

Pressure transmitter PASCAL CV4

with threaded connection

Type series CV4100



Application area

- Pharmaceutical industry
- Food industry
- Biotechnology
- General process technology

Features

- Compact case of stainless steel in hygienic design according to recommendations from EHEDG and 3A, degree of protection IP 65/67
- Accuracy $\leq 0.15\%$
- High-resolution graphic display with intuitive operation and backlight
- Quick access to device data
- Comprehensive parameterising, simulation and diagnostic functions
- Nominal range 0,25 bar to 600 bar
- Turndown up to 20:1
- Output signal 4...20 mA with HART® protocol
- Digital communication via PDM/EDD and FDT/DTM
- Output functions: linear, inverse
- Table function with up to 32 support points
- Wetted parts stainless steel
- Case design:
 - process connection at back
 - process connection bottom
- Process connection: screw-in thread with internal diaphragm

Options

- Accuracy $\leq 0.1\%$
- Gold coating of sensor diaphragm (thickness 6 μm)
- Thin film sensor for H₂-applications
- Approvals/Certificates
 - Explosion protection (ATEX/IECEX/UKEX) for gases and dust
 - Material certificate per EN 10204-3.1
 - Calibration certificate per EN 10204-3.1
 - Certificate for hydrogen resistance per EN 10204-3.1
- As per UKCA regulations
- Degree of protection IP 69K
- Case and front cover of stainless steel 316L
- Oxygen free of oil and grease

Application

The digital pressure transmitter PASCAL CV4 is suitable for measuring the relative and absolute pressure of gases, vapors and liquids. Due to the design the transmitter is suitable for highest requirements. The 4 operation buttons allow an easy and fast parameterisation.

Especially for use in hydrogen applications a calculation tool is available with which the suitable sensor diaphragm material (with/without gold plating) can be determined on the basis of the available process data.

Technical data

Measuring ranges

Up to a turndown of 20:1 the measuring span can be freely selected.

Nominal range	Measuring span		Overload capacity	Lower measuring range limit **	Sensor type
	min	max			
0...1 bar *	0.05 bar	2 bar	3 bar	100 mbar abs	Piezoresistive
0...4 bar *	0.2 bar	5 bar	10 bar	100 mbar abs	
0...16 bar *	0.8 bar	17 bar	60 bar	100 mbar abs	
0...40 bar *	2 bar	41 bar	100 bar	100 mbar abs	
0...100 bar *	5 bar	101 bar	200 bar	100 mbar abs	
-0.25...0.25 bar	0.0125 bar	0.5 bar	1 bar	750 mbar abs	
-1...1 bar	0.05 bar	2 bar	3 bar	30 mbar abs	
-1...4 bar	0.2 bar	5 bar	10 bar	30 mbar abs	
-1...16 bar	0.8 bar	17 bar	60 bar	30 mbar abs	
-1...40 bar	2 bar	41 bar	100 bar	30 mbar abs	
-1...100 bar	5 bar	101 bar	200 bar	30 mbar abs	
-1...100 bar	5 bar	101 bar	200 bar	0 mbar abs	Thin film for H ₂ -applications
-1...400 bar	20 bar	401 bar	see table A (order details)	0 mbar abs	
-1...600 bar	30 bar	601 bar	see table A (order details)	0 mbar abs	Thin film
-1...100 bar	5 bar	101 bar	200 bar	0 mbar abs	
-1...400 bar	20 bar	401 bar	see table B (order details)	0 mbar abs	
0...1 bar abs	0.05 bar abs	1 bar abs	3 bar abs	30 mbar abs	Piezoresistive
0...4 bar abs	0.2 bar abs	4 bar abs	10 bar abs	30 mbar abs	
0...16 bar abs	0.8 bar abs	16 bar abs	60 bar abs	30 mbar abs	
0...40 bar abs	2.0 bar abs	40 bar abs	120 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: Hygienic case of stainless steel, continuously rotatable by $\pm 170^\circ$

Material case and front cover: Process connection back:
Stainless steel mat.-no. 1.4305 (303)
Option: stainless steel mat.-no. 1.4404 (316L)
Process connection bottom:
Stainless steel mat.-no. 1.4301 (304)
Option: stainless steel mat.-no. 1.4404 (316L)

Gasket: Silicone
EPDM / FKM (if degree of protection IP 69K)

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

Climatic category: 4K4H per EN 60721 3-4

Material window: Macrolon hardened
Option: Non-splintering glass

Electrical connection:

Circular connector M12
Option: Cable glands

- M16 x 1.5, PA black
- M16 x 1.5, brass nickel-plated
- M16 x 1.5, stainless steel
- M20 x 1.5, PA black
- M20 x 1.5, brass nickel-plated
- M20 x 1.5, stainless steel
- 1/2" NPT, PA black

Further connections upon request

Terminal blocks:

Spring clamp terminals up to 2 mm²

Type plate:

Adhesive label

Process connection

Position:

- back
- bottom

Design:

- G1/2 B per EN 837-1
- G1/4 B per EN 837-1
- G1/4 A per DIN EN ISO 1179-2 (DIN 3852-11 model E)
- 1/2" NPT
- 1/4" NPT

Further process connections upon request.

Material wetted parts

Sensor	Material diaphragm	Material socket
Piezoresistive	1.4404/1.4435 (316L) optional: gold-coated (6 µm)	1.4404/1.4435 (316L)
Thin film	1.4542 (630)	1.4301/1.4542 (304/630)
Thin film for H ₂ -applications	Stainless steel	Stainless steel

Measuring system

Sensor	System filling
Piezoresistive	Synthetic oil, free of silicone FD1, FDA listed
Thin Film	dry
Thin film for H ₂ -applications	dry

Accuracy

Reference cond. per EN 61298-1:	T _U = const. (15...25) °C φ = const. (45...75) % r.F. p _U = const. (860...1060) mbar U _B = 24 V DC (± 3 V DC) R _B = 50 Ω, HART: 250 Ω Ground connected Lower range value = 0 bar
Calibration position:	Vertical

Deviation of characteristic:

Refer to the adjusted measuring span (Limit point method per DIN 16086)

For piezoresistive sensor and thin film sensor		
Nominal range	Turndown ≤ 5:1	Turndown > 5:1
1 - 400 bar	≤ ± 0.15 %	≤ ± 0.03 % x TD
0.25 bar	≤ ± 0.15 %	≤ ± 0.03 % x TD

Option (not for nominal range 250 mbar):

Nominal range	Turndown ≤ 5:1	Turndown > 5:1
1 - 400 bar	≤ ± 0.1 %	≤ ± 0.02 % x TD

For thin film sensor for H ₂ -applications		
Nominal range	Turndown ≤ 5:1	Turndown > 5:1
1 - 600 bar	≤ ± 0.15 %	≤ ± 0.03 % x TD

Long-term drift:

Refer to nominal range:

Nominal range	Piezoresistive / thin film sensor	Thin film sensor for H ₂ - applications
100 bar	≤ 0.1 %/Jahr	≤ 0.2 %/Jahr
400 bar		≤ 0.25 %/Jahr
600 bar		≤ 0.2 %/Jahr

Temperature influence, case:

For piezoresistive sensor and thin film sensor		
Nominal range	Temp. -20...80 °C	Temp. -40...-20 °C
1 - 400 bar	≤ ± 0.15 %/10K , max. 0.3 %	typical ≤ ± 0.2 %/10K

For thin film sensor for H ₂ applications		
Nominal range	Temp. -20...80 °C	Temp. -40...-20 °C
1 - 600 bar	≤ ± 0.2 %/10K , max. 0.3 %	typical ≤ ± 0.6 %/10K

Indication

Display:	- High-resolution graphic display with backlight - 4-button operation - Freely configurable display modes - Continuously rotatable - Removable under voltage
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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 for SIMATIC PDM
- DTM for PACTware or compatible systems (FDT compliance)

Function:	■ Linear ■ Invers ■ Table function with up to 32 support points
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Turndown: Up to 20:1

Damping: 0...999.9 s

Measuring rate: 20 Hz

Resolution: ≤ 1 µA

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

Load R_B: R_B ≤ (U_V-12V DC)/0.022 A [Ω]
U_V = supply voltage
for HART® communication R_B ≥ 230 Ω

Supply voltage

Functional range:	12...30 V DC, protected against polarity reversal 13...30 V DC (Ex), protected against polarity reversal
Ripple:	< 5 %

Temperature ranges

Ambient:	-20...80 °C Option: -40...80 °C (Display visibility is limited at temperatures below - 30 °C)
Media:	-20...100 °C
Storage:	-40...80 °C

Tests and certificates

Ex approvals

ATEX:	TÜV 20 ATEX 265286 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 20.0015X 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 21UKEX21177X ⊕ 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 detailed information see Ex Instruction XA_027.

EMV : Per EN 61326-1

Parameterisation, simulation and adjustment

Parameterisation

Parameter	Values	Default setting
Device		
device ID	16 digits, freely selectable	ID: PASCAL CV4
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, Chinese	German
decimal point	auto, x.xxxx, xx.xxx, xxx.xx, xxxx.x, xxxxx	auto
display mode	four values, three values, two values, big display,	three values
main value	pressure, current (%), current (mA)	pressure
secondary values	pressure, current (%), current (mA), sensor temperature, device ID, HART-TAG, HART descriptor, <empty>	device ID , Bargraph
Current output		
output function	linear, invers, table	linear
number of table points	2...32	2 (0 % ≙ 4 mA, 100 % ≙ 20 mA)
lower range value	at any value within nominal range	0 bar
upper range value	at any value within nominal range	upper range limit
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	on, off	off
HART® data		
HART® address	0...63	0
number of response preambels	5...20	5
current mode	proportional, constant	proportional

Diagnostic functions

Measuring circuit diagnostics	Description	Value
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
min/max values	for process pressure and sensor temperature	/

Adjustment

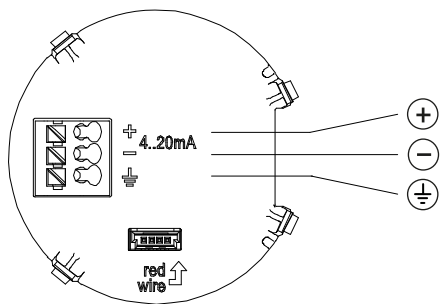
Type	Description
zero point correction	adjusts reading to zero at ambient pressure (for differential and gauge pressure devices)
position correction	adjusts reading of mounted device to zero at ambient pressure (only relative pressure measurement devices)
lower adjustment	adjusts reading of mounted device to zero at ambient pressure
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

Parameterisation for devices without a firmly fitted display

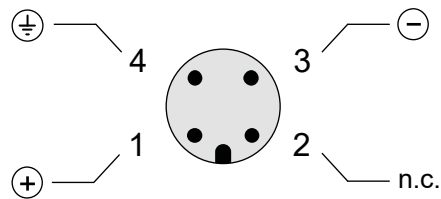
Parameterisation possible via HART® protocol.

Parameterisation possible at any time via plugging a display module.

Connection diagram



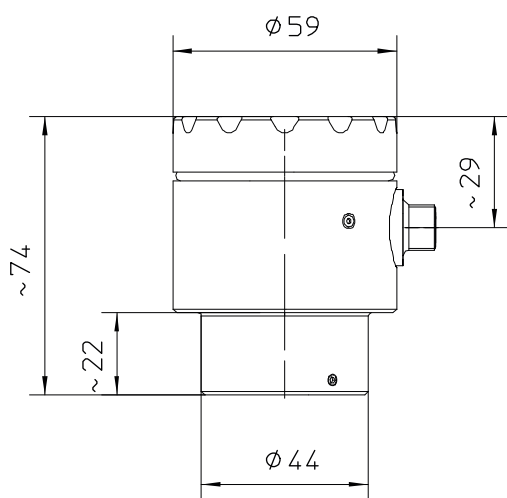
Cable gland



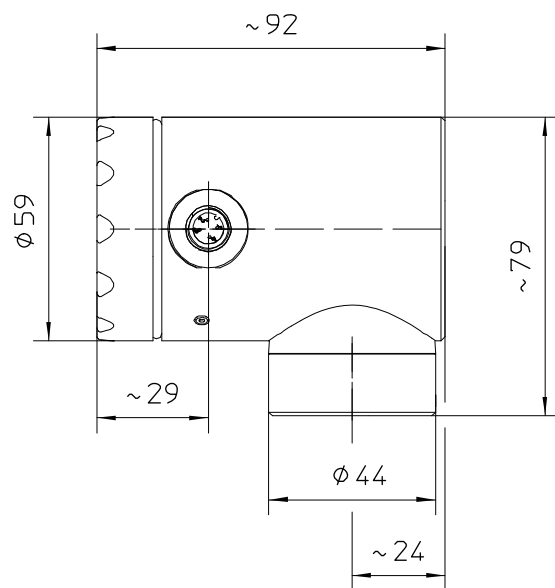
Circular connector M12 x 1

Dimensions

Standard Case

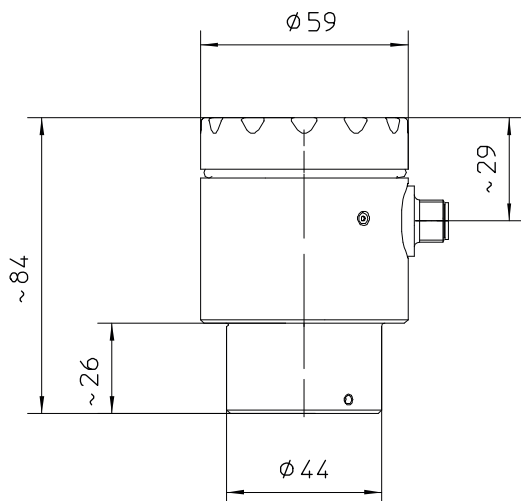


process connection at back

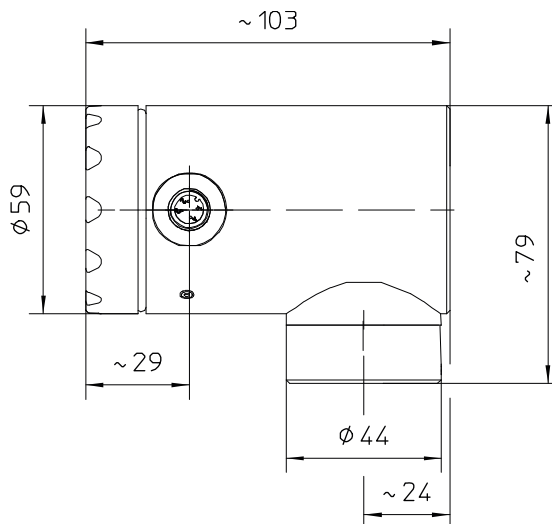


process connection bottom

Case in Ex design

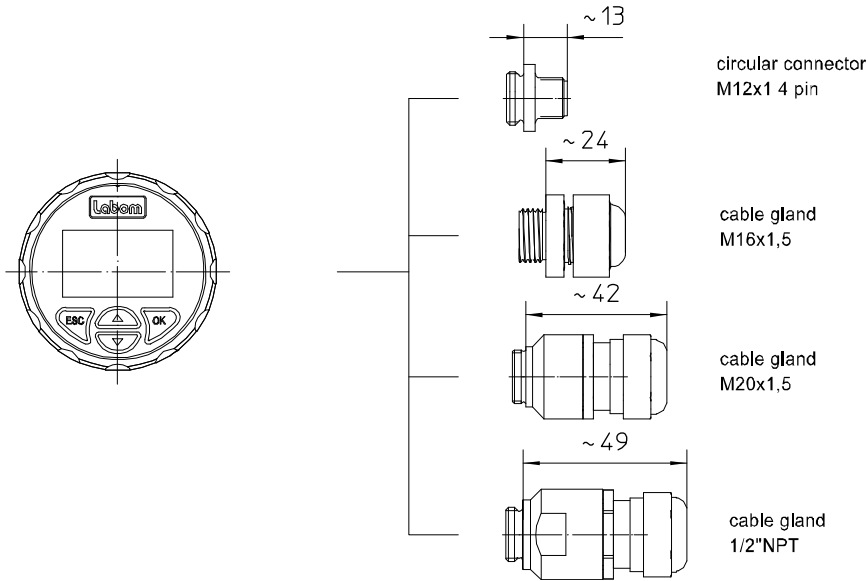


process connection at back

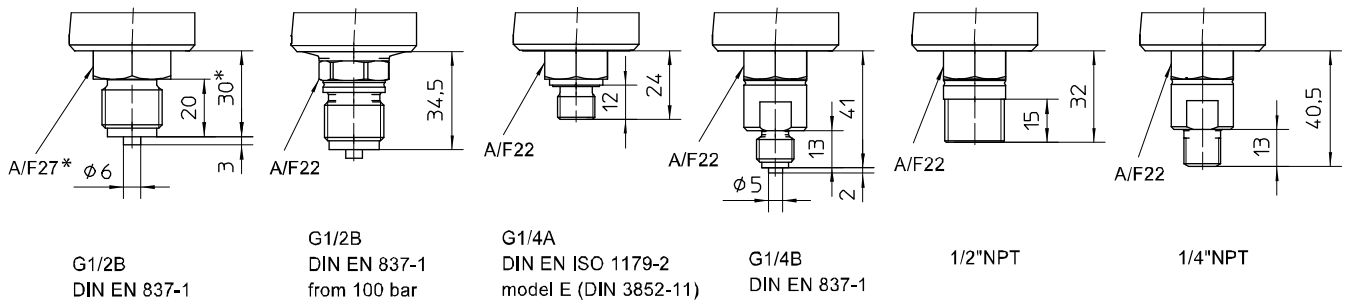


process connection bottom

Electrical connection



Process connections





* Deviations possible due to design

All dimensions are in millimeters

Order details

Pressure transmitter CV4 with threaded connection			
CV4100	pressure transmitter PASCAL CV4 with threaded connection		
R70	position process connection	at back	
R71		bottom	
	nominal range	overload limit [bar]	sensor type
A1053	0...1 bar	1	piezoresistive
A1056	0...4 bar	10	
A1059	0...16 bar	60	
A1061	0...40 bar	100	
A1063	0...100 bar	200	
A1178	-0,25...0,25 bar	1	
A1153	-1...1 bar	3	
A1156	-1...4 bar	10	
A1159	-1...16 bar	60	
A1161	-1...40 bar	100	
A1163	-1...100 bar	200	
A3163.6	-1...100 bar	200	
A3166.6	-1...400 bar	see table A ¹	
A3168.6	-1...600 bar	see table A ¹	
A3163	-1...100 bar	200	thin film
A3166	-1...400 bar	see table B ²	
B1053	0...1 bar abs	3	piezoresistive
B1056	0...4 bar abs	10	
B1059	0...16 bar abs	60	
B1061	0...40 bar abs	120	
F1	parameterisation	standard according to data sheet (see parameterisation table)	
F9		as per customer's specification	
Q2	accuracy	≤ 0,15 % der eingestellten Messspanne	
Q1		≤ 0,1 % der eingestellten Messspanne ¹	
H21	output signal	4...20 mA, with HART®-protocol	
Y14	material case/window	stainless steel mat.-no.1.4305 (303)	window Macrolon
Y12			window non-splintering glass
Y13			closed, without window
Y24		stainless steel mat.-no.1.4404 (316L)	window Macrolon
Y22			window non-splintering glass
Y23			closed, without window
T1			case degree of protection
T4	IP 69K ²		
			default language
M21.1	display	High-resolution graphic display with backlight, intuitive 4-button operation, quick access to device data	English
M21.2			German
M21.3			Chinese
M1	without display		
T20	electrical connection	cable gland	M16 x 1.5 polyamide, for cable Ø 4.5-10 mm ³
T21			M16 x 1,5 brass nickel-plated, for cable Ø 5-10
T22			M16 x 1.5 stainless steel, for cable Ø 5-9 mm ³
T15			M20 x 1.5 polyamide, for cable Ø 7-13 mm ³
T16			M20 x 1.5 brass nickel-plated, for cable Ø 7-13
T17			M20 x 1.5 stainless steel, for cable Ø 8-13 mm
T27			1/2" NPT polyamide, for cable Ø 5-12 mm
T30	circular connector M12 x 1 (4 pin) ³		
K1010	process connection	G1/2 B per EN 837-1	
K1002		G1/4 B per EN 837-1	
K1024		G1/4 A per DIN EN ISO 1179-2 model E (DIN 3852-11)	
K1070		1/2" NPT	
K1072		1/4" NPT	
K9999		as per indication	
U1	ambient temperature	-20...80 °C	
U7		-40...80 °C	

Additional features (to be indicated if required)			
J304	Coating	gold coating of internal sensor diaphragm (thickness 6 µm), for hydrogen applications ⁴	
S66	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
		S76	IECEX
S86			
		W1020	material certificate
W1201		calibration certificate	per EN 10204-3.1, 5 measuring points
W1251		certificate	per EN 10204-3.1, for hydrogen applications
W2660	as per UKCA regulations		
W4001	oxygen free of oil and grease		

Order code (example): CV4100 – A1056 – F1 – H21 – Y42 – T20 – K1010

¹ overload limit (UE) depending on process connection (see table A)

² overload limit (UE) depending on process connection (see table B)

³ not for nominal range 0.25 bar

⁴ only possible with window of Macrolon, gasket made of EPDM/FKM and selected electrical connections (see footnote 5)

⁵ suitable for degree of protection IP 69K

⁶ possible for piezoresistive nominal ranges up to 100 bar only

⁷ not possible with window of Macrolon, not suitable for degree of protection IP 69K

⁸ not possible with thin film sensors (order code A3163 and A3166 and A3163.6, A3166.6 and A3168.6)

⁹ operating conditions for the option "Oxygen free of oil and grease" depending on process connection and sensor type (see table C)

Table A: Overload limit (UE) for nominal range -1...400 and -1...600 bar depending on process connection

Process connection (s. order details)	Overload limit
K1010, K1002, K1070, K1072	1050 bar
K1024	640 bar

Table B: Overload limit (UE) for nominal range -1...400 bar depending on process connection

Process connection (s. order details)	Overload limit
K1010, K1002, K1070, K1072	600 bar
K1024	640 bar

Table C: Operating conditions for the option "Oxygen free of oil and grease" depending on process connection and sensor type

Process connection + sensor type (s. order details)	Restriction temperature	Restriction pressure
K1010, K1002, K1070, K1072 + thin film	none	none
K1010, K1002, K1070, K1072 + thin film for H2-applications	Tmax ≤ 60 °C	Pmax ≤ 80 bar

* The combination of the process connection G1/4 A per DIN EN ISO 1179-2 (DIN 3852-11) model E (K1024) and the option "Oxygen free of oil and grease" is possible upon request.