

Pressure transmitter PASCAL CV4 with threaded connection Type series CV4100



Application area

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

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.

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 1050 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
 - UL 61010-1 and CAN/CSA-C22.2 no. 61010-1
 - 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

Technical data

Measuring ranges

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

Nominal range	Measuring span		Overload limit	Increased overload limit	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	6 bar	750 mbar abs	
-1...1 bar	0.05 bar	2 bar	3 bar	10 bar	30 mbar abs	
-1...4 bar	0.2 bar	5 bar	10 bar	25 bar	30 mbar abs	
-1...16 bar	0.8 bar	17 bar	60 bar	120 bar	30 mbar abs	
-1...40 bar	2 bar	41 bar	100 bar	120 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	-	0 mbar abs	
-1...600 bar	30 bar	601 bar	see table A	-	0 mbar abs	
-1...1050 bar	52,5 bar	1051 bar	see table A	-	0 mbar abs	
-1...100 bar	5 bar	101 bar	200 bar	-	0 mbar abs	Thin film
-1...400 bar	20 bar	401 bar	see table B	-	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	

Table A: Overload limit (UE) for nominal range -1...400, -1...600 bar and -1...1050 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

* 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.

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

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:

- Non-splintering glass
- Polycarbonate

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:

$T_U = \text{const. (15...25) } ^\circ\text{C}$
 $\varphi = \text{const. (45...75) \% r.F.}$
 $p_U = \text{const. (860...1060) mbar}$
 $U_B = 24 \text{ V DC } (\pm 3 \text{ V DC})$
 $R_B = 50 \Omega$, 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 $\leq 5:1$	Turndown $> 5:1$
1 - 400 bar	$\leq 0.15 \%$	$\leq 0.03 \% \times \text{TD}$
0.25 bar	$\leq 0.15 \%$	$\leq 0.03 \% \times \text{TD}$

Option (not for nominal range 250 mbar and H₂-applications):

Nominal range	Turndown $\leq 5:1$	Turndown $> 5:1$
1 - 400 bar	$\leq 0.1 \%$	$\leq 0.02 \% \times \text{TD}$

For thin film sensor for H ₂ -applications		
Nominal range	Turndown $\leq 5:1$	Turndown $> 5:1$
100 - 1050 bar	$\leq 0.15 \%$	$\leq 0.03 \% \times \text{TD}$

Long-term drift:

Refer to nominal range

Nominal range	Piezoresistive / thin film sensor	Thin film sensor for H ₂ - applications
100 bar	$\leq 0.1 \%/ \text{Jahr}$	$\leq 0.2 \%/ \text{Jahr}$
400 bar		$\leq 0.25 \%/ \text{Jahr}$
600 bar	/	$\leq 0.2 \%/ \text{Jahr}$
1050 bar		

Temperature influence, case:

For piezoresistive sensor and thin film sensor		
Nominal range	Temp. -20...80 $^\circ\text{C}$	Temp. -40...-20 $^\circ\text{C}$
1 - 400 bar	$\leq 0.15 \%/10\text{K}$, max. 0.3 %	typical $\leq 0.2 \%/10\text{K}$

For thin film sensor for H ₂ applications		
Nominal range	Temp. -20...80 $^\circ\text{C}$	Temp. -40...-20 $^\circ\text{C}$
100 - 1050 bar	$\leq 0.2 \%/10\text{K}$, max. 0.3 %	typical $\leq 0.6 \%/10\text{K}$

Indication

- Display:
- High-resolution graphic display with backlight
 - 4-button operation
 - Freely configurable display modes
 - Continuously rotatable
 - Removable under voltage

Output

Signal:	2-wire technology	4...20 mA
	Lower limit	3.8...4 mA
	Upper limit	20...21 mA
	Lower alarm current	$< 3.6 \text{ mA}$
	Upper alarm current	$> 21 \text{ mA}$
	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

Turndown: Up to 20:1

Damping: 0...999.9 s

Measuring rate: 20 Hz

Resolution: $\leq 1 \mu\text{A}$

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

Load R_B : $R_B \leq (U_V - 12\text{V DC})/0.022 \text{ A } [\Omega]$
 U_V = supply voltage
 for HART[®] communication $R_B \geq 230 \Omega$

Supply voltage

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

For Ex design: 13...30 V DC, protected against polarity reversal

For UL/CSA: 12...30 V DC, protected against polarity reversal, PELV

Further informations see Operating Instruction BA_080.

Ripple: $< 5 \%$

Temperature ranges

Ambient: -20...80 °C

Option: -40...80 °C
 (Display visibility is limited at temperatures below -30 °C)

For UL/CSA: 5...40 °C

Media: -20...100 °C

Storage: -40...80 °C

Ambient conditions for UL/CSA

- Exclusively for indoor use
- Altitude up to 2000 m
- Maximum relative humidity 80 % for temperatures up to 31 °C, decreasing linearly to 50 % relative humidity at 40 °C
- Pollution degree 2

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.

UL/CSA : per UL 61010-1 and CAN/CSA-C22.2 no. 61010-1
 UL certificate no. E536236

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

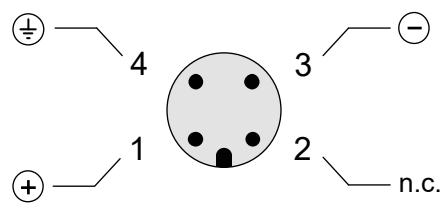
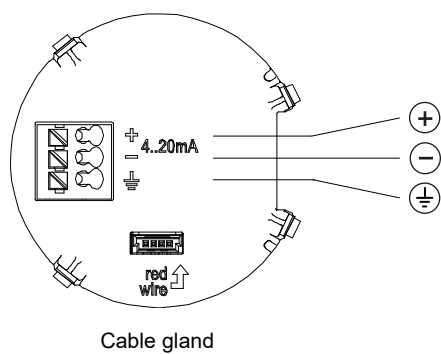
Type	Description
zero point correction	adjusts reading to zero at ambient pressure (for differential and gauge pressure devices)
position correction	adjusts reading of mounted device to zero at ambient pressure (only relative pressure measurement devices)
lower adjustment	adjusts reading of mounted device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

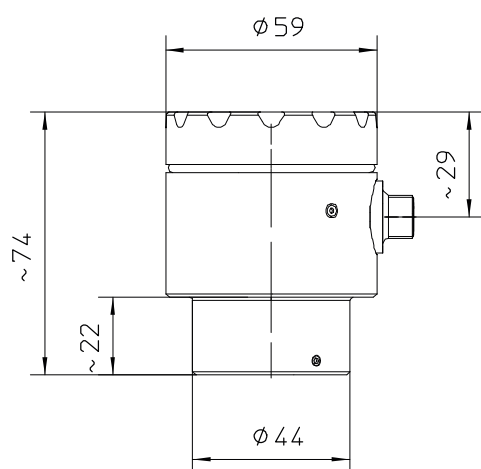
Connection diagram



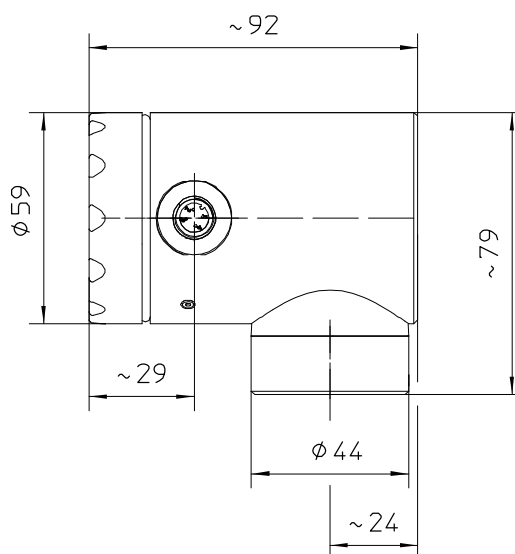
Circular connector M12 x 1

Dimensions

Standard Case

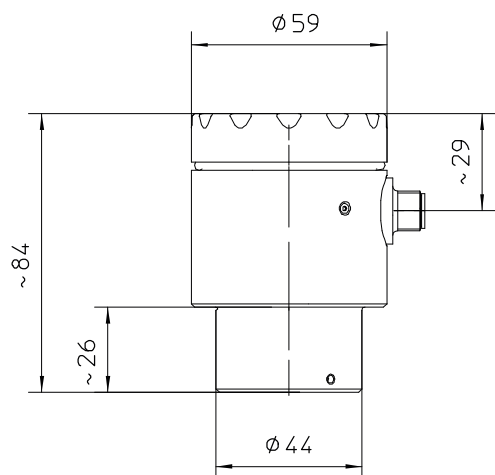


process connection at back

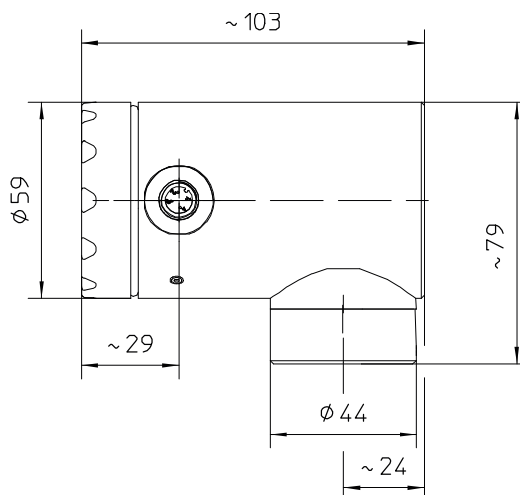


process connection bottom

Case in Ex design

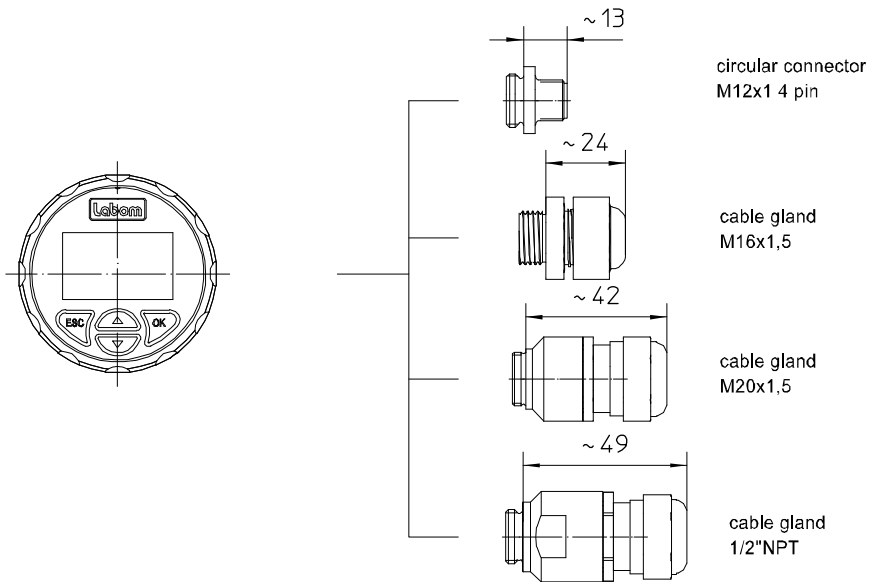


process connection at back



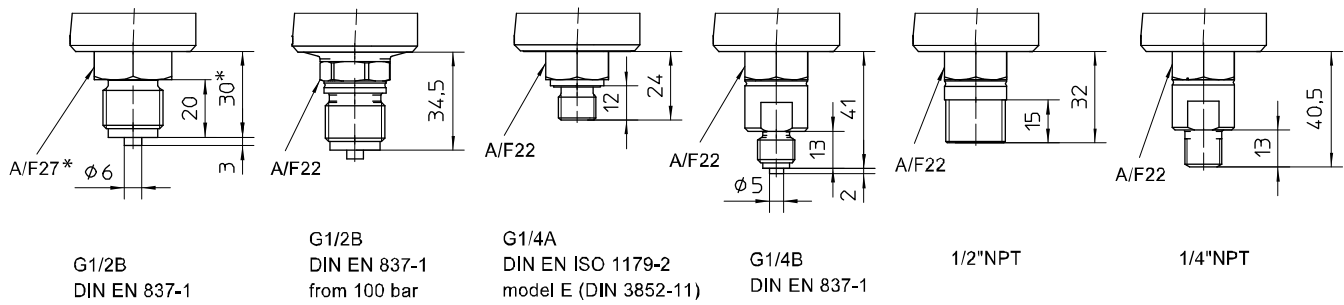
process connection bottom

Electrical connection



All dimensions are in millimeters

Process connections



* Deviations possible due to design

All dimensions are in millimeters

Order details

Pressure transmitter PASCAL 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]	increased overload limit [bar]	sensor type
A1053	0...1 bar	3	-	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	-	
A1178.1	-0,25...0,25 bar	-	6	
A1153.1	-1...1 bar	-	10	
A1156.1	-1...4 bar	-	25	
A1159.1	-1...16 bar	-	120	
A1161.1	-1...40 bar	-	120	
A3163.6	-1...100 bar	200	-	thin film for H2-applications
A3166.6	-1...400 bar	see table A ¹	-	
A3168.6	-1...600 bar ²	see table A ¹	-	
A3173.6	-1...1050 bar ²	see table A ¹	-	
A3163	-1...100 bar	200	-	thin film
A3166	-1...400 bar	see table B ³	-	
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 % of adjusted measuring span		
Q1		≤ 0,1 of adjusted measuring span ⁴		
H21	output signal	4...20 mA, with HART®-protocol		
Y14	material case/window	stainless steel mat.-no.1.4305 (303)	window polycarbonate	
Y15			window polycarbonate, UL case design	
Y12			window non-splintering glass	
Y13			closed, without window	
Y24		stainless steel mat.-no.1.4404 (316L)	window polycarbonate	
Y25			window polycarbonate, UL case design	
Y22			window non-splintering glass	
Y23			closed, without window	
T1	case degree of protection	IP 65 / IP67		
T4		IP 69K ⁵		
			default language	
M21.1	display	High-resolution graphic display with backlight, intuitive 4-button operation and 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 ⁶	
T21			M16 x 1,5 brass nickel-plated, for cable Ø 5-10 mm	
T22			M16 x 1.5 stainless steel, for cable Ø 5-9 mm ⁶	
T15			M20 x 1.5 polyamide, for cable Ø 7-13 mm ⁶	
T16			M20 x 1.5 brass nickel-plated, for cable Ø 7-13 mm	
T17			M20 x 1.5 stainless steel, for cable Ø 8-13 mm ²	
T27			1/2" NPT polyamide, for cable Ø 5-12 mm ⁷	
T30		circular connector M12 x 1 (4 pin) ⁶		

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 ²
U7		-40...80 °C ²
U12		5...40 °C

Additional features (to be indicated if required)			
J304	Coating	gold coating of internal sensor diaphragm (thickness 6 μm), for hydrogen applications ^{7, 8}	
S66	Ex marking ⁹	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
S86		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
W1020	material certificate	per EN 10204-3.1, wetted parts ¹⁰	
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		
W2680	approval per UL 61010-1 and CAN/CSA-C22.2 no. 61010-1 ^{11,12}		
W4001	oxygen free of oil and grease ¹³		

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

¹ Overload limit (UE) depending on process connection (see table A under Technical data).

² Not possible for UL/CSA.

³ Overload limit (UE) depending on process connection (see table B under Technical data).

⁴ Not for nominal range 0.25 bar and for thin film sensors for H₂ applications up to 600 bar.

⁵ Only possible with window of polycarbonate or closed cover without window, gasket made of EPDM/FKM and selected electrical connections (see footnote 6).

⁶ Suitable for degree of protection IP 69K.

⁷ For UL/CSA after consultation.

⁸ Possible for piezoresistive nominal ranges up to 100 bar only.

⁹ Not possible with window of polycarbonate.

¹⁰ Not possible with thin film sensors (order code A3163 and A3166 and A3163.6, A3166.6, A3168.6 and A3173.6).

¹¹ Not possible for devices with Ex marking.

¹² Only in combination with UL/CSA case design (order code Y15 or Y25) or with closed case without window (order code Y13 and Y23) and at a fixed ambient temperature (order code U12).

¹³ Operating conditions for the option "Oxygen free of oil and grease" depending on process connection and sensor type (see table C).

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 + piezoresistiv	-20...85 °C	Pmax ≤ 90 bar
K1010, K1002, K1070, K1072 + thin film	none	none
K1010, K1002, K1070, K1072 + thin film for H ₂ applications	Tmax ≤ 85 °C	Pmax ≤ 90 bar
K1024 + piezoresistiv / thin film / thin film for H ₂ applications	Tmax ≤ 60 °C	Pmax ≤ 40 bar

Other temperature and pressure ranges on request.