \text{TD} + 0.0175 \%)$	
-3...3 bar		$\leq \pm (0.005 \% \times \text{TD} + 0.0175 \%)$	
-16...16 bar		$\leq \pm (0.01 \% \times \text{TD} - 0.0325 \%)$	

Long-term drift: $\leq 0.1 \%$ within 5 years, referring to nominal range

Temperature influence of ambient temperature:

Refer to measuring range (per IEC 61298-3):		
Nominal range	temperature range: -10...60 °C	max. turndown
-10...10 mbar	$\leq \pm (0.15 \% + 0.20 \% \times \text{TD})$	20 : 1
-30...30 mbar	$\leq \pm (0.10 \% + 0.10 \% \times \text{TD})$	30 : 1
-100...100 mbar	$\leq \pm (0.15 \% + 0.15 \% \times \text{TD})$	100 : 1
-500...500 mbar	$\leq \pm (0.15 \% + 0.05 \% \times \text{TD})$	
-3...3 bar	$\leq \pm (0.15 \% + 0.05 \% \times \text{TD})$	
-16...16 bar	$\leq \pm (0.15 \% + 0.15 \% \times \text{TD})$	
Nominal range	temperature range: -40...80 °C	max. turndown
-10...10 mbar	$\leq \pm (0.40 \% + 0.30 \% \times \text{TD})$	20 : 1
-30...30 mbar	$\leq \pm (0.15 \% + 0.15 \% \times \text{TD})$	30 : 1
-100...100 mbar	$\leq \pm (0.15 \% + 0.2 \% \times \text{TD})$	100 : 1
-500...500 mbar	$\leq \pm (0.2 \% + 0.06 \% \times \text{TD})$	
-3...3 bar	$\leq \pm (0.2 \% + 0.06 \% \times \text{TD})$	
-16...16 bar	$\leq \pm (0.15 \% + 0.2 \% \times \text{TD})$	

Temperature influence current output (-40...80 °C): $\leq \pm (0.04 \% / 10 \text{ K})$

Influence static pressure (per EN 61298-3):
Refer to nominal range:
for PN40 and PN160:
 $\leq \pm (0.1 \% + 0.1 \% \times \text{TD})$
for PN400:
 $\leq \pm (0.25 \% + 0.25 \% \times \text{TD})$

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

Operational availability < 12 s

Response time t_{90} at current output typically 200 ms

Digitale 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: 50 Hz

Resolution: 0.5 μA

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

Load R: $R \leq (U - 12\text{V DC}) / 0.022 \text{ A } [\Omega]$
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 for PN40 and PN160:
-40...85 °C (at the measuring cell)

for PN400:
-20...85 °C (at the measuring cell)

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
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_022.

EMC :	per EN 61326-1, NAMUR NE21
SIL2:	In preparation: Functional safety per EN 61508, classification per SIL2.

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
upper range value	at any value within nominal range	end of nominal range
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
static 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 in %, current in mA	pressure
secondary values	pressure, static pressure, current in %, current in mA, sensor temperature, device ID, HART-TAG, HART-Descriptor, <empty>	current in %, current in 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

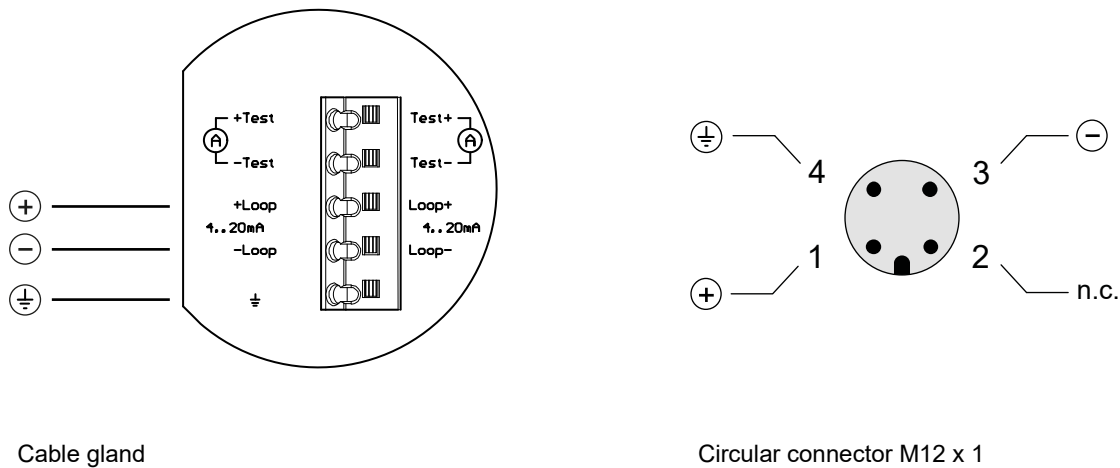
Self- diagnosis	Description	Value range
RAM-Test	Permanent check of the read/write memory	/
ROM-Test	Permanent check of the checksum via the program memory	/
Bridge circuit test	Permanent check of the bridge circuit	/
CRC parameterisation test	Permanent check of the checksum via the parameter memory	/
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 same pressure on both connections
position correction	adjusts reading of mounted instrument to zero at same pressure on both connections
lower adjustment	adjusts reading to applied pressure (affects zero point)
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

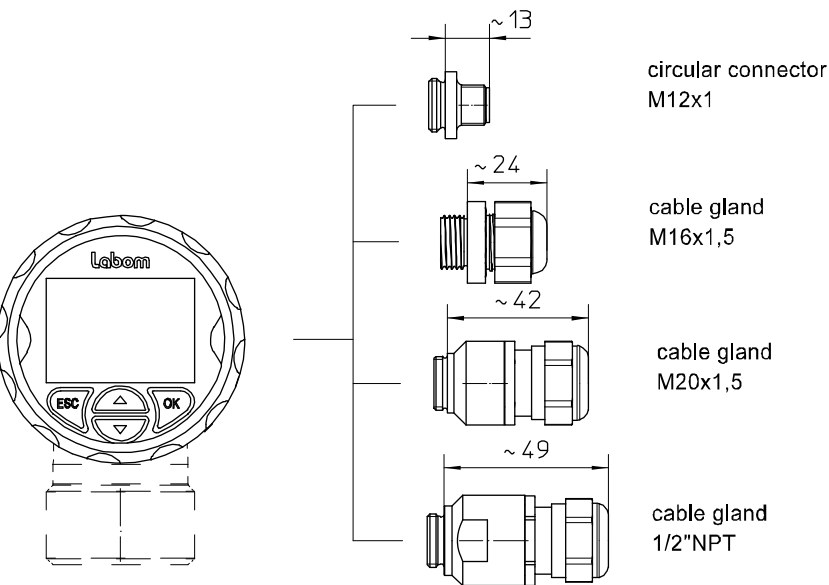
Connection diagram



Cable gland

Circular connector M12 x 1

Electrical connection



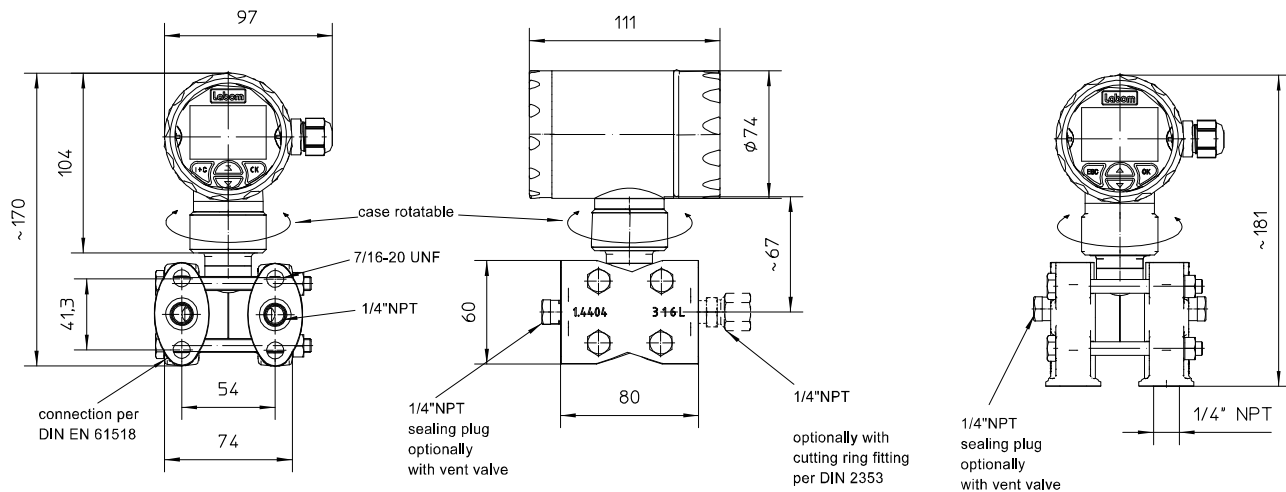
All dimensions are in mm.

Dimensions

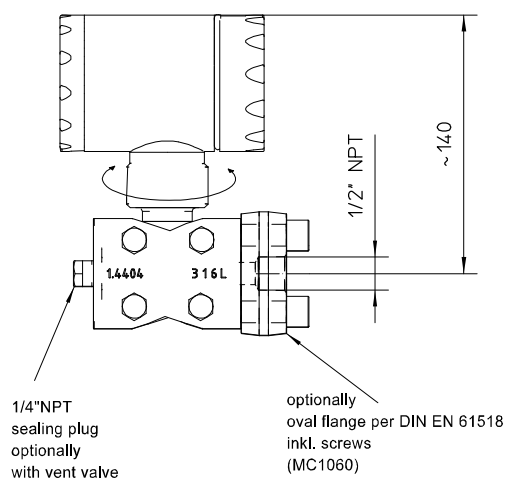
Case and process connections

Orientation process flange horizontal (standard)

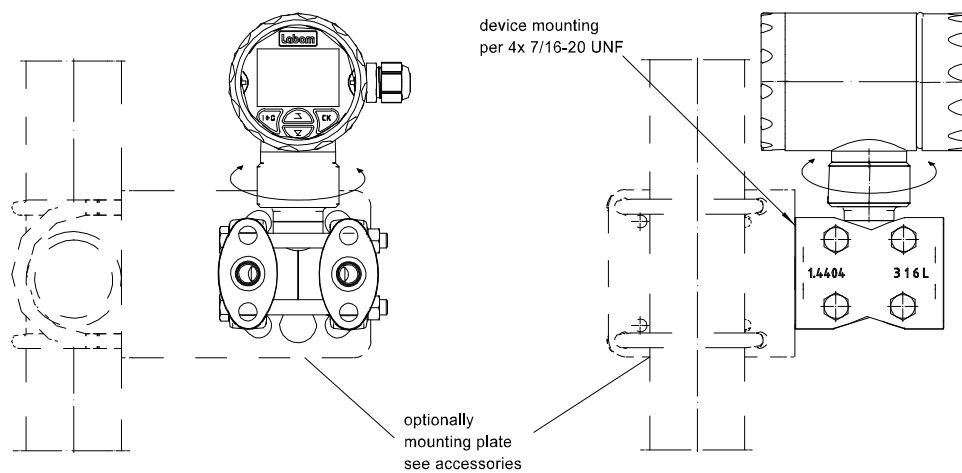
Orientation process flange turned by 90°



Design with oval flange (type series MC1060)



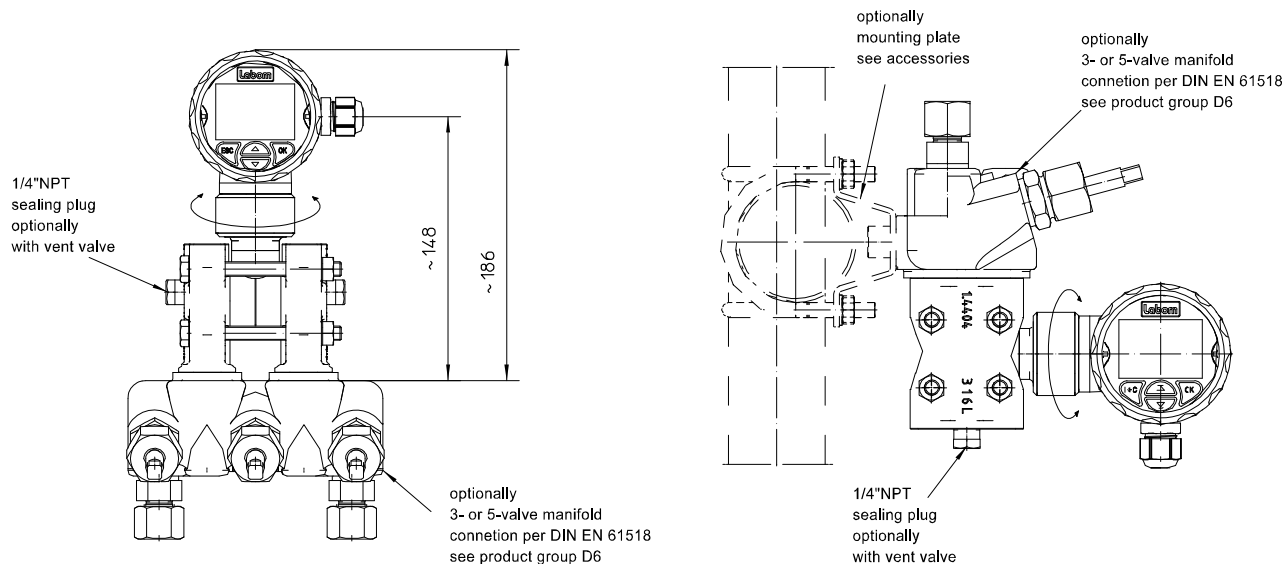
Design with mounting angle for wall and pipe-mounting (type series MM1500)



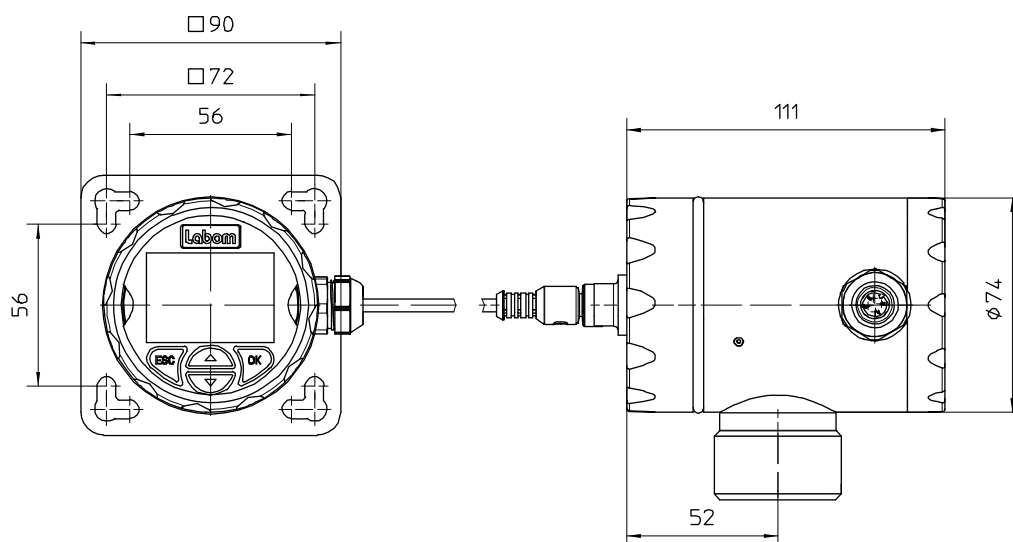
Design with valve block (type series MV6210 / MV6410)

Orientation process flange turned by 90° (standard)

Orientation process flange horizontal

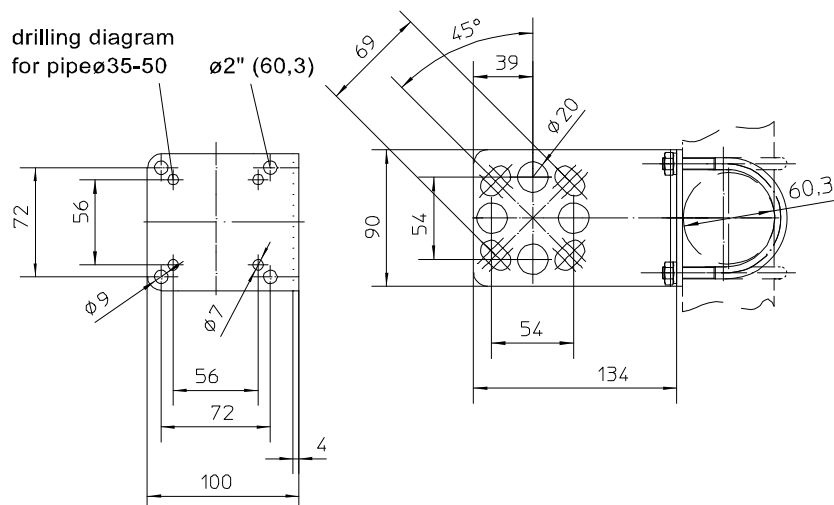


Remote display and control unit (Type series MC1140)



All dimensions are in mm

Mounting angle for wall and pipe-mounting (Type series MM1500)



All dimensions are in mm

Order details

Differential pressure transmitter PASCAL Ci4 Delta P for high static working pressure				
CI4340	Differential pressure transmitter PASCAL Ci4 Delta P for high static working pressure			
A1003.2	nominal range for PN40	-10...10 mbar		
A1574.2		-30...30 mbar		
A1008.2	nominal range for PN160	-100...100 mbar		
A1573.2		-500...500 mbar		
A1618.2		-3...3 bar		
A1059.2		-16...16 bar		
A1573.4	nominal range for PN400 ₁	-500...500 mbar		
A1618.4		-3...3 bar		
A1059.4		-16...16 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
	display	High-resolution graphic display with backlight, intuitive 4-button operation, quick access to device data	German (standard)	English, German
M21.1			English	
M22.1			English	English, Chinese
M22.2			Chinese	
M23.1			English	English, Spanish, French
M23.2			Spanish	
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	
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)		

K511..	process connection	process flange ²	stainless steel 316L, connection per EN 61518 process flange horizontal (standard) - process connection 1/4 – 18 NPT - mounting thread 7/16 – 20 UNF
K532..			stainless steel 316L, connection per EN 61518, process flange turned by 90°, compact design ^{3,4} - process connection 1/4 – 18 NPT bottom - mounting thread 7/16 – 20 UNF bottom - ventilation lateral
3		ventilation	without, with sealing plug of stainless steel 316L
4			with vent valve of stainless steel 316L
2		gasket	EPDM, Temperaturbereich -40...85 °C ³
1.			FKM, temperature range -20...85 °C
	threaded pipe connection	without cutting ring fitting	

K511..	process connection	process flange ²	stainless steel 316L, connection per EN 61518 process flange horizontal (standard) - process connection 1/4 – 18 NPT - mounting thread 7/16 – 20 UNF
K532..			stainless steel 316L, connection per EN 61518, process flange turned by 90°, compact design ^{3,4} - process connection 1/4 – 18 NPT bottom - mounting thread 7/16 – 20 UNF bottom - ventilation lateral
3		ventilation	without, with sealing plug of stainless steel 316L
4			with vent valve of stainless steel 316L
2		gasket	EPDM, Temperaturbereich -40...85 °C ³
1.			FKM, temperature range -20...85 °C
1		incl. 2 x cutting ring fittings	stainless steel per DIN 2353 for pipe ø 6 mm, mounted
2			stainless steel per DIN 2353 for pipe ø 8 mm, mounted
3			stainless steel per DIN 2353 for pipe ø 10 mm, mounted
4			stainless steel per DIN 2353 for pipe ø 12 mm, mounted
G1	diaphragm material	stainless steel mat.-no. 1.4404 / 1.4435 (316L)	
G21		stainless steel mat.-no. 1.4404 / 1.4435 (316L), gold coating 6 µm ⁴	
G3		Hastelloy C276	
Additional features (to be indicated if required)			
S62	Ex marking 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
S87		UKEX	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
T4	degree of protection	IP 69K ⁵	
W1020	material certificate	per EN 10204-3.1, wetted parts	
W1030		per NACE MR0175/ISO 15156-3 ⁶	
W1201	calibration certificate	per EN 10204-3.1, 5 measuring points ⁷	
W2002	calibration protocol		
W2660	as per UKCA regulations		
Accessories			
MV6210	valve manifold	3-fway, directly flanged per EN 61518, nominal pressure PN 400 DN 5, material: stainless steel mat.-no. 1.4571 (316Ti)	
MV6410		5-fway, directly flanged per EN 61518, nominal pressure PN 400 DN 5, material: stainless steel mat.-no. 1.4571 (316Ti) with packing of PTFE up to 200 °C	
A21	process connection	compression fitting for pipes ø 8 mm	
A22		compression fitting for pipes ø 10 mm	
A23		compression fitting for pipes ø 12 mm	
A30		G 3/8 female	
A32		1/2" NPT female	
A35		G 1/2B male	
A36		1/2" NPT male	
N1	design	with socket wrench	
N2		with plastic handwheel	
M10	mounting material	without mounting material	
M11		with mounting material, screws and gaskets of NBR	
W1020	material certificate	per EN 10204-3.1, wetted parts	
MM1500-A11	mounting angle	for wall and pipe-mounting Ø 35-50 mm of stainless steel, incl. screws 7/16-20 UNF	
MM1500-A12		for wall and pipe-mounting Ø 2" of stainless steel, incl. screws 7/16-20 UNF	
MC1060-A132	oval flange	oval flange 1/2-14 NPT per EN 61518, modal A of stainless steel mat.-no. 1.4404 (316L), incl. 2 screws 7/16-20 UNF, material stainless steel, incl. gasket EPDM ²	
MC1060-A133		oval flange 1/2-14 NPT per EN 61518, modal A of stainless steel mat.-no. 1.4404 (316L), incl. 2 screws 7/16-20 UNF, material stainless steel, incl. gasket FKM	
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
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)

Order code (example): CI4340 – A1573.2 – F1 – H21 – Y12 – T200 – K51132 – G1 - ...

¹ Not possible with cutting ring fittings.

² With mounted valve manifold upon request.

³ Not for PN400.

⁴ Not for PN40.

⁵ Requires front cover of stainless steel.

⁶ Not for diaphragm of stainless steel with gold coating.

⁷ For all nominal ranges except 10 and 30 mbar.