

Operating instruction for pressure transmitter PASCAL CV4 4...20 mA, Type series CV3... with basic module



Features

- Modular pressure transmitter
Output signal:
4...20 mA, optional with HART® protocol
- Function modules
 - Multifunctional display with 5-segment digital display and bar graph
 - Switching module with 2 floating channels, maximum 0.5 A switching current, electrically isolated at all sides, without additional auxiliary power
- Function module replacement on site without recalibration "plug and measure"
- Classification per SIL2
- Watchdog for electronics modules and measuring cell
- Accuracy: $\leq 0,15\%$
- Turndown 5:1
- Explosion protection for gases and types of dust
- Degree of protection IP 66
- Piezoresistive measuring cell directly aerated, fully welded, without inside gasket



Basic modules 4...20 mA



PROFIBUS PA



Function modules

switching module



Display module



Various modules can easily be added to PASCAL CV (see table page 5).

General

These operating instructions refer to installation, commissioning, servicing and adjustment. Statutory regulations, valid standards, additional technical details in the relevant data sheet, details of the type plate and any additional certificates are to be observed along with these operating instructions.



Safety instructions

- Installation, operation and maintenance of the instrument may be executed by authorized personnel, only, using suitable equipment.
- Warning: If the instrument is used incorrectly it is possible that serious injuries or damage can occur!
- Prior to the disassembly of the pressure transmitter the impulse ducts between the measuring transmitter and the process have to be locked and relieved from pressure.
- The standard nominal pressure rating and the permissible operating temperature of the gasket should be observed for all process connections. Operation outside the allowed nominal pressure rating, especially with clamp connections, is only possible with suitable clamps. In this case, note DIN 32676 for stipulations on heat resistance.
- Pressure transmitters that are mechanically defective can cause injuries or give rise to process faults. Suitable precautions should be taken to avoid this.



CE marking

The CE marking on the instruments certifies compliance with valid EU directives for bringing products to market within the European Union. The following directives are met:

EMC directives	EMC	2004/108/EC
Pressure Equipment Directive	PED	97/23/EC
Ex directive	ATEX	94/9/EC



Ex approval

Electrical equipment in hazardous areas should only be installed and commissioned by competent personnel. Modifications to devices and connections destroy the operating safety, the ex-proofing and the guarantee. The limit values detailed in the EC Type-Examination Certificate of conformity are to be observed.

Certificate no.	TÜV 04 ATEX 2387 X
Ex-protection intrinsically safe	⊕ II 1/2 G Ex ia IIC T4/T5/T6 Ga/Gb
	⊕ II 2 G Ex ia IIC T4/T5/T6 Gb
Ex-protection dust	⊕ II 2 D Ex ia IIIC T xx °C Db

Connection to Zone 0

The pressure transmitter is suitable for Zone 0-connection. Zone 0 is allowed with pressure from 0.8 to 1.1 bar and temperatures from -20 °C to +60 °C.

Mounting and operating

- Before mounting the instrument ensure that pressure range, overpressure resistance, media compatibility, thermostability and pressure port are suitable for the process at hand.
- Conduct process installation before electrical installation.
- Measuring instruments that should not have any oil or grease residues in the pressure port are marked „Free of oil and grease“.

- Gaskets must be chosen that are suited to the process connection and resistant to the measured medium.
- Check for pressure tightness when commissioning the transmitter.
- Do not insulate the temperature decoupler, as this would reduce the decoupling effect. Follow DIN 32676.
- Wire up the instrument with power switched off.
- The housing in protection class IP66 consists of a two chamber system in which the measuring cell is aerated directly in relation to the environment by means of a PTFE filter system.
- The instrument can only be protected against electromagnetic interference (EMC) when the conditions for screening, earthing, wiring and potential isolation are met during installation.
- The mounting position should be taken into consideration when checking the zero output. Standard transmitters are adjusted at the factory for vertical mounting. Changes to the mounting position can cause zero shifts at pressure ranges ≤ 2 bar. These drifts can be corrected by adjustment on site.
- When the instrument is opened any contact with the electrical connections can affect the signals. This situation can be avoided by switching off the supply voltage or by disconnecting the signal circuit.
- The types of protection IP66 are only achieved, when the threaded ring has been screwed tight after electrical connection/parameterization.
- The instrument requires no maintenance.

Instructions for the operation with diaphragm seal

- To avoid soiling and damage remove protective cap or wrapping in front of the separating diaphragm before mounting.
- Do not touch the flush mounted separating diaphragm, as there is a danger of deformation at measuring ranges to 10 bar / 150 psi. Instrument zero point and measuring characteristics could also be affected.
- Measuring instrument and diaphragm seal are a closed system and should not be separated.
- Avoid overtightening the process screw joints as this can result in zero displacements at the pressure transmitter (fixing error).
- When using systems with capillary for vacuum measurements always mount the pressure transmitter underneath the diaphragm seal. The instruments are set at the factory with pressure transmitter and diaphragm seal at the same height. Correct any differences in height between diaphragm seal and pressure transmitter arising from conditions on site on the pressure transmitter when placing the instrument into operation (see “Setting the measuring range”). When correcting for elevation be aware of the adjustment limits.
- Be sure to install and securely fasten the capillary to avoid vibrations. Roll up overlengths with a minimum radius of 50 cm. Shock and changes in temperature can impact on measurements.
- Process and ambient temperatures can cause zero displacements at the pressure transmitter with some system designs. We can supply you with an error analysis.

Functional safety

per IEC 61508 SIL 2

Certificates / Approvals

Interference emission EN 55011
 Noise immunity EN 61326
 Classification per SIL2 for basic module 4...20 mA,
 Switching module and HART module.

Ex-approval

The limit values detailed in the EC-Type Examination Certificate are to be observed!

EG-Type Examination

Certificate TÜV 04 ATEX 2387 X
 Type of ex-protection Ex II 1/2 G Ex ia IIC T4/T5/T6 Ga/Gb
 Ex II 2 G Ex ia IIC T4/T5/T6 Gb
 Ex II 2 D Ex ia IIIC Txx°C Db

Permissible temperatures for pressure transmitter with category II 1/2 G

Temperature class	Ambient temperature	Medium temperature
T6	-20...+60 °C	-20...+60 °C
T5	-20...+80 °C	-20...+60 °C
T4	-20...+85 °C	-20...+60 °C

Permissible temperatures for pressure transmitter with category II 2G

Temperature class	Ambient temperature	Medium temperature
T6	-20...+60 °C	-20...+60 °C
T5	-20...+80 °C	-20...+80 °C
T4	-20...+85 °C	-20...+85 °C

Permissible temperatures for pressure transmitter with category II 2D

Max. surface temperature	Ambient / Medium temperature
60 °C	40 °C
80 °C	60 °C
100 °C	80 °C
105 °C	85 °C

Electrical data

Sum of maximum values in the intrinsically safe circuits (according to IEC 60079-27; FISCO)

$U_i = 30 \text{ V}$
 $I_i = 150 \text{ mA}$
 $P_i = 1,0 \text{ W}$
 $C_i = 4.8 \text{ nF}$
 $L_i = 20 \text{ }\mu\text{H}$

Special conditions for safe use

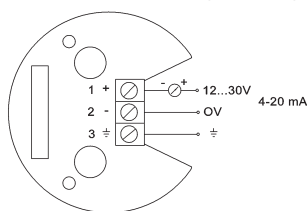
The pressure port of the pressure transmitter PASCAL CV type CVxx is allowed to be operated in an explosion hazardous atmosphere, which requires apparatus of the category 1, only if atmospheric conditions exist (Temperature from -20°C to 60°C, pressure from 0.8 bar to 1.1 bar).

Since the intrinsically safe circuits are connected with the earth potential for safety reasons, potential equalization has to exist in the complete course of the erection of the intrinsically safe circuit.

The maximum surface temperature regarding dust explosion protection was determined without dust layer. Additional information has to be taken from EN 60079-14.

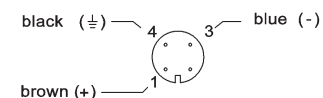
Connection diagram

Internal terminals with cable gland design



Modules may only be exchanged/added when the power supply has been switched off!

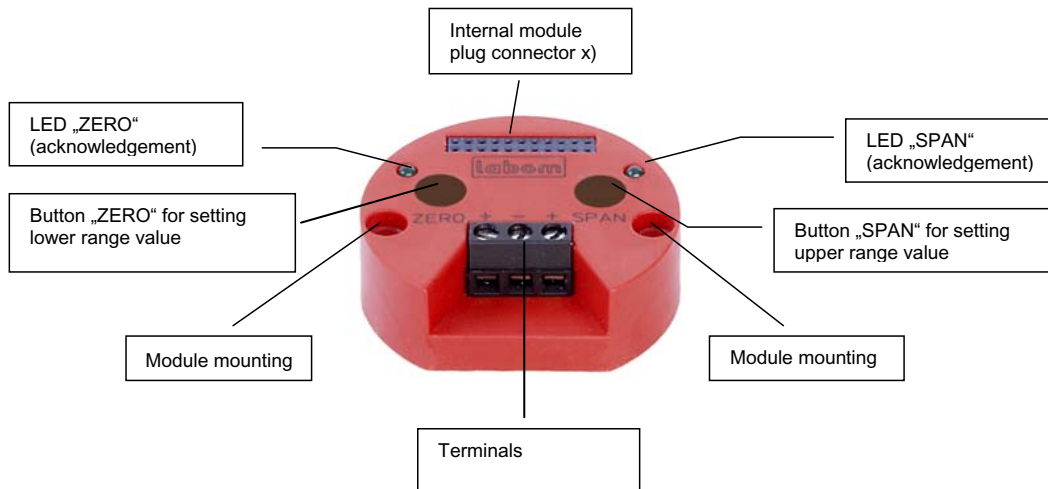
Circular plug connector ¹



¹ color code as Binder series 763

Operation of pressure transmitter PASCAL CV with Basic Module 4...20 mA

The standard factory setting for the basic module can be found in the table on page 5..



- x) Various function modules can easily be added to PASCAL CV for displaying, switching or communicating purposes (see table p. 5).

Setting the measuring range

Setting lower range value (Operating menu: Zero Point)

1. Create a stable pressure at which 4 mA is to be set.
2. Hold down the left button (ZERO) for about 3 seconds.
3. The change to the lower range value is acknowledged after you release the button by a flashing "ZERO" LED.

Note:

The measuring span is always retained when the lower range value is changed if this is permitted by the sensor. A completed change is acknowledged by a flashing "ZERO" LED.

If the pressure transmitter is set outside the permissible measuring range limits (nominal range $\pm 5\%$, smallest measuring span) then the values will not be applied and the LED will not be acknowledged.

Setting upper range value (Operating menu: Measuring Span)

1. Create a stable pressure at which 20 mA is to be set.
2. Hold down the right button (SPAN) for about 3– seconds.
3. The change to upper range value is acknowledged after you release the button by a flashing "SPAN" LED.

Note:

The lower range value is always retained when upper range value is changed. A completed change is acknowledged by a flashing "SPAN" LED.

If the pressure transmitter is set outside the permissible measuring range limits (nominal range $\pm 5\%$, smallest measuring span) then the values will not be applied and the LED will not be acknowledged.

Setting and resetting the write protection (Operating menu: Write Protection)

After all parameters have been entered, subsequent operation can be disabled as follows:

- Press the "ZERO" and "SPAN" buttons at the same time (approx. 10 seconds).
After write protection has been activated, the "ZERO" and "SPAN" LEDs flash in synchrony four times in succession.

Deactivating write protection:

- Press the "ZERO" and "SPAN" buttons at the same time (approx. 10 seconds).
After deactivation, the "ZERO" and "SPAN" LEDs flash in synchrony.

Parameterizing of basic module 4...20 mA

Description of further function modules

Please check the following table for further information concerning the operating menu of the basic module 4...20 mA (grey marked).

Various function modules can easily be added to PASCAL CV (see table).

These modules for display, switching and communicating can be exchanged or extended with ease on site without having to recalibrate or remove the device from the process ("plug and measure"). Automatic module detection renders programming redundant.

Note: Modules may only be exchanged/added when the power supply has been switched off!

operating menus	display of display module	parameter		basic module		function modules		
		variability	standard	4...20 mA	PROFIBUS	switching module	display module	HART®-module
zero point	RANGE / Zero	see instrument ranges	nominal range	x	x	x	x	x
measuring span	RANGE / Span	see instrument ranges	nominal range	x	x	x	x	x
damping	DAMP	0.0...120.0 sec.	0.0 sec.	w	x	—	x	x
min-max-values	HI / LO	pressure and temperature ressetable	—	—	x	—	x	x
characteristic	FUNC	linear, table	linear	w	—	—	x	x
pressure unit	UNIT	bar, mbar, kPa, MPa, mmH2O, mH2O, kg/cm ² , psi	bar	w	x	—	x	x
measuring circuit test	LOOP	3.55...22 mA	—	—	—	—	x	x
alarm state	ALARM	< 3.6 mA, > 21.0 mA	< 3.6 mA	w	—	—	x	x
current trimming	I-CAL	-2 %...+ 5 %	—	—	—	—	x	x
pressure trimming	P-CAL	zero point -50...+50% o.n.range span -10...+10 % of nom. range	—	—	x	—	x	x
table function	TABLE	2...31 points in table	0 % = 4 mA 100 % = 20 mA	—	—	—	x	x
system info	INFO	software, serial number revision level	—	—	x	—	x	x
factory data reset	RESET	—	—	—	x	—	x	x
switch points	SWCH1(2)	0.0...100.0 % of nominal range	50 %	—	x	x	x	x
hysteresis	SWCH1(2)/Hyst.	0.0...100.0 % of nominal range	0,1 % hyster.falling	—	x	w	x	x
switching function	SWCH1(2)/SwTyp	breaker, maker	breaker	—	x	w	x	x
write protection	—	ON, OFF	OFF	x	x	x	x	x

x = configurable

w = factory setting

Error code description

System Errors	
W-DOG ERROR	Device software not running correctly.
FLASH ERROR	Device parameters invalid.
BrdGE ERROR	Bridge is faulty.
SnSr nmbr	Error in sensor module or this basic module cannot access the sensor.
bASE ChkEr	The sensor module has been replaced or there is an error in the basic module.
SnSr ChkEr	Error in sensor module (compensation table/ set-up data)

Error code description

Four-Digit Error Code Display

0 0 0 0

Fourth Digit in Error Code in PASCAL CV Display Module

0	No error.
1	Pressure outside nominal measuring range.
2	Temperature outside specified range.
3	Pressure outside nominal measuring range and temperature outside specified range.
4	Analog output limited to current value.
5	Pressure outside nominal measuring range and analog output limited to current value.
6	Temperature outside specified range and analog output limited to current value.
7	Pressure outside nominal measuring range; temperature outside specified range; and analog output limited to current value.

Third Digit in Error Code in PASCAL CV Display Module

0	No error.
8	General device error (always shown with other errors)

Second Digit in Error Code in PASCAL CV Display Module

0	No error.
2	A memory cell in the microprocessor is faulty.

First Digit in Error Code in PASCAL CV Display Module

0	No error.
1	Data in sensor module invalid.
2	Data in basic module invalid.
3	Data in sensor and basic module invalid or do not match.
4	Connected sensor not detected by basic module.
8	Measuring bridge / pressure sensor faulty.

Digits on a gray background indicate errors that can only be remedied by the manufacturer. All other issues can be remedied by the customer.