

Technical manual BA0410



Hydrocont S50

Hydrostatic filling level transmitter

for continuous measuring and surveillance
of filling levels in liquids

Pressure ranges 0...0,05 bar to 0...20 bar / -1...+1 bar

Ceramic membrane with various process connections

Suitable for wide process temperature range from - 40 °C to +200 °C

Various usability, especially for hygienic applications

ATEX II 1/2 G Ex ia IIC T4 resp. ATEX II 1/2 D Ex iaD 20/21 T60°C/T102°C

Certification for the use in explosion hazardous areas

Excellent accuracy up to $\leq 0,1\%$

Programmable evaluation electronic with high brightness LED-display


- in 2-wire-technology with current signal 4...20 mA or
- in 3-wire-technology with voltage signal 0...10 V
- with two PNP switching outputs

ACS-CONTROL-SYSTEM
know how mit system



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Application description

The devices of the series **Hydrocont S50** with integrated digital evaluation electronic are compact hydrostatic filling level transmitter for continuous measuring and surveillance of filling levels in liquids at hydrostatic pressures from –1 up to 20 bar within pressure less container, also in explosive hazardous areas, at process temperatures from – 40°C to +200°C.

The use of a capacitive measuring sensor with ceramic membrane, by use of various process connections, allows the use in nearly all fields of industry, especially also in hygienic applications.

Application fields are e.g. water, waste water, solvents, oil, sludge, fat, cleaning liquids, etc.

Function

The device is used for filling level measurement by recording the hydrostatic pressure.

Measuring principle

The height of the liquid column over the measuring membrane causes on the measuring membrane the so-called hydrostatic pressure, that is defined besides the height of the liquid column also by the density of the liquid and the gravitational constant.

$$h = \frac{P}{\rho * g} \quad \text{with} \quad \begin{array}{l} h \text{ height (filling level)} \\ p \text{ pressure} \\ \rho \text{ density of the liquid} \\ g \text{ gravitational constant} \end{array}$$

Characteristics of the ceramic measuring membrane

The hydrostatic pressure of the liquid is applied to the ceramic membrane and causes there a variation of the capacity at the back side of the membrane.

A pressure transmitting liquid is not used.

The ceramic membrane offers excellent characteristics like highest pressure and pressure blow strength up to eighty times the nominal pressure, vacuum resistance, very high resistance against chemicals, corrosion and abrasion as well as very good insensitiveness against temperature shocks, highest accuracy and reproducibility, good long term stability and a very low temperature influence.

Characteristics of the process diaphragm seal – high temperature version type H

The hydrostatic pressure of the liquid is applied to the metallic membrane of the process diaphragm seal and is transmitted by a pressure transmitting liquid to the ceramic measuring membrane that is placed behind.

This leads among others to a extension of the permissible medium temperature up to +200°C and to an essential increase of the temperature stability of the device.

Signal processing

The pressure dependent variation of capacity is recorded in high resolution by a processor, adjusted acc. to the settings and converted in high resolution into an output signal of 4...20mA or 0...10V.

According to the resp. settings the PNP switching outputs are driven.

The switching state of the two PNP switching output are indicated by each an LED.

By 3 keys and the four digit LED display all settings for the display, the analogue output as well as the PNP switching outputs can be set resp. adjusted.

A transmitter fast adjustment per key combinations is also possible.

Available pressure ranges – permissible negative resp. burst pressure

pressure range	negative / burst pressure in bar
-1...+1 bar	0 _{abs} / 18 _{rel}
0...0,05 bar	0,7 _{abs} / 4 _{rel} 0 _{abs} / 4 _{rel} at process connection 8 / R
0...0,1 bar	0,7 _{abs} / 4 _{rel} 0 _{abs} / 4 _{rel} at process connection 8 / R
0...0,2 bar	0,5 _{abs} / 6 _{rel} 0 _{abs} / 4 _{rel} at process connection 8 / R
0...0,4 bar	0 _{abs} / 6 _{rel}
0...1 bar	0 _{abs} / 10 _{rel}
0...2 bar	0 _{abs} / 18 _{rel}
0...4 bar	0 _{abs} / 25 _{rel}
0...10 bar	0 _{abs} / 40 _{rel}
0...20 bar	0 _{abs} / 40 _{rel}

Safety notes



Each person that is engaged with inauguration and operation of this device, must have read and understood this technical manual and especially the safety notes.


Installation, electrical connection, inauguration and operation of the device must be made by a qualified employee according to the informations in this technical manual and the relevant standards and rules.

The device may only be used within the permitted operation limits that are listed in this technical manual. Every use besides these limits as agreed can lead to serious dangers.

The materials of the device must be chosen resp. checked for suitability to the respective application requirements (contacting substances, process temperature). An unsuitable material can lead to damage, abnormal behavior or destruction of the device and to the resulting dangers.

The device may not used as sole device for prevention of dangerous conditions in machines and plants.

This device meets article 3 (3) of the EC directive 97/23/EC (pressure equipment device directive) and is designed and produced in good engineer practice.

The device meets the legal requirements of all relevant EC directives.  0158



Safety notes for electrical operating supplies for explosive hazardous areas

If a device is installed and operated in explosive hazardous areas, the general Ex construction standards (EN/IEC 60079-14, EN/IEC 61241-14, VDE 0165), this safety notes and the enclosed EC conformity certificate incl. supplements must be observed.

The installation of explosive hazardous systems must be carried out principally by specialist staff.

The device meets the classification

	$T_{a \text{ liquid}}$	$T_{a \text{ housing}}$
II 1/2 G Ex ia IIC T4	-20... +60 °C	-20...+85 °C
II 1/2 D Ex iaD 20/21 T60°C / T102°C (T57°C)	-20... +60 °C	-20...+85 °C (+40 °C)
II 2 G Ex ib IIC T4	-20...+85 °C	-20...+85 °C
II 2 D Ex ibD 21 T102°C	-20...+85 °C	-20...+85 °C
II 2 G Ex ib IIC T4	-20...+125 °C	-20...+50 °C
II 2 D Ex ibD 21 T125°C	-20...+125 °C	-20...+50 °C

The highest surface temperature is determined inside the housing at complete fill up, that means thermal isolation. The power at the sensor is negligible.

The devices are conceived for measuring of filling levels in explosive hazardous areas.

The measured medium may also be combustible liquids.

The permitted operating temperatures and pressures are type and variant dependent and can be found in this technical manual.

For applications, which require devices of category 1/2 or category 1, the process pressure and temperature range of the liquid has to be between 0,8 bar and 1,1 bar and between -20 °C and 60 °C.

The permissible maximum values for U_i , I_i and P_i are equal for variants A/B/C/D/E/F/G/H. To this there must be paid especially attention in the case of combining more intrinsically safe circuits at the variants with voltage output 0...10V (variants E/F/G/H) and at the variants with PNP switching outputs (variants A/E). The rules for combination of intrinsically safe circuits must be applied.

The PA terminal inside the connection housing resp. the process connection must be connected to the potential compensation of the explosive hazardous area.

At variants of the devices with chargeable plastic parts (e.g. cable resp. connection housing), a warning marking points out to the safety measures, that must be applied because of the electrostatic charging in operation and especially in the case of maintenance activities.

avoid friction - no dry cleaning - no assembling in pneumatic conveying stream

Installation

The device must be installed below the lowest measuring level. The installation of the device in the fill-in stream, in the tank outflow or at a position, where high pressure pulses e.g. of the mixing engine can occur, should be avoided. Adjustment and function control can be made easier, if the device is mounted behind a stop fitting.

The installation of the device should be made if possible at temperature calmed places to get a reliable measuring result. Large temperature steps, e.g. at filling of a hot liquid into a cold system, can produce a short-time higher measuring signal deviation. At a large amplification of the measuring signal this deviation will be also amplified accordingly. The deviation will be completely neutralized after the adaptation of the measuring membrane to the temperature.

At a step from +20°C ...+80°C this neutralization can wile up to 3 minutes.

The use of a process diaphragm seal can cause an essential improvement.

The installation position has influence on the measuring result of the kind of a zero value shift because of the deadweight of the measuring membrane and a possible pressure transmitting liquid. This deviation can be eliminated by an offset adjustment. Zero and end value must be shifted by the same amount.

Drive the system pressure free prior installation resp. deinstallation of the sensor.

The tightening of the process connection with screw-in thread may only be done at the hexagon by a suitable spanner.

The maximum permitted torque strength is 50 Nm.

The screw in of the process connection by using the connection housing is not permitted.

The housing can be rotated every time, also at operation, by 330°.

Avoid the pollution of the pressure compensation vent. The hindrance of the pressure compensation can lead to faulty measuring results.

The correct function of the device within the specific technical data can only be guaranteed, if the permitted temperature in the area of the connection housing (see technical data) will not be exceeded.

This can be achieved by the using of the temperature decoupler, a process diaphragm seal (high temperature version type H) or also by isolation of the liquid carrying part of the plant or by other constructive measures to reduce the transferring of an extreme temperature to the connection housing.

A process diaphragm seal (high temperature version type H) together with the measuring transmitter forms a closed, calibrated system, that is filled by openings in the process diaphragm seal and in the measuring system of the measuring transmitter. These openings are sealed and may not be opened.

Maintenance

The device is free of maintenance.

Special substances can lead to solid coatings on the membrane.

Such depositions can lead to faulty measurement results of the device.

In the case of coat forming liquids the membrane must be regularly cleaned e.g. with clear water.

Don't use sharp tools or aggressive chemicals for cleaning.

Repair

A repair may only be carried out by the manufacturer.

If the device must be sent back for repair, the following informations must be enclosed:

- An exact description of the application.
- The chemical and physical characteristics of the product.
- A short description of the occurred error.

Before returning the device for repair, the following measures must be proceeded:

- All stick product residues must be removed. This is especially important, if the product is unhealthily, e.g. caustic, toxic, carcinogenic, radioactive etc.
- A returning must be refrained, if it is not possible by 100% to remove the unhealthily product completely, because e.g. it is penetrate into cracks or is diffused through plastic.

Electrical connection

The electrical connection of the device must be carried out according to the respective country specific standards. Incorrect installation or adjustment could cause applicationally conditioned risks.

Use only twisted shielded signal and measurement wires and install these wires separated from power leading wires. Connect the cable shield only at one side to earth, ideally at the installation place of the device. The metallic parts of the device with connection housing plug - type S resp. cable - type K are electrically connected with the earthing connection screw. At the variant with connection housing terminal box – type A all metallic parts are connected with terminal 1 - PE/shield. The device must be grounded, e.g. by the earth terminal screw or by the process connection.

At the housing variant with terminal box, the terminals for wire cross-section from 0,5...2,5mm², for the connection of a cable are placed below the electronic module. This is plugged and can be pushed easily. After the connection of the cable, the module must be correctly inserted again.

The cable gland is suitable für cable diameter from 4,5 to 10 mm.

After the installation of the cable the cable gland must be firmly screwed to ensure the tightness of the connection housing. The same is valid for the screw cap of the housing.

The voltage applied to the terminal contacts may not exceed 45 V to avoid damage of the electronic. All connections are polarity protected.

The minimum resp. maximum supply voltage depends on the respective variant:

Variant	not Ex	Ex
type A/B/E/F/G/H	14,5...45V DC	14,5...30V DC
type C/D	10,5...45V DC	10,5...30V DC

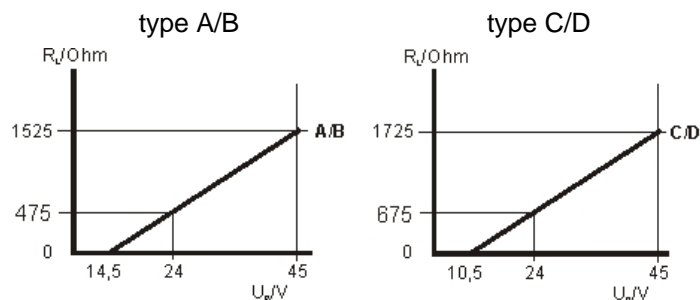
A load, e.g. the measuring shunt of an evaluation device, in series with a sensor of the variant A/B/C/D with 4...20 mA current signal in 2-wire-technology reduces the supply voltage available at the sensor. Dependent on version resp. minimum supply voltage, it results in a maximum value for this resistor, where a correct function is still possible.

The maximum load at signal current 20mA can be calculated by the equation:

$$R_L \text{ max} = (V_{S \text{ act.}} - V_{S \text{ min}}) / 20\text{mA}$$

with $V_{S \text{ act.}}$ = applying supply voltage and $V_{S \text{ min}}$ = minimum supply voltage.

The following graph shows the characteristics for the resistor values at 24 V and 45 V.



Inductive loads at the pnp switching outputs, e.g. relays or contactors may only be used with a free-wheeling diode or a RC protection circuit to avoid high voltage peaks.

The load at the PNP switching output will be connected to the terminal +terminal of the supply voltage by a semiconductor switch contactless and by this bounce-free. At an activated switching state a positive signal near supply voltage is feed to the output.

At deactivated switching state and at failure of supply voltage the semiconductor switch is shut off.

The PNP switching output is current limited to 0,2...0,25 A and is overload and short circuit protected.

Assignment

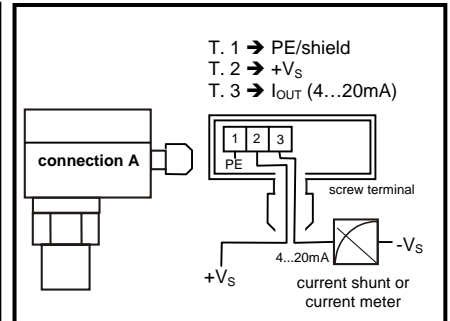
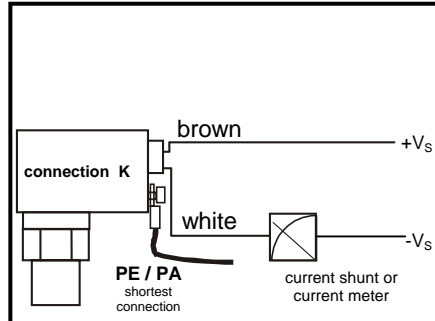
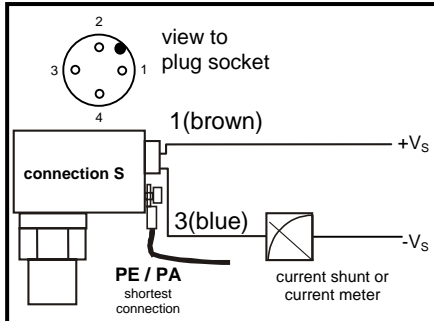
connection type S plug M12x1

connection type K cable

connection type A terminal box

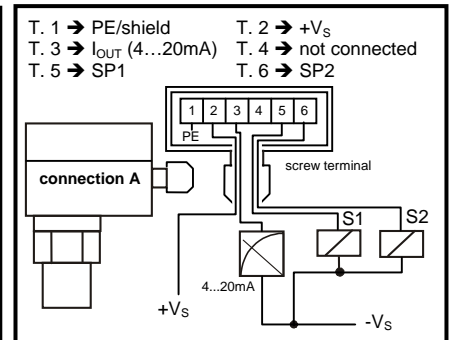
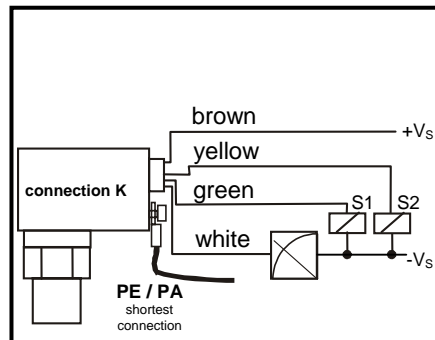
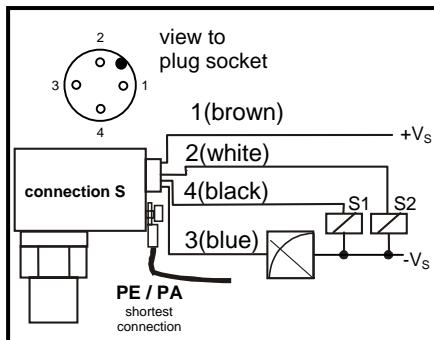
2 – wire – technology / signal 4...20 mA

variant B/C/D



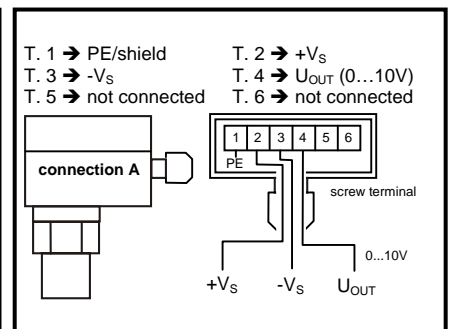
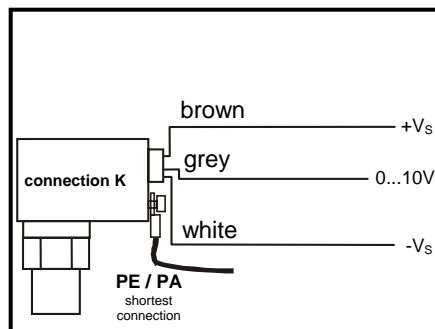
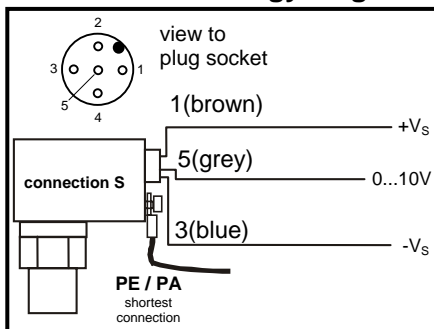
2 – wire – technology / signal 4...20 mA / 2x PNP switching output

variant A



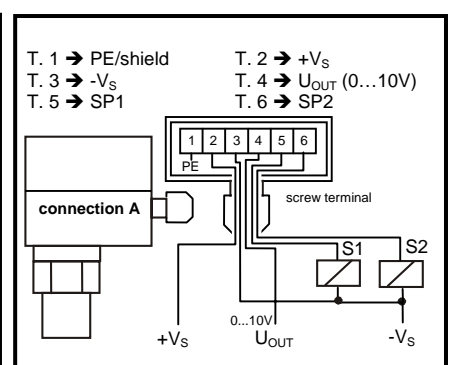
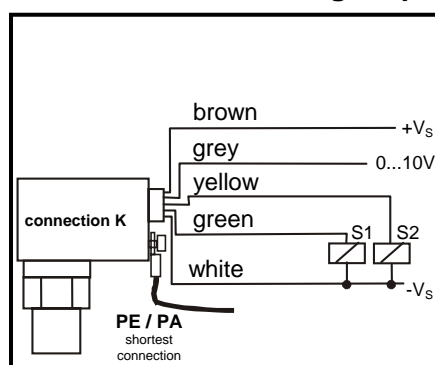
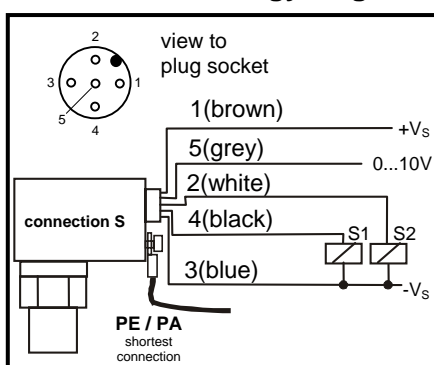
3 – wire – technology / signal 0...10 V

variant F/G/H



3 – wire – technology / signal 0...10 V / 2x PNP switching output

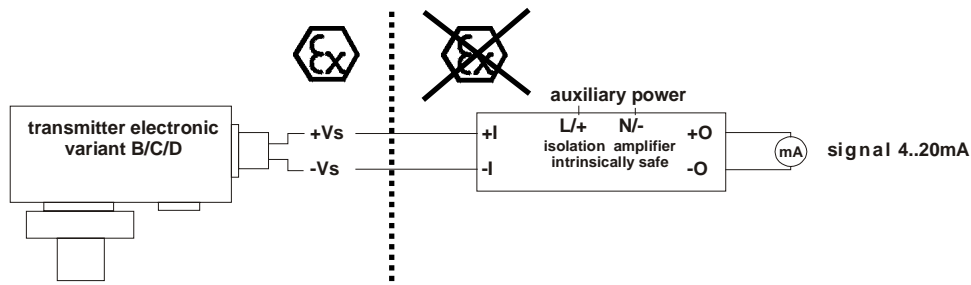
variant E



Electrical connection in an explosion hazardous area

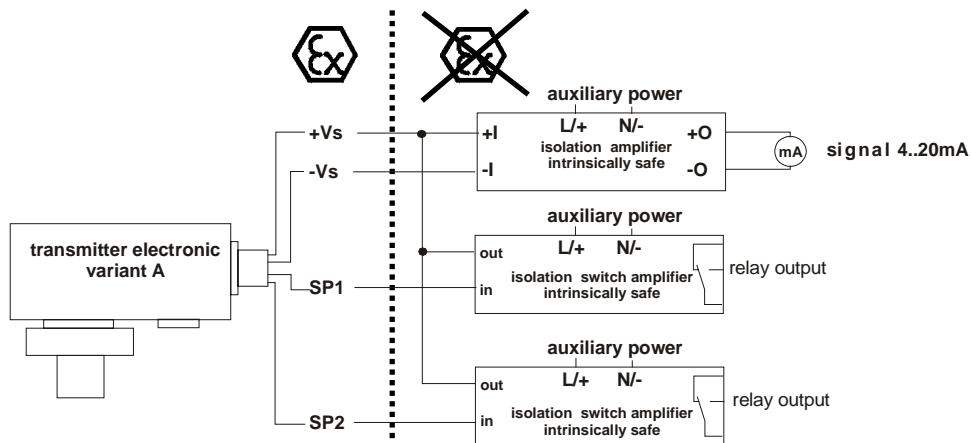
2 – wire – technology / signal 4...20 mA

variant B/C/D



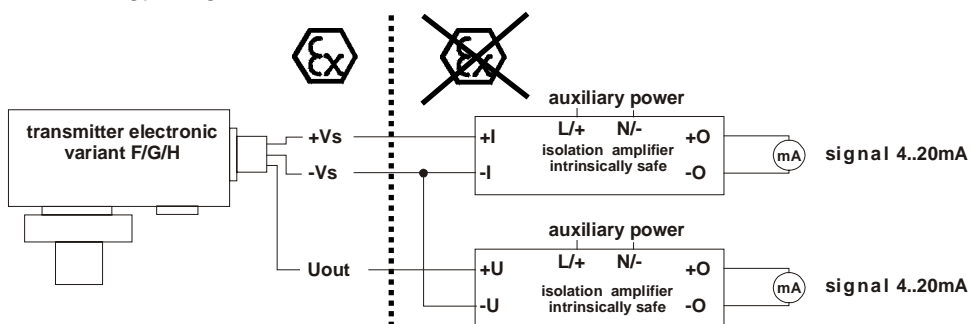
2 – wire – technology / signal 4...20 mA / 2x PNP switching output

variant A



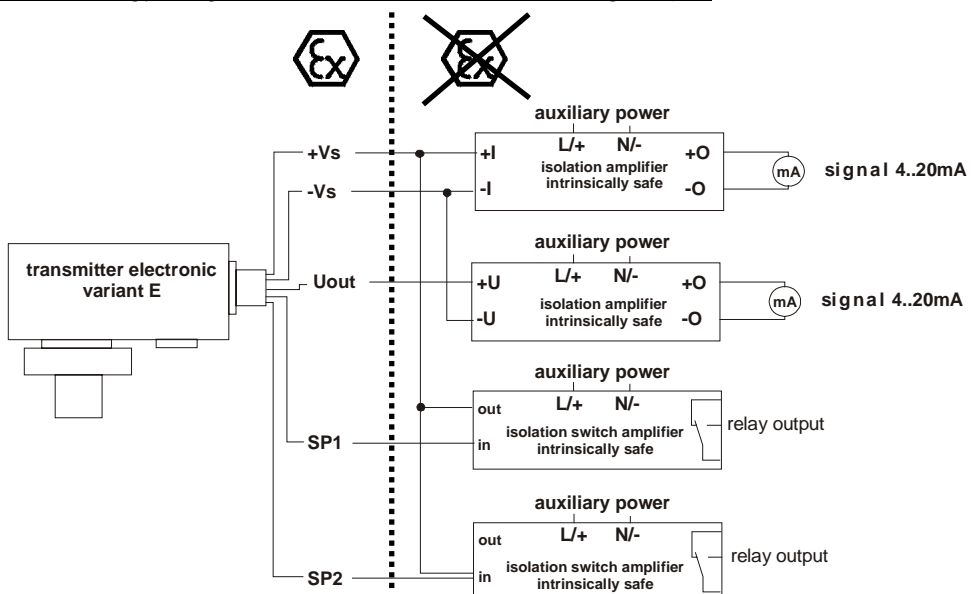
3 – wire – technology / signal 0...10 V

variant F/G/H

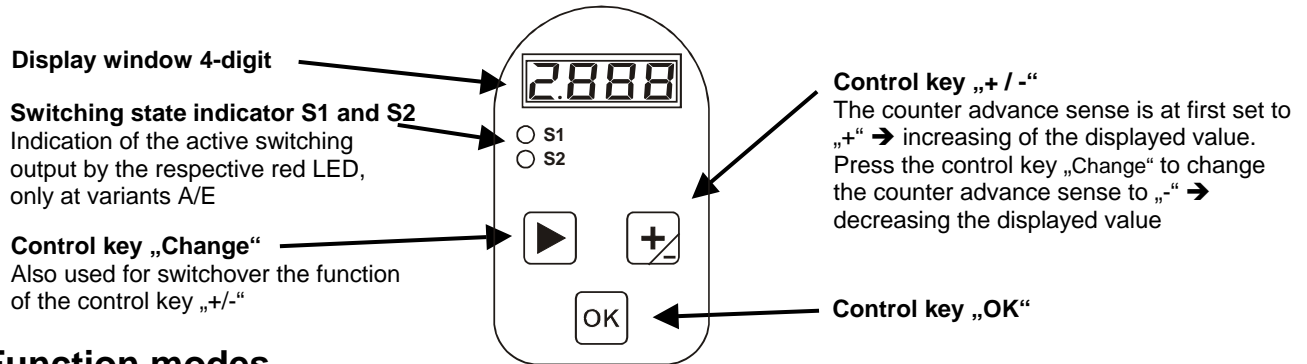


3 – wire – technology / signal 0...10 V / 2x PNP switching output

variant E



Operation and display elements



Function modes

run mode

The device records the hydrostatic pressure and proceeds the chosen functions according to the set parameter. The measuring value is displayed in the display window.

Analogue output and the switching outputs are driven. A switched-on switching output is signaled by the come on of the respective red switching condition light-emitting diode.

The exceeding of the frame specifications, abnormal behavior conditions or also device malfunctions are displayed by the display values EEEE resp. $-\text{EEE}$.

By pushing the control key „+ / -“ the software version will be displayed.

Programming mode

To access to the adjustment menu push the control key „OK“ and enter the **password 3009**.

Fast adjustment mode

By pushing of key combinations in the run mode the transmitter can be operated without using the adjustment menu.

Zero value adjustment with applied pressure signal:

Short pushing the key's „Change“ and „OK“ in succession and hold approx. 6 seconds.

The output signal 4mA / 0V is generated that can be varied by „+ / -“ resp. „Change“ and „+ / -“.

By pushing the key „OK“, the current pressure value is captured as lower pressure reference value, assigned to the previously adjusted output signal and the changed settings are stored loss protected (duration approx. 3 s). A jump back to the run mode is carried out.

End value adjustment with applied pressure signal:

Short pushing the key's „+ / -“ and „OK“ in succession and hold approx. 6 seconds.

The output signal 20mA / 10V is generated that can be varied by „+ / -“ resp. „Change“ and „+ / -“.

By pushing the key „OK“, the current pressure value is captured as upper pressure reference value, assigned to the previously adjusted output signal and the changed settings are stored loss protected (duration approx. 3 s). A jump back to the run mode is carried out.

Damping adjustment:

Short pushing the key's „Change“ and „+ / -“ in succession and hold approx. 6 seconds.

The damping value can now be varied. This value can be varied arbitrary by „+ / -“ resp. „Change“ and „+ / -“ from 0,3 to 30 seconds in 100 steps of each 0,3 seconds (variants C / G in 10 steps of each 3 seconds).

By pushing the key „OK“, the value is captured and stored loss protected (duration approx. 3 s). A jump back to the run mode is carried out.

Reset to factory values:

At devices of variants C / G, a reset to factory values will be carried out by pushing the key „OK“ for approx. 5 seconds at a restart after removing the supply voltage. All customer specific adjustment values will be lost.

Attention:

If the lower pressure reference value (zero) is adjusted higher than the upper pressure reference value (span), the output signal falls **below** 3,8mA resp. to 0V. The display shows EEEE as long as the key „OK“ is pushed. A readjustment has to be done correctly (zero < span).

Function description

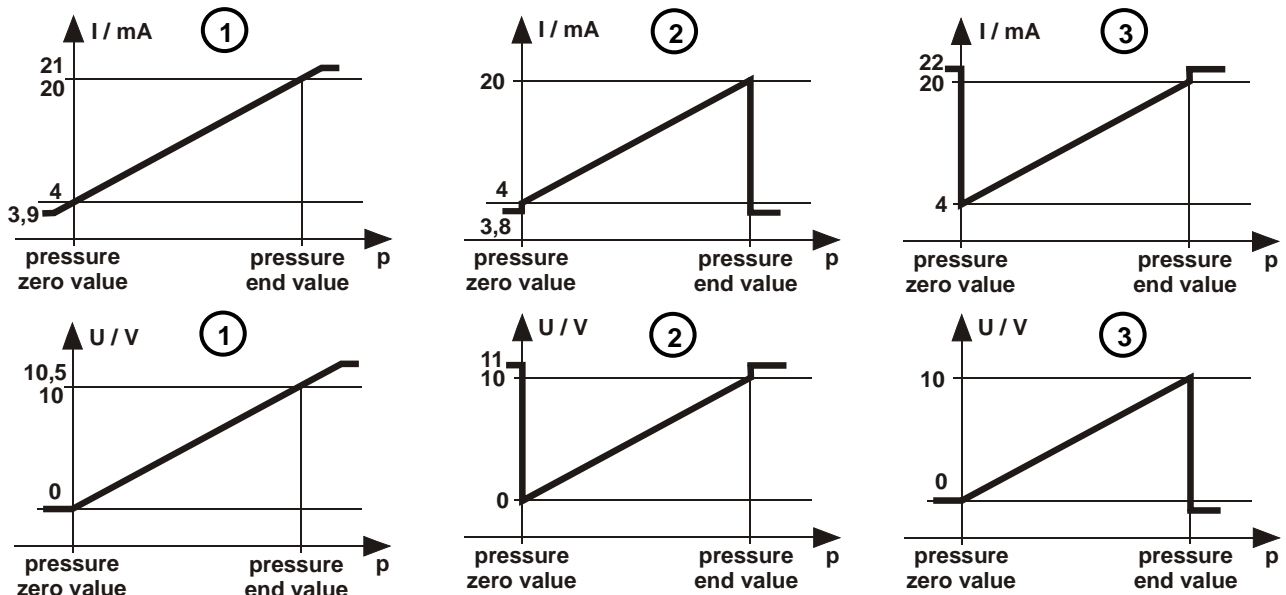
Analogue output

The hydrostatic pressure signal is transmitted to the analogue output, in which the adjusted pressure zero value equals an output current of 4 mA resp. an output voltage of 0 V and the adjusted pressure end value equals an output current of 20 mA resp. an output voltage of 10 V.

At an adjustment by *Zero resp. Span*, the pressure zero value resp. the pressure end value and thus the zero value (4 mA / 0 V) resp. the end value (20 mA / 10 V) of the analogue output can be shifted.

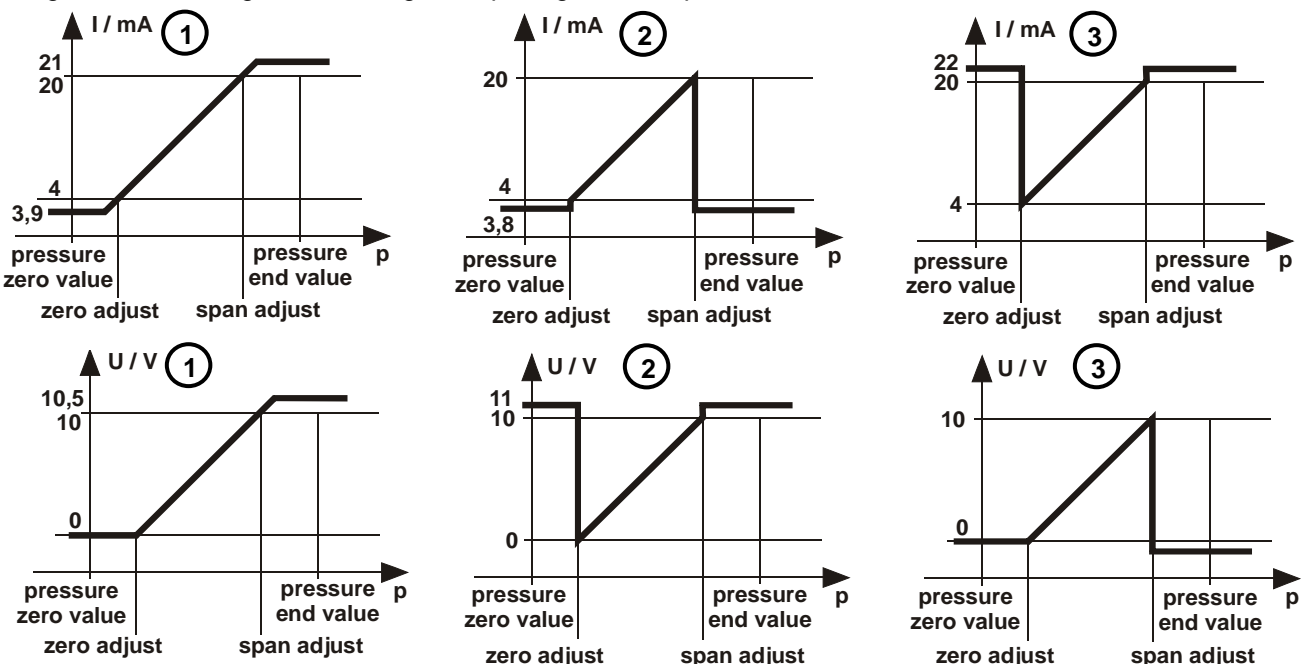
The output signal behaves depending on the set mode in three different possibilities:

- ① Linear signal transmission in the range from 3,9 mA to 21 mA resp. 0 V to 10,5 V. The limit values are kept at exceeding or underrun.
- ② Linear signal transmission in the range from 4 mA to 20 mA resp. 0 V to 10 V. At exceeding or underrun of these limit values a jump to 3,8 mA resp. 0 V is proceeded for an error evaluation.
- ③ Linear signal transmission in the range from 4 mA to 20 mA resp. 0 V to 10 V. At exceeding or underrun of these limit values a jump to 22 mA resp. 11 V is proceeded for an error evaluation.



At an adjustment by *Zero – with signal resp. Span – with signal*, in addition to the shift of pressure zero value resp. the pressure end value, there can be arbitrarily shift the zero value (4 mA / 0 V) resp. the end value (20 mA / 10 V) of the analogue output in the range from 3,9 to 21 mA resp. 0...10,5 V.

Doing this an inverting of the analogue output signal is not possible.



PNP – switching output

The switching function realizes a stable switching condition, independent from system conditioned pressure fluctuations around the adjusted set point.

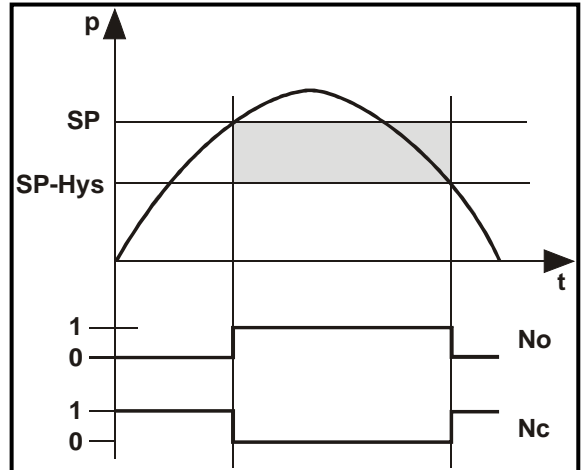
It can also be used for realizing a pressure controlled two-position control.

The switching range is determined separately by the switch point – SP – and hysteresis – HYS – for the respective switching output.

For the switch point as well as for the hysteresis an arbitrary value referring to the display scaling can be input.

The switch back point result from switch point deducting hysteresis, as equation $SP - Hys$.

There is no default minimum value for hysteresis, that means the distance between switch resp. switch back point.



The working principle can be set separately for each switching output to:

open-circuit principle resp. no normally open or to closed-circuit principle resp. nc normally closed

The switching output S1 can be also used for error indication function alternatively to the limit value function. Doing this a switching action happens, if the output signal becomes higher than 20mA/10V resp. lower than 4mA/0V.

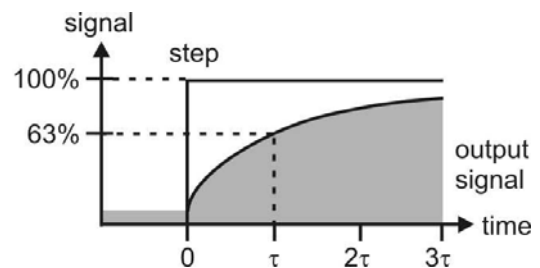
Damping

The damping influences the reaction speed of display, output signal and switching output at a change of the pressure.

The behaviour of display and output signal follows an exponential characteristic with the damping time constant τ .

Within the time period τ the output signal increases respectively by 63% of the existing deviation.

With 99,3%, the end value is nearly achieved after 5τ .



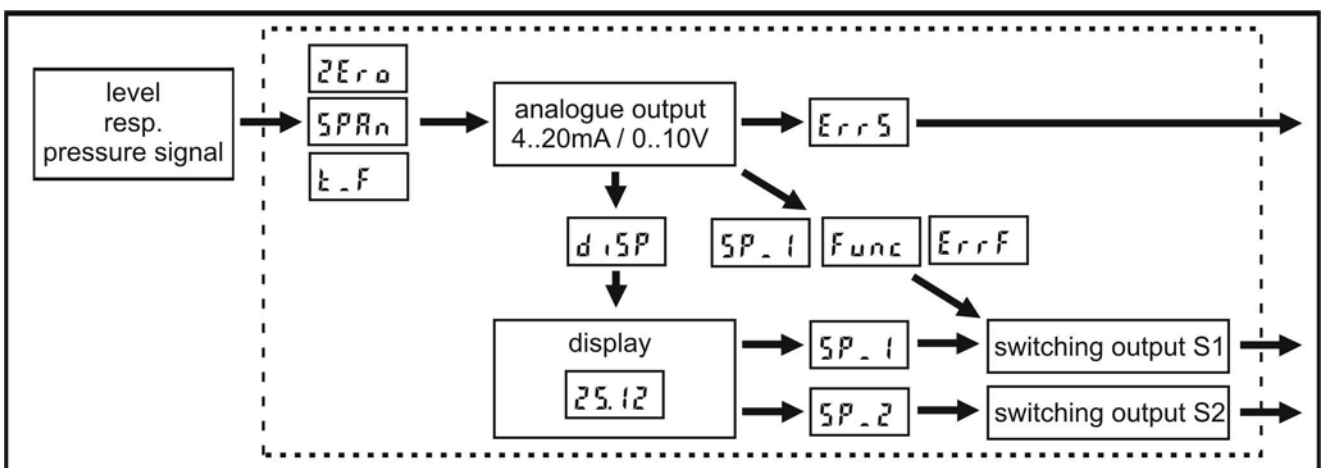
At the variants A / B / E / F the damping can be adjusted from 0,3...30 seconds in 100 steps from 1...100, whereby one step equals 0,3 seconds.

The set time (value x 0,3 seconds) equals 5τ .

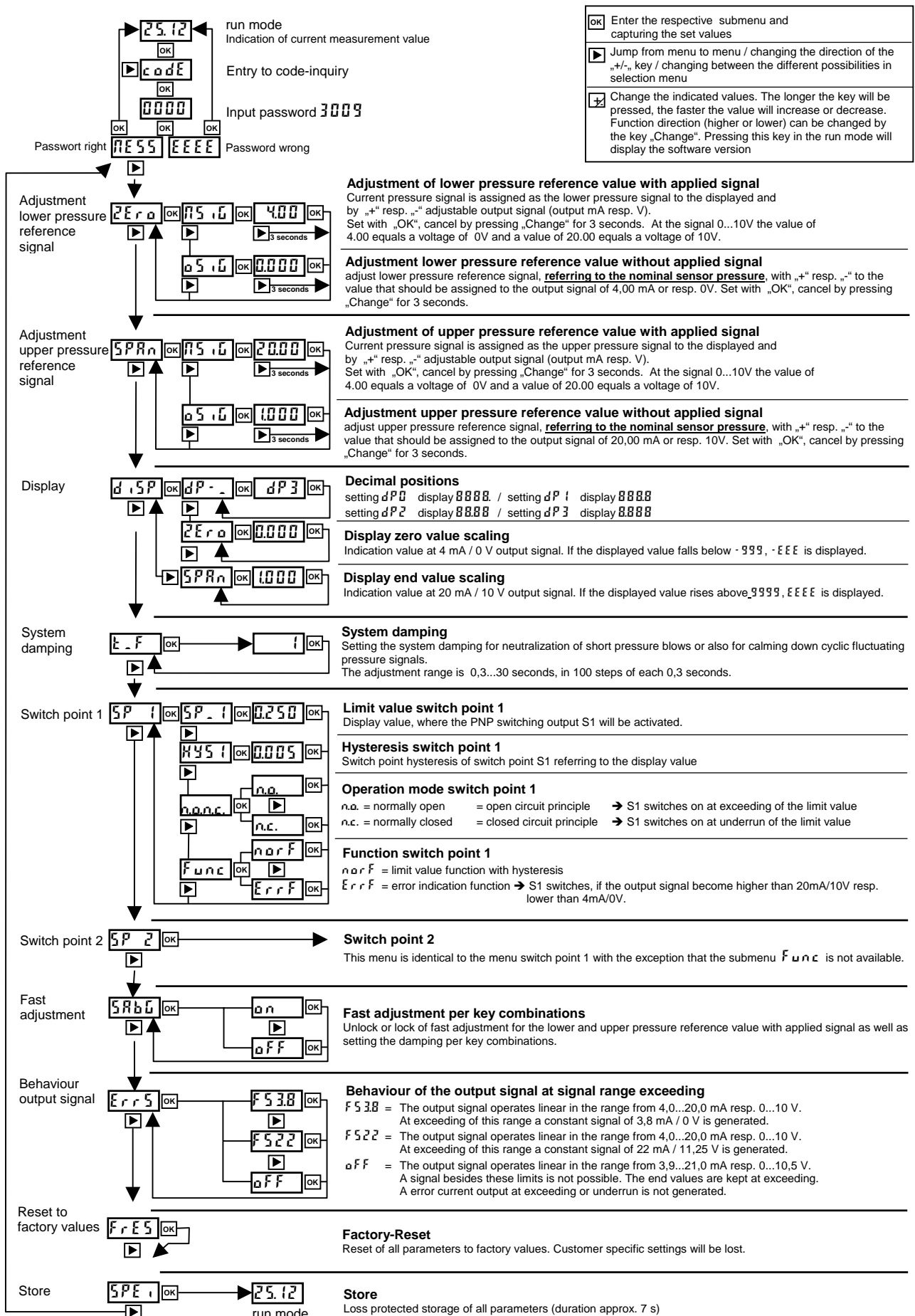
At the variants type C and G the damping can be adjusted from 0,3...30 seconds in 10 steps from 1...10, whereby one step equals 3 seconds.

The set time (value x 3 seconds) equals 5τ .

Function scheme



Adjustment menu – password 3009



Technical data

Auxiliary supply

Permitted supply voltage:	reverse polarity protected			
	variant A/B/E/F/G/H	14,5...45 V DC	Ex	14,5...30 V DC
	variant C/D	10,5...45 V DC	Ex	10,5...30 V DC
Ripple voltage:	$\leq 2 V_{PP}$	condition:	within the permitted supply voltage range	
Supply current:	2-wire 4...20 mA	≤ 22 mA	PNP switching outputs no load	
	3-wire 0...10 V	≤ 10 mA	PNP switching outputs no load	

Analogue output 4...20 mA

Signal range:	linear characteristic from 3,9 mA resp. 21 mA, error 3,8 mA / 22 mA inverted output characteristic 20...4 mA only possible by manufacturer			
Permitted load:	$R_L \max = (V_{S \text{ act.}} - V_{S \text{ min.}}) / 20\text{mA}$	$V_{S \text{ min.}} = 10,5 / 12,5 / 14,5 / 16,5$ V		
Resolution:	$\leq 1 \mu\text{A}$			
Minimum delay time:	≤ 310 ms (typ. 260 ms)	at set system damping 1		
Influence of supply voltage:	$\leq \pm 0,02\% \text{ FS}^2) / 10\text{V}$			

Analogue output 0...10 V

Signal range:	linear characteristic from $\leq 0,07...10,5$ V, error $\leq 0,07$ V / 11,25 V inverted output characteristic 10...0 V only possible by manufacturer			
Permitted load:	$R_L \geq 2000 \Omega$, equals 5 mA at signal 10 V, current limited			
Resolution:	$\leq 0,5$ mV			
Minimum delay time:	≤ 310 ms (typ. 260 ms)	at set system damping 1		
Influence of supply voltage:	$\leq \pm 0,02\% \text{ FS}^2) / 10\text{V}$			

PNP switching output

Function:	PNP switching to +Vs			
Output voltage:	$V_{OUT} \geq +V_s - 2$ V			
Output current:	≤ 250 mA, min. 200 mA	current limited, short circuit protected		
Rise up time:	≤ 700 μs	output load $\leq 3000 \Omega$ resp. $\geq 4,5$ mA		
Delay time:	≤ 330 ms (typ. 280 ms)	at set system damping 1		
Switching cycles:	$\geq 100.000.000$			

²⁾ Referring to nominal measuring span resp. full scale (FS)

Measuring accuracy

Characteristic deviation ^{3) 5) 6) 12)} :	$\leq \pm 0,1\% / 0,2\% \text{ FS}^2)$	
Nonlinearity ^{6) 12)} :	$\leq \pm 0,1\% / 0,2\% \text{ FS}^2)$	
Hysteresis ^{6) 12)} :	negligible	
Long term drift ^{6) 12)} :	$\leq \pm 0,1\% \text{ FS}^2) / \text{year}$	not cumulative
Temperature deviation ^{6) 12)} :	$T_k^4)$ Zero	$\leq \pm 0,10\% \text{ FS}^2) / 10 \text{ K}$ max. $\leq \pm 0,75\% \text{ FS}^2) (-20\dots+80^\circ\text{C})$
	$T_k^4)$ Span	$\leq \pm 0,10\% \text{ FS}^2) / 10 \text{ K}$ max. $\leq \pm 0,5\% \text{ FS}^2) (-20\dots+80^\circ\text{C})$ max. $\leq \pm 0,8\% \text{ FS}^2) (-20\dots+80^\circ\text{C}) \leq 0..0,4 \text{ bar}$ besides $-20\dots+80^\circ\text{C}$ with factor 2 for T_k

Variant H

A change in temperature produces a change of the volume of the pressure transmitting liquid and thus results in an additional zero value shift, whose amount depends on the style of the process diaphragm seal. The influence of the temperature can be minimized by a process diaphragm seal with a wider membrane diameter.

Mounting position

Maximum deviation ¹⁰⁾: $\leq 0,18 \text{ mbar}$

Variant H

At versions with process diaphragm seal the deadweight of the membrane and of the pressure transmitting liquid produces an additional zero value shift, whose amount depends on the style of the process diaphragm seal.

²⁾ Referring to nominal measuring span resp. full scale (FS)

³⁾ Nonlinearity + Hysteresis + Reproducibility

⁴⁾ T_k = Temperature coefficient

⁵⁾ Limit value adjustment

⁶⁾ Specification valid, if adjusted measuring range = nominal measuring range, i.e. for $\text{TD}^7) = 1$

At $\text{TD}^7) \geq 1$ (adjusted measuring range \leq nominal measuring range):

Specification at adjusted measuring range = specification at nominal measuring range x $\text{TD}^7)$

⁷⁾ Turn-Down $\text{TD} = \text{nominal measuring range (FS}^2) / \text{adjusted measuring range}$

¹⁰⁾ Device rotated by 180° , process connection upside.

¹²⁾ Higher values for special measuring range

Materials

Membrane: (medium contact)	Ceramic AL ₂ O ₃ 96% resp. 99,9%
Process connection: (medium contact)	Steel 1.4404 (AISI 316L) at high temperature version type H
Tube prolongation: (medium contact)	Steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)
Carrying cable (medium contact):	PE – polyethylene / FEP – fluorinated ethylene propylene
Process connection:	CrNi-steel at type T – carrying cable resp. R – tube prolongation
Temperature decoupler:	CrNi-steel
Neck tube:	CrNi-steel
Connection housing:	CrNi-steel / PBT polybutyleneterephthalat / PP – polypropylene / POM – polyoxymethylene (Delrin®)
Display window:	PC – polycarbonate (Makrolon®)
Device plug M12x1:	Socket CrNi-steel, insert PUR, contacts gold-plated
Connection cable:	PE – polyethylene
Cable gland:	Housing PA – polyamide, gasket CR / NBR
Pressure compens. element:	Housing PA – polyamide, membrane ePTFE
Membrane keyboard:	PES – polyester
Gaskets:	medium contact → FPM – fluorelastomere (Viton®) EPDM – etylene-propylene-dienmonomere CR – chloroprene-rubber (Neopren®) FFKM – perfluorelastomere (Kalrez®)
	others → FPM – fluorelastomere (Viton®) Silicone

Environmental conditions

Environmental temperature: – 40°C...+85°C, limitation at Ex variants

additional limitations by material	Environmental temperature range
Connection housing PBT	-25...+85°C
Connection housing PP	-10...+85°C
Connection cable PE	-40...+70°C

Process temperatures: – 40°C...+100°C, limitation at Ex variants

Limitations by variant	Process temperature range
Temperature decoupler / neck tube	-40...+125°C
High temperature variant	-10...+200°C
Carrying cable variant	-20...+70°C
additional limitations by material	Process temperature range
Gasket FPM	-25...+140°C
Gasket EPDM	-40...+130°C
Gasket CR	-40...+120°C
Gasket FFKM	-25...+140°C

Process pressure ranges: depends on variant, maximum – 1 bar ... 20 bar

Vacuum / overload strength: depends on measuring range, see table negative / burst pressure

Pressure transmitting liquid: vegetable oil FP at high temperature version type H

Weight: depends on variant

Torque strength: ≤ 50 Nm at process connections with screw-in thread

Protection classification: IP67 EN/IEC 60592 IP65 at Ex variant

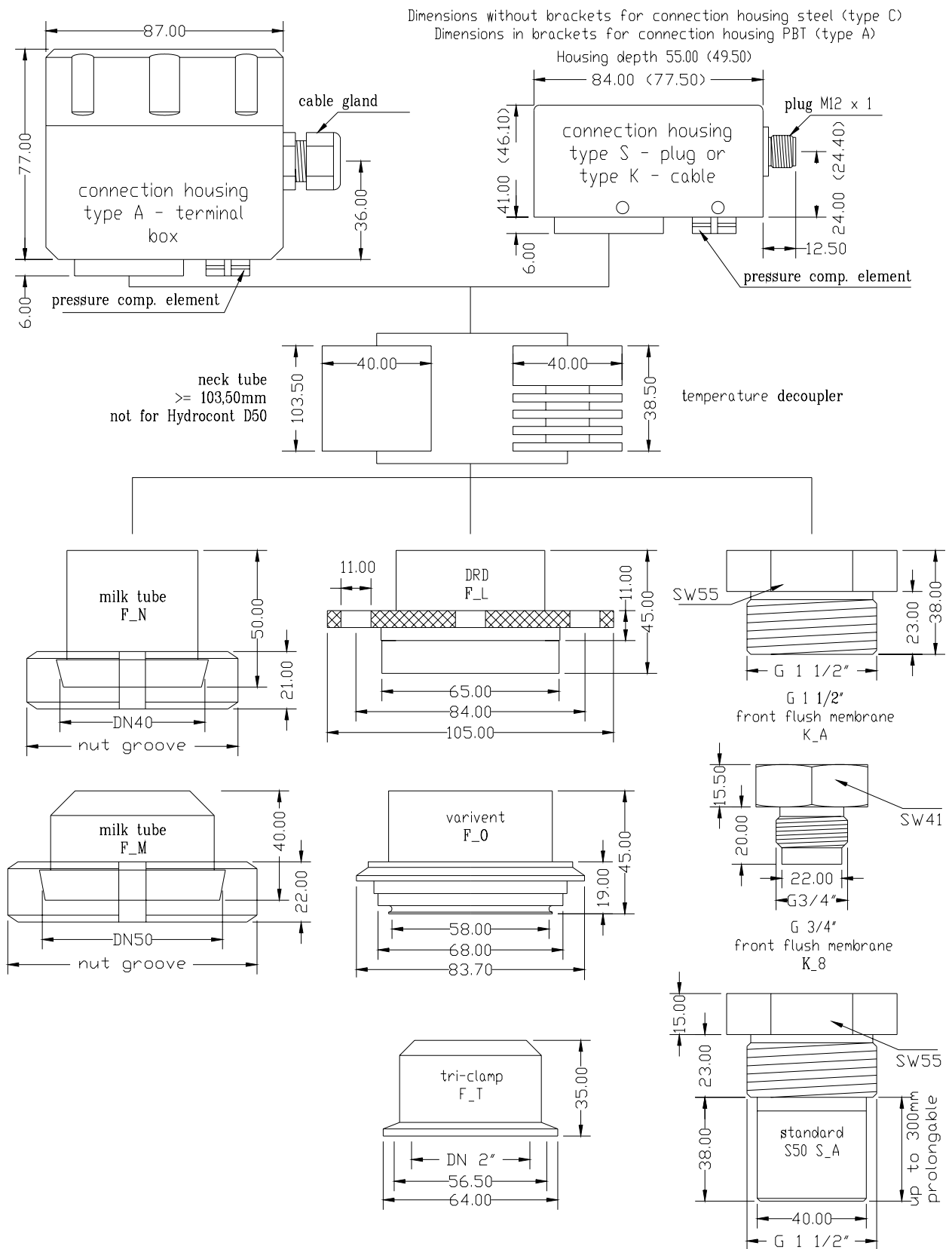
Climatic classification: 4K4H EN/IEC 60721-3

Vibration classification: 4 g 5 - 100 Hz

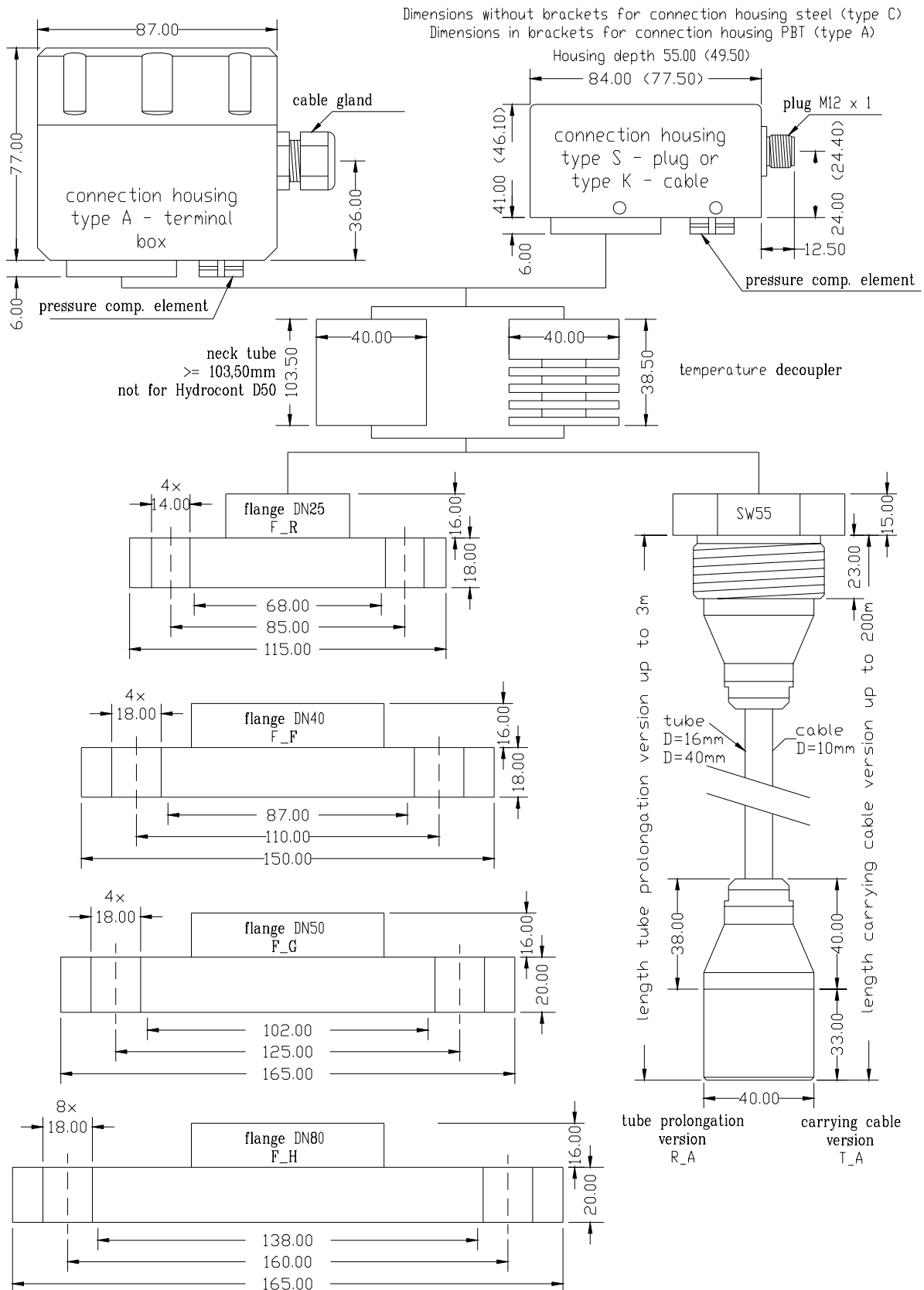
EM – compatibility: emission EN/IEC 61326-1 operation device class B
immunity EN/IEC 61326-1 industrial range

Reference conditions: EN/IEC 60770-1 T = 15...35 °C, relative humidity 45...75 %, environmental air pressure 860...1060 kPa

Dimension drawings



Dimension drawings



Order code overview

Digital hydrostatic filling level transmitter with **ceramic capacitive membrane** from -1...+20 bar

Type:

S50 Standard
 ExS50 ATEX II 1/2 G Ex ia IIC T4
 XDS50 ATEX II 1/2 D Ex iaD 20/21 T60°C/T102°C only with material connection housing type C – CrNi-steel

Version:

S Standard for process connection A – G 1½" A
 K Short form front flush for process connection 8 – G ¾" A resp. A – G 1½" A
 T Carrying cable for version prolongation A – carrying cable PE resp. E – carrying cable FEP
 R Tube prolongation for version prolongation C – tube Ø40mm resp. D – tube Ø16mm
 F Front flush membrane for process connection N, M, O, L, R, F, G, H, T
 H High temperature -10...+200°C Process diaphragm seal with metallic membrane, welded
 Y others on request

Accuracy measuring system¹⁾ – material measuring membrane (medium contact):

0	0,2%		ceramic AL ₂ O ₃	96%
H	0,2%		ceramic AL ₂ O ₃	99,9% (highly clean)
K	0,1%	Linearization protocol	ceramic AL ₂ O ₃	96%
L	0,1%	Linearization protocol	ceramic AL ₂ O ₃	99,9% (highly clean)

Process connection:

8	G ¾" A	ISO228-1	front flush membrane	not for variant membrane H / K	99,9%
A	G 1½" A	ISO228-1			
N	Milk tube	DN 40, PN 40	DIN 11851		
M	Milk tube	DN 50, PN 40	DIN 11851		
O	Varivent	68 mm	DN40-80/DN1½" ..6", PN25	DN100/DN4", PN20	DN125/DN6", PN10
L	DRD	65 mm	DN 50, PN 40		
R	Flange	DN 25, PN 10-40	DIN EN 1092-1	sealing surface DIN 2527-D	
F	Flange	DN 40, PN 10-40	DIN EN 1092-1	sealing surface DIN 2527-D	
G	Flange	DN 50, PN 10-40	DIN EN 1092-1	sealing surface DIN 2527-D	
H	Flange	DN 80, PN 10-40	DIN EN 1092-1	sealing surface DIN 2527-D	
T	Tri-clamp®	DN 2", PN 16	ISO 2852		
B	Nut groove adapter				

Electronic - output:

A	2-wire-technology signal 4...20 mA	2x PNP switching output	LED display, 3 key's
B	2-wire-technology signal 4...20 mA		LED display, 3 key's
C	2-wire-technology signal 4...20 mA		3 key's
D	2-wire-technology signal 4...20 mA		fix adjusted
E	3-wire-technology signal 0...10 V	2x PNP switching output	LED display, 3 key's
F	3-wire-technology signal 0...10 V		LED display, 3 key's
G	3-wire-technology signal 0...10 V		3 key's
H	3-wire-technology signal 0...10 V		fix adjusted

Measuring range:

0	0...0,2 bar	5	0...10 bar
1	0...0,4 bar	6	0...20 bar
2	0...1 bar	7	-1...+1 bar
3	0...2 bar	8	0...0,05 bar
4	0...4 bar	9	0...0,1 bar
		Y	special measuring range separate spec. necessary

Material connection housing:

A	PBT – polybutyleneterephthalat	not for electrical connection type A
C	CrNi-steel	
E	PP – polypropylene	not for electrical connection type S / K
D	POM – polyoxymethylene (Delrin®)	not for electrical connection type S / K

Electrical connection:

S Plug M12x1
 K Cable 2m
 A Terminal box

Process temperature / material process connection (medium contact):

1	-40°C...+100°C	steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)
2	-40°C...+125°C temperature decoupler	steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)
3	-40°C...+125°C neck tube (isolated container)	steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)
Y	others on request	

Gaskets (medium contact):

1	FPM	fluorelastomere (Viton®)	
2	CR	chloroprene-rubber (Neopren®)	
3	EPDM	etylene-propylene-dienmonomere	for food applications
4	FFKM	perfluorelastomere (Kalrez®)	
5	welded		at high temperature version type H
6	FFKM	perfluorelastomere high density	for gas applications

Version probe prolongation:

0	No prolongation	
E	Carrying cable FEP -20...+70°C	not for type XDS50
A	Carrying cable PE -20...+70°C	not for type XDS50
B	Neck tube	
C	Tube Ø 40mm	
D	Tube Ø 16mm	
Y	others on request	

Probe length incl. process connection: measure in mm

Hydrocont

¹⁾ Higher values for special measuring range