Technical manual BA 0811

Pressure

Precont S

Pressure transmitter

for continuous measuring and surveillance of pressures
in gases, vapors, liquids and dusts

Pressure ranges 0...0,1 bar to 0...1000 bar / -0,1...0/+0,1 bar / -1...0/+1 bar

Ceramic or metallic membrane with various process connections

Suitable for wide process temperature range from – 40 °C to +370 °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 ≤ 0,1%

Programmable evaluation electronic with high brightness LED-display
for connection to PROFIBUS-PA

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Application description

The devices of the series **Precont S** with integrated digital evaluation electronic are compact pressure transmitter for continuous measuring and surveillance of pressures from –1 up to 1000 bar within gases, vapors, liquids and dusts within closed container or pipelines, also in explosive hazardous areas, at process temperatures from – 40°C to +370°C.

The use of a capacitive measuring sensor with ceramic membrane or of a strain gauge with metallic membrane, by use of various, also front flush process connections resp. process diaphragm seals, allows the use in nearly all fields of industry, especially also in hygienic applications.

Function

The device is used for pressure measurement.

Characteristics of the ceramic measuring membrane – Precont S10 / S40 / S70

The system pressure 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 forty 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 metallic measuring membrane – Precont S20 / S30 / S70

The system pressure is applied to the metallic membrane and causes there a deflection of the strain gauge at the back side of the membrane.
A pressure transmitting liquid is only used at pressure ranges lower than 0...25 bar.

The metallic membrane offers excellent characteristics like high pressure and pressure blow strength up to six times the nominal pressure, vacuum resistance, good reproducibility and hysteresis and also good long term stability and a low temperature influence.

Characteristics of the process diaphragm seal – Precont S70

The system pressure is applied to the metallic membrane of the process diaphragm seal and is transmitted by a pressure transmitting liquid to the respective ceramic or metallic measuring membrane that is placed behind. This leads among others to a extension of the permissible medium temperature up to +370°C and to an essential increase of the temperature stability of the device.

Signal processing

The pressure dependent variation of capacity resp. the variation of the strain gauge output voltage is recorded in high resolution by a processor, adjusted acc. to the settings and via the fieldbus PROFIBUS-PA to a SPS or to a PC.

By 3 keys and the four digit LED display multiple settings be set resp. the device can be adjusted.
Via the fieldbus PROFIBUS-PA the operation of the device from the SPS or the PC is possible

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Variant differences

	Precont S10	Precont S20	Precont S30	Precont S40	Precont S70
Measuring range limits	-1 bar to 60 bar	-1 bar to 1000 bar	-1 bar to 25 bar	-1 bar to 60 bar	-1 bar to 400 bar
Hygienic applications			X	X	
Use in explosion hazardous areas – ATEX	X	X	X	X	X
Process diaphragm seal					X
Process temperature -40...+100°C	X	X		X	
Process temperature -40...+125°C Temperature decoupler	X	X		X	
Process temperature -20...+150°C			X		
Process temperature -10...+100°C -10...+200°C -20...+275°C -40...+370°C					X
Ceramic membrane with accuracy ≤ 0,1% / ≤ 0,2% FS [2)]	X			X	X
Metallic membrane with accuracy ≤ 0,5% FS [2)]		X	X		X

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

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Available pressure ranges – permissible overload resp. burst pressure

	S10	S20	S30	S40	S70	
ceramic membrane	X			X	X	
metallic membrane		X	X			X
pressure range	burst pressure in bar	overload / burst pressure in bar	overload / burst pressure in bar	burst pressure in bar	burst pressure in bar	overload / burst pressure in bar
-0,1...0 bar	4	n. a.[1)]	n. a.[1)]	4	4	n. a.[1)]
-0,1...+0,1 bar	6	n. a.[1)]	n. a.[1)]	6	6	n. a.[1)]
-1...0 bar	10	5 / 6	5 / 6	10	10	n. a.[1)]
-1...+1 bar	18	12 / 12	10 / 12	18	18	n. a.[1)]
0...0,1 bar	4	n. a.[1)]	1 / 2	4	4	n. a.[1)]
0...0,2 bar	6	n. a.[1)]	n. a.[1)]	6	6	n. a.[1)]
0...0,25 bar	n. a.[1)]	n. a.[1)]	1,5 / 2	n. a.[1)]	n. a.[1)]	n. a.[1)]
0...0,4 bar	6	2 / 2,4	2 / 2,4	6	6	n. a.[1)]
0...0,6 bar	10	4 / 4,8	4 / 4,8	10	10	n. a.[1)]
0…1 bar	10	5 / 6	5 / 6	10	10	n. a.[1)]
0…1,6 bar	18	n. a.[1)]	n. a.[1)]	18	18	n. a.[1)]
0…2,5 bar	25	n. a.[1)]	10 / 12	25	25	n. a.[1)]
0…4 bar	25	17 /20,5	17 /20,5	25	25	n. a.[1)]
0…6 bar	40	35 / 42	35 / 42	40	40	n. a.[1)]
0…10 bar	40	35 / 42	35 / 42	40	40	n. a.[1)]
0…16 bar	40	35 / 42	80 / 96	40	40	n. a.[1)]
0…20 bar	40	n. a.[1)]	n. a.[1)]	40	40	n. a.[1)]
0…25 bar	n. a.[1)]	80 / 96	80 / 96	n. a.[1)]	n. a.[1)]	n. a.[1)]
0…40 bar	60	80 / 400	n. a.[1)]	60	60	n. a.[1)]
0…60 bar	105	80 / 400	n. a.[1)]	105	105	n. a.[1)]
0…100 bar	n. a.[1)]	200/800	n. a.[1)]	n. a.[1)]	n. a.[1)]	200/800
0…160 bar	n. a.[1)]	200/800	n. a.[1)]	n. a.[1)]	n. a.[1)]	200/800
0…250 bar	n. a.[1)]	200/800	n. a.[1)]	n. a.[1)]	n. a.[1)]	200/800
0…320 bar	n. a.[1)]	200/800	n. a.[1)]	n. a.[1)]	n. a.[1)]	200/800
0…400 bar	n. a.[1)]	800 / 1700 [11)]	n. a.[1)]	n. a.[1)]	n. a.[1)]	800 / 1700 [11)]
0…600 bar	n. a.[1)]	1200 / 2400 [11)]	n. a.[1)]	n. a.[1)]	n. a.[1)]	n. a.[1)]
0…1000 bar	n. a.[1)]	1500 / 3000	n. a.[1)]	n. a.[1)]	n. a.[1)]	n. a.[1)]

[1)] Not available (n. a.)

[11)] At front flush metallic membrane: The value in the table is only valid at sealing with ring gasket below the hexagon. Otherwise the value of max. 1500 bar is valid.

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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. CE **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 (EN60079-14, EN61241-14, VDE0165), 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	$T_{a\ Medium}$	$T_{a\ Housing}$
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 pressures in explosive hazardous areas.
The measured medium may also be combustible gases, vapors, liquids and dusts.

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 medium has to be between 0,8 bar and 1,1 bar and between -20 °C and 60 °C.

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

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Installation

The installation of the device at a position, where high pressure pulses 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 the variant with ceramic measuring membrane. 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 of the pressure transmitter 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.

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 (variant S70) or also by isolation of the medium 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 (variant S70) 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.

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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 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...2,5mm^2, 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.

PROFIBUS-PA is an open Fieldbus standard. It allows the connection of multiple sensors and actors to one bus cable, also in explosion hazardous areas.
The digital communication signal is transmitted on the bus by a two-core connection cable.
The bus cable carries also the auxiliary energy.

The connection of an device to a SPS or to the PROFIBUS interface card of a PC is done either by a DP/PA segment coupler or by a DP/PA link (bus feeding device).

Variant	not Ex	Ex
type P	9...32V DC	9...24V DC

Only a twisted and shielded two-core cable should be used exclusively.

Because of the low current consumption (11mA ±1mA) up to the following device count can be powered at a bus segment installed acc. to FISCO:

Variant	not Ex	Ex ia/ib(D) IIC	Ex ib(D) IIB
type P	32	9	21

Further informations to PROFIBUS-PA can be found in the PNO directive.

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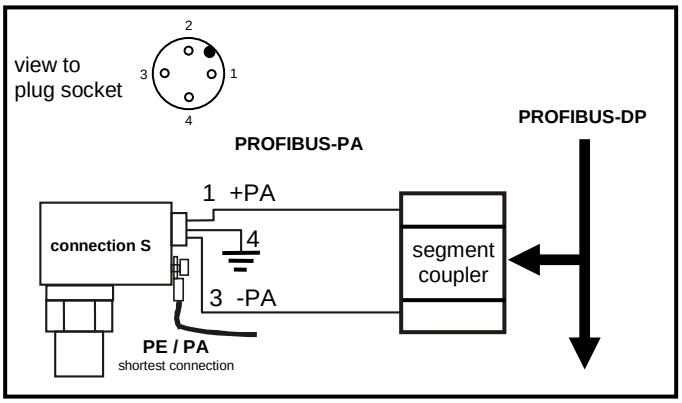
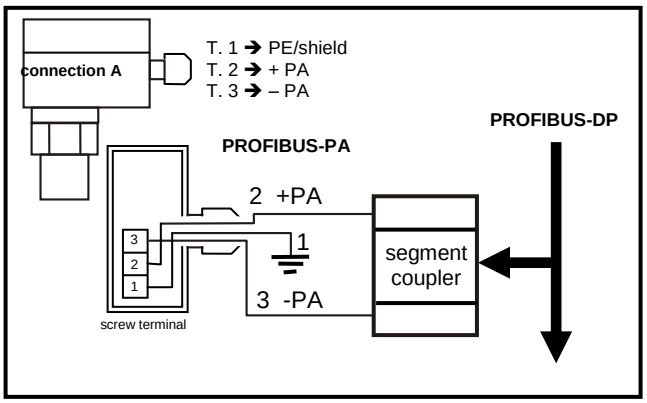
Assignment

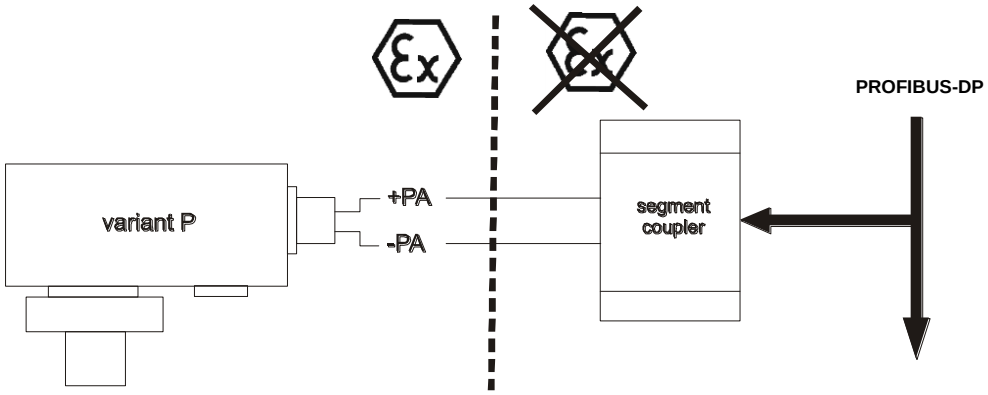
connection type S
plug M12x1



connection type A
terminal box



Electrical connection in an explosion hazardous area



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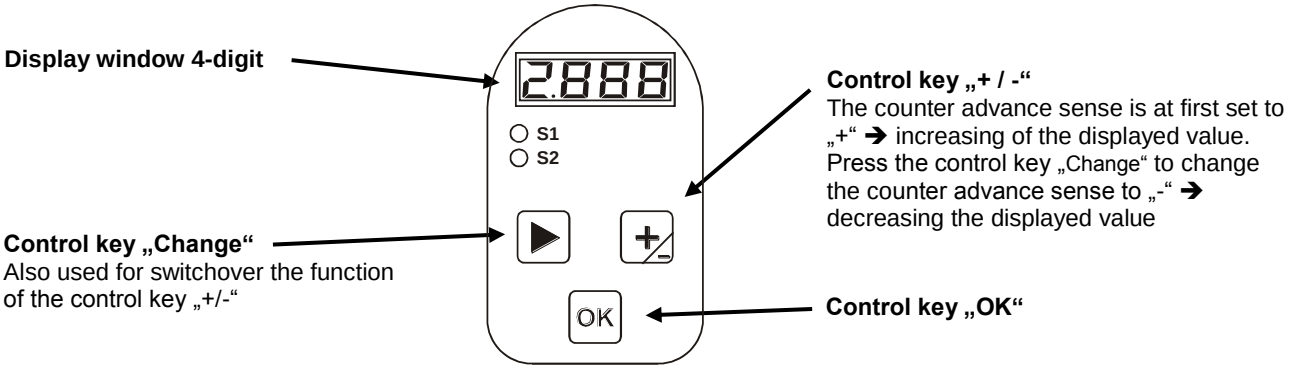
Operation and display elements



Function modes

run mode

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

The measuring value is transmitted by the PROFIBUS-PA network.

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

Programming mode

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

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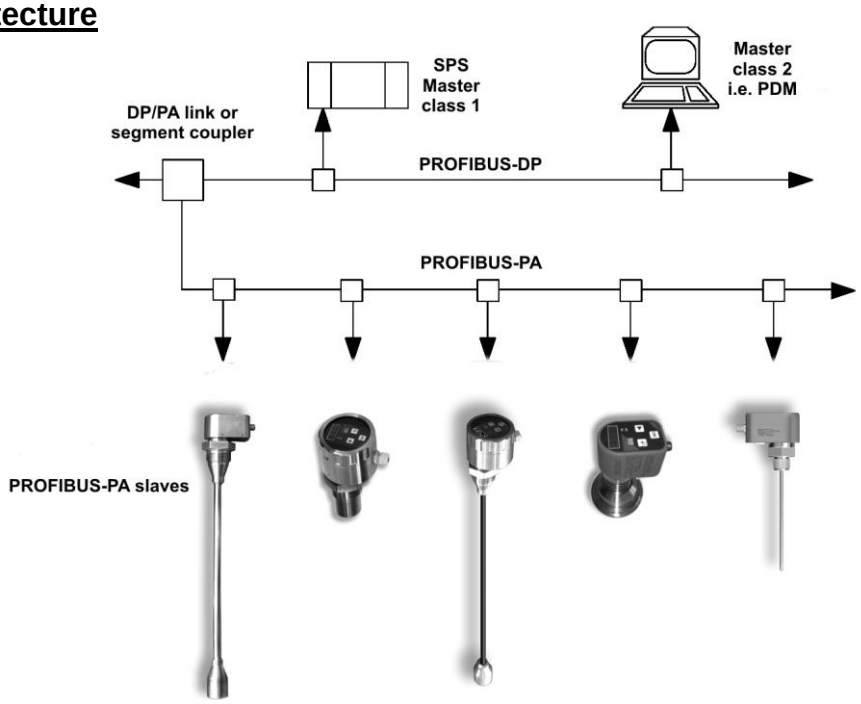
Function description variant P PROFIBUS-PA

System architecture

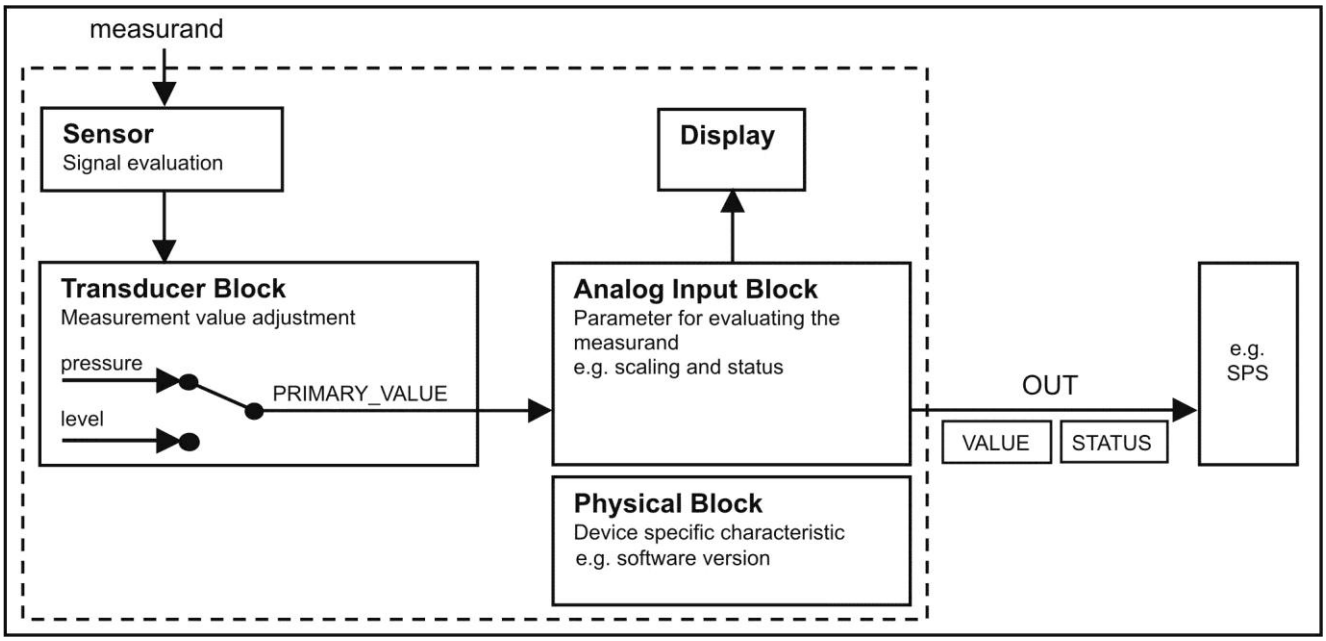


Operation

For the configuration special configuration and operation programs, offered from different manufacturers, like e.g. the operation program Simatic-PDM from Siemens, are available for the user.
With this operation program the PROFIBUS PA and the device specific parameter can be configured.
By the predefined function blocks an uniform access to all network and device data is possible.

Cyclic data exchange

Block model



The block model shows the structure for the data transmission in the cyclic data traffic between the device and the master class 1 (e.g. SPS)
Using the configuration software of your SPS you can create the cyclic data telegram.

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Function blocks
For the description of the function blocks of a device and for specification of an uniform data access, PROFIBUS uses predefined function blocks. The following blocks are implemented:

- *Physical Block*
  The Physical Block includes device specific characteristics like e.g. device type, manufacturer, version, etc.
- *Transducer Block* (measurand transducing block)
  The Transducer Block includes all measuring specific and device specific parameter of the device.
  In the Transducer Block the pressure measuring principle for the use as pressure and filling level measuring transducer is mapped.
- *Analog Input Block* (function block)
  The Analog Input Block includes the signal processing functions of the measuring value like e.g. scaling, special function calculations, simulation, etc.

Dependent on the chosen operation mode (CHANNEL) a pressure or filling level value is transmitted.

Structure of the output data SPS ➔ Precont S
With the Data_Exchange service a SPS can read output data from the Precont S by the calling telegram.
The cyclic data telegram is of the following structure:

Index	Output data	Data access	Data format / remarks
0, 1, 2, 3	Display Value	write	32 bit floating point number (IEEE 754)
4	Status code	write	see chapter "Status codes"

Structure of the input data Precont S ➔ SPS
With the Data_Exchange service a SPS can read input data from the Precont S by the response telegram.
The cyclic data telegram is of the following structure:

Index	Output data	Data access	Data format / remarks
0, 1, 2, 3	Pressure or filling level	read	32 bit floating point number (IEEE 754)
4	Status code for Pressure or filling level	read	see chapter "Status codes"

Status codes
The device supports the following status codes:

Status Code	Device state	Meaning
0x23	BAD_PASSIVATED	Out of Service (Target Mode)
0x24	BAD_MAINTENANCE_ALARM	No measuring value available due to an error
0x4B	UNCERTAIN_SUBSTITUTE_SET	Device supplies replacement value at error case
0x73	UNCERTAIN_SIMULATED_VALUE	Start of a simulation
0x74	UNCERTAIN_SIMULATED_VALUE_END	End of a simulation
0x80	GOOD	Positive acknowledgement
0x84	GOOD_UPDATE_EVENT	Change indication (audit trailing)
0x89	GOOD_ADVISORY_ALERT_LOW_LIMIT	Lower warn limit LO_LIM exceeded
0x8A	GOOD_ADVISORY_ALERT_HIGH_LIMIT	Upper warn limit HI_LIM exceeded
0x8D	GOOD_CRITICAL_ALERT_LOW_LIMIT	Lower alarm limit LO_LO_LIM exceeded
0x8E	GOOD_CRITICAL_ALERT_HIGH_LIMIT	Upper alarm limit HI_HI_LIM exceeded
0xA4	GOOD_MAINTENANCE_REQ	End of the maintenance interval achieved

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Acyclic data exchange

Function blocks
The acyclic data exchange is used
- for transmission of inauguration or maintenance parameter
- for indication of measurands, that are not included in the cyclic data diagram.

Using the acyclic data exchange, device parameter can be changed, although the device is within the cyclic data exchange with a SPS.
There are two types of the acyclic data exchange:
- Acyclic communication by the C2 channel (MS2)
- Acyclic communication by the C1 channel (MS1)

Acyclic communication by the C2 channel (MS2)
For the communication by the C2 channel, the master opens a communication channel using a Service Access Point (SAP) for the access to the device. A master, that support an acyclic communication by the C2 channel, is defined as master class 2. Simatic-PDM, for example, is a master class 2.
Before exchanging data over PROFIBUS, all device parameter must be announced to the master.
For this there are the following possibilities:
- a device description (DD: Device Description resp. EDD: Electronic Device Description)
- a configuration program within the master, that access to the parameter by slot- and index addresses (e.g. Simatic-PDM)

Note
- The DD/EDD is included on the enclosed CD
- The number of masters class 2, that communicates with the device are limited to the number SAP's, that are available for the communication. The device supports the MS2 communication with three SAP's. For this there must be paid attention that there is no writing access to the same data, since otherwise the data consistency in not guaranteed.
- The use of the C2 channel for the acyclic data exchange increases the cycle time of the bus system. This must be considered at the programming of the control system

Acyclic communication by the C1 channel (MS1)
At the acyclic communication by the C1 channel, an already cyclic with the device communicating master opens an additional acyclic communication channel by the SAP 0x33 (special SAP for MS1).
Now he can read resp. write parameter acyclic like a master class 2 by using slot- and index addresses.
The device does not support the MS1 communication with a SAP.

Warning
In the application program a continuous writing of parameter, e.g. at every cycle of the program, must be absolutely avoided.

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Slot / index tables

The device parameter are noted in the following tables. The access to the parameter is made by the slot- and index numbers. The individual blocks includes respectively standard parameter, block parameter and manufacturer specific parameter.

General explanations

Object type

- Record: contains data structures (DS)
- Array: group of a definite data type
- Simple: contains individual data types like e.g. Float

Data type

- DS: Data structure, contains data types like e.g. Unsigned8, Octet String, etc.
- Float: IEEE 754 format
- Integer:
  - Integer8: range of values = -128...127
  - Integer16: range of values = -327678....327678
  - Integer32: range of values = $-2^{31}...2^{31}$
- Octet String: Binary coded
- Visible String: ASCII coded
- Unsigned:
  - Unsigned8: range of values = 0...255
  - Unsigned16: range of values = 0...65535
  - Unsigned32: range of values = 0...4294967295

Storage Class

- Cst: constant parameter
- D: dynamic parameter
- N: not volatile parameter
- S: static parameter

Device management

Parameter	Slot	Index	Object Type	Data Type	Size (Byte)	Storage Class	Read	Write
Directory Object Header	1	0	Array	Unsigned16	12	Cst	x	
Composite list directory entries	1	1	Array	Unsigned16	24	Cst	x	
Composite directory entry	1	2					x	

Physical Block

Parameter	Slot	Index	Object Type	Data Type	Size (Byte)	Storage Class	Read	Write
Physical Block Standard Parameter								
BLOCK_OBJECT	0	16	Record	DS-32	20	Cst	x	
ST_REV	0	17	Simple	Unsigned16	2	N	x	
TAG_DESC	0	18	Simple	Visible String	32	S	x	x
STRATEGY	0	19	Simple	Unsigned16	2	S	x	x
ALLERT_KEY	0	20	Simple	Unsigned8	1	S	x	x
TARGET_MODE	0	21	Simple	Unsigned8	1	S	x	x
MODE_BLK	0	22	Record	DS-37	3	D	x	
ALARM_SUM	0	23	Record	DS-42	8	D	x	
Physical Block Parameter								
SOFTWARE_REVISION	0	24	Simple	Visible String	16	Cst	x	
HARDWARE_REVISION	0	25	Simple	Visible String	16	Cst	x	
DEVICE_MAN_ID	0	26	Simple	Unsigned16	2	Cst	x	
DEVICE_ID	0	27	Simple	Visible String	16	Cst	x	
DEVICE_SER_NUM	0	28	Simple	Visible String	16	Cst	x	
DIAGNOSIS	0	29	Simple	Visible String	4	D	x	
DIAGNOSIS_MASK	0	31	Simple	Visible String	4	Cst	x	
DEVICE_CERTIFICATION	0	33	Simple	Visible String	32	Cst	x	
FACTORY_RESET	0	35	Simple	Unsigned16	2	S	x	x
DESCRIPTOR	0	36	Simple	Visible String	32	S	x	x
DEVICE_MESSAGE	0	37	Simple	Visible String	32	S	x	x
DEVICE_INSTALL_DATE	0	38	Simple	Visible String	16	S	x	x
LOCAL_OP_ENA	0	39	Simple	Unsigned8	1	N	x	x
IDENT_NUMBER_SELECTOR	0	40	Simple	Unsigned8	1	S	x	x
FEATURE	0	42	Record	DS-68	8	N	x	
SENSORMESSBEREICH	0	43	Array	Float2	8	N	x	
WARTUNGSINTERVALL	0	44	Simple	Float	4	N	x	x
WARTUNGSTIMER	0	45	Simple	Float	4	N	x	x
UEBERLASTZAEHLER	0	46	Simple	Unsigned16	2	N	x	x

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Analog Input Block

Parameter	Slot	Index	Object Type	Data Type	Size (Byte)	Storage Class	Read	Write
Analog Input Block Standard Parameter								
BLOCK_OBJECT	1	16	Record	DS-32	20	Cst	x	
ST_REV	1	17	Simple	Unsigned16	2	N	x	
TAG_DESC	1	18	Simple	Visible String	32	S	x	x
STRATEGY	1	19	Simple	Unsigned16	2	S	x	x
ALERT_KEY	1	20	Simple	Unsigned8	1	S	x	x
TARGET_MODE	1	21	Simple	Unsigned8	1	S	x	x
MODE_BLK	1	22	Record	DS-37	3	D	x	
ALARM_SUM	1	23	Record	DS-42	8	D	x	
Analog Input Block Parameter								
BATCH	1	24	Record	DS-67	10	S	x	x
OUT	1	26	Record	101	5	S	x	
PV_SCALE	1	27	Array	Float	8	S	x	x
OUT_SCALE	1	28	Record	DS-36	11	S	x	x
LIN_TYPE	1	29	Simple	Unsigned8	1	S	x	x
CHANNEL	1	30	Simple	Unsigned16	2	S	x	x
PV_FTIME	1	32	Simple	Float	4	S	x	x
FSAFE_TYPE	1	33	Simple	Unsigned8	1	S	x	x
FSAFE_VALUE	1	34	Simple	Float	4	S	x	x
ALARM_HYS	1	35	Simple	Float	4	S	x	x
HI_HI_LIM	1	37	Simple	Float	4	S	x	x
HI_LIM	1	39	Simple	Float	4	S	x	x
LO_LIM	1	41	Simple	Float	4	S	x	x
LO_LO_LIM	1	43	Simple	Float	4	S	x	x
HI_HI_ALM	1	46	Record	DS-39	16	D	x	
HI_ALM	1	47	Record	DS-39	16	D	x	
LO_ALM	1	48	Record	DS-39	16	D	x	
LO_LO_ALM	1	49	Record	DS-39	16	D	x	
SIMULATE	1	50	Record	Ds-50	6	S	x	x

Transducer Block

Parameter	Slot	Index	Object Type	Data Type	Size (Byte)	Storage Class	Read	Write
Transducer Block Pressure Standard Parameter								
BLOCK_OBJECT	1	52	Record	DS-32	20	Cst	x	
ST_REV	1	53	Simple	Unsigned16	2	N	x	
TAG_DESC	1	54	Simple	Visible String	32	S	x	x
STRATEGY	1	55	Simple	Unsigned16	2	S	x	x
ALERT_KEY	1	56	Simple	Unsigned8	1	S	x	x
TARGET_MODE	1	57	Simple	Unsigned8	1	S	x	x
MODE_BLK	1	58	Record	DS-37	3	D	x	
ALARM_SUM	1	59	Record	DS-42	8	D	x	
Transducer Block Pressure Parameter								
SENSOR_VALUE	1	60	Simple	Float	4	D	x	
SENSOR_HI_LIM	1	61	Simple	Float	4	N	x	
SENSOR_LO_LIM	1	62	Simple	Float	4	N	x	
CAL_POINT_HI	1	63	Simple	Float	4	S	x	x
CAL_POINT_LO	1	64	Simple	Float	4	S	x	x
CAL_MIN_SPAN	1	65	Simple	Float	4	N	x	
SENSOR_UNIT	1	66	Simple	Unsigned16	2	S	x	x
TRIMMED_VALUE	1	67	Record	101	5	D	x	
SENSOR_TYPE	1	68	Simple	Unsigned16	2	N	x	
SENSOR_SERIAL_NUMBER	1	69	Simple	Unsigned32	4	N	x	
PRIMARY_VALUE	1	70	Record	101	5	D	x	
PRIMARY_VALUE _UNIT	1	71	Simple	Unsigned16	2	S	x	x
PRIMARY_VALUE_TYPE	1	72	Simple	Unsigned16	2	S	x	x
SENSOR_DIAPHRAGM_ MATERIAL	1	73	Simple	Unsigned16	2	S	x	x
SENSOR_FILL_FLUID	1	74	Simple	Unsigned16	2	S	x	x
SENSOR_MAX_ STATIC_PRESSURE	1	75	Simple	Float	4	N	x	
SENSOR_O_RING_ MATERIAL	1	76	Simple	Unsigned16	2	S	x	x
PROCESS_CONNECTION_ TYPE	1	77	Simple	Unsigned16	2	S	x	x
PROCESS_CONNECTION_ MATERIAL	1	78	Simple	Unsigned16	2	S	x	x

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Parameter	Slot	Index	Object Type	Data Type	Size (Byte)	Storage Class	Read	Write
SECONDARY_VALUE_1	1	81	Record	101	5	D	x	
SECONDARY_VALUE_1_ UNIT	1	82	Simple	Unsigned16	2	S	x	x
SECONDARY_VALUE_2	1	83	Record	101	5	D	x	
SECONDARY_VALUE_2_ UNIT	1	84	Simple	Unsigned16	2	S	x	x
LIN_TYPE	1	85	Simple	Unsigned8	1	S	x	x
SCALE_IN	1	86	Array	Float	8	S	x	x
SCALE_OUT	1	87	Array	Float	8	S	x	x
MAX_SENSOR_VALUE	1	97	Simple	Float	4	N	x	x
MIN_SENSOR_VALUE	1	98	Simple	Float	4	N	x	x
SENSOR_OFFSET	1	99	Simple	Float	4	S	x	x
Transducer Block Level Standard Parameter								
BLOCK_OBJECT	1	108	Record	DS-32	20	Cst	x	
ST_REV	1	109	Simple	Unsigned16	2	N	x	
TAG_DESC	1	110	Simple	Visible String	32	S	x	x
STRATEGY	1	111	Simple	Unsigned16	2	S	x	x
ALERT_KEY	1	112	Simple	Unsigned8	1	S	x	x
TARGET_MODE	1	113	Simple	Unsigned8	1	S	x	x
MODE_BLK	1	114	Record	DS-37	3	D	x	
ALARM_SUM	1	115	Record	DS-42	8	D	x	
Transducer Block Level Parameter								
PRIMARY_VALUE	1	116	Record	101	5	D	x	
PRIMARY_VALUE_UNIT	1	117	Simple	Unsigned16	2	S	x	x
LEVEL	1	118	Simple	Float	4	D	x	
LEVEL_UNIT	1	119	Simple	Unsigned16	2	S	x	x
SENSOR_VALUE	1	120	Simple	Float	4	D	x	
SENSOR_UNIT	1	121	Simple	Unsigned16	2	S	x	x
SECONDARY_VALUE_1	1	122	Record	101	5	D	x	
SECONDARY_VALUE_1_ UNIT	1	123	Simple	Unsigned16	2	S	x	x
SECONDARY_VALUE_2	1	124	Record	101	5	D	x	
SECONDARY_VALUE_2_ UNIT	1	125	Simple	Unsigned16	4	S	x	x
SENSOR_OFFSET	1	126	Simple	Float	4	S	x	x
CAL_TYPE	1	127	Simple	Unsigned8	1	S	x	x
CAL_POINT_LO	1	128	Simple	Float	4	S	x	x
CAL_POINT_HI	1	129	Simple	Float	4	S	x	x
LEVEL_LO	1	130	Simple	Float	4	S	x	x
LEVEL_HI	1	131	Simple	Float	4	S	x	x
LEVEL_OFFSET	1	132	Simple	Float	4	S	x	x
LIN_TYPE	1	133	Simple	Unsigned8	1	S	x	x
SENSOR_HIGH_LIMIT	1	136	Simple	Float	4	C	x	
SENSOR_LOW_LIMIT	1	137	Simple	Float	4	C	x	
MAX_SENSOR_VALUE	1	138	Simple	Float	4	N	x	
MIN_SENSOR_VALUE	1	139	Simple	Float	4	N	x	
TAB_ENTRY	1	144	Simple	Unsigned8	1	D	x	x
TAB_X_Y_VALUE	1	145	Array	Float	8	D	x	x
TAB_MIN_NUMBER	1	146	Simple	Unsigned8	1	N	x	
TAB_MAX_NUMBER	1	147	Simple	Unsigned8	1	N	x	
TAB_OP_CODE	1	148	Simple	Unsigned8	1	D	x	x
TAB_STATUS	1	149	Simple	Unsigned8	1	D	x	
TAB_ACTUAL_NUMBER	1	150	Simple	Unsigned8	1	N	x	

View Object

Parameter	Slot	Index	Object Type	Data Type	Size (Byte)	Storage Class	Read	Write
Physical Block	1	152	Simple	Octed String	17	D	x	
Analog Input Block	1	154	Simple	Octed String	18	D	x	
Transducer Block Pressure	1	156	Simple	Octed String	18	D	x	
Transducer Block Level	1	158	Simple	Octed String	18	D	x	

I&M Function

Parameter	Slot	Index	Object Type		Size (Byte)		Read	Write
I&M0	0	65000	Record		64		x	
I&M1	0	65001	Record		64		x	
I&M2	0	65002	Record		64		x	
PA_I&M0	0	65016	Record		64		x	

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Data format

At PROFIBUS PA the cyclic transmission of the analogue values to the SPS is made in data blocks of 5 Byte length. The measuring value is included in the first 4 Bytes in the form of a floating point number acc. to IEEE standard. The 5th Byte contains a standardized status information that belongs to the device.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5
Measuring value as IEEE 754 floating point number				Status

The measuring value is transmitted as IEEE 754 floating point number like follows:

Measuring value = $(-1)^{VZ} \times 2^{(E\ -127)} \times (1 + F)$

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
VZ	Exponent (E)								Fraction (F)						
	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-1}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}
Fraction (F)															
2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}

Example
40 F0 00 00 hex = 0100 0000 1111 000 000 000 000 0000 binary
Value = $(-1)^0 \times 2^{(129-127)} \times (1 + 2^{-1} + 2^{-2} + 2^{-3})$
$= 1 \times 2^2 \times (1 + 0{,}5 + 0{,}25 + 0{,}125) = 1 \times 4 \times 1{,}875 = 7{,}5$

Note

- Not all stored-program controls supports the IEEE 754 format. In that case, a converting module must be used or written.
- Dependent on the kind of data filing (Most-Significant-Byte or Low-Significant-Byte), that is used in the SPS (master), a rearrangement of the byte sequence could be necessary (Byte-Swapping-Routine).

Data strings
In the slot/index table, some data types, e.g. DS-36 are noted. These data types are data strings, that are built up acc. to the PROFIBUS PA specification part 1, version 3.0. They consists on more elements, that can be addressed by the slot, index and sub-index, like in the following two examples shown.

Parameter name	Type	Slot	Index	Element	Sub-index	Type	Size (Byte)
OUT	DS-33	1	26	OUT VALUE	1	Float	4
				OUT STATUS	5	Unsigned8	1

Parameter name	Type	Slot	Index	Element	Sub-index	Type	Size (Byte)
OUT_SCALE	DS-33	1	26	EU_100_PERCENT	1	Float	4
				EU_0_PERCENT	5	Float	4
				UNITS_INDEX	9	Unsigned16	2
				DECIMAL_POINT	11	Integer8	1

Device address

- Every PROFIBUS PA device must be assigned an address. Only at a correct set address, the measuring device can be identified by the control system/master.
- In every PROFIBUS PA net, each address may only be assigned once.
- Valid device addresses are in the range from 0 to 125.
- The address 126, that is preset by factory, can be used for function test of the device and for the connection into a already working PROFIBUS PA network. Following this address must be changed, to include further devices.

There are two possibilities to assign the device address:

- By an operation program of the DP-master class 2 like e.g. Simatic-PDM
- At the device by the menu point nEtA (network address)

Factory setting (reset)

By input the code number 1 the values for the parameter can be reset to the factory values. After a reset the OUT Value must be scaled newly if necessary. See also "Scaling OUT Value".

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Inauguration

The default setting for the device is operation mode pressure (in the parameter CHANNEL). The measuring range and the unit of the measuring value as well as the digital output value of the Analog Input Blocks OUT corresponds with the data on the type label. After a reset with the code 1 the OUT_VALUE must be scaled newly, if necessary (see also "Scaling OUT Value").

Inauguration by class 2 master (Simatic-PDM)
Inauguration and operation of the Simatic-PDM are described in the operation manual of the Simatic-PDM. Proceed for the inauguration of the device like follows:

- Input measuring point name.
- Assign a bus address to the device (see "Device address").
- Parameterize the manufacturer specific device parameter.
- Parameterize the PHYSICAL BLOCK.
- Parameterize the ANALOG INPUT BLOCK.
  In the Analog Input Block the input value resp. the input range can be scaled acc. to the requirements of the automation system (see "Scaling OUT Value").
  Adjust the limit values, if necessary.
- Configure the cyclic data traffic (see "System integration" und "Cyclic data exchange")

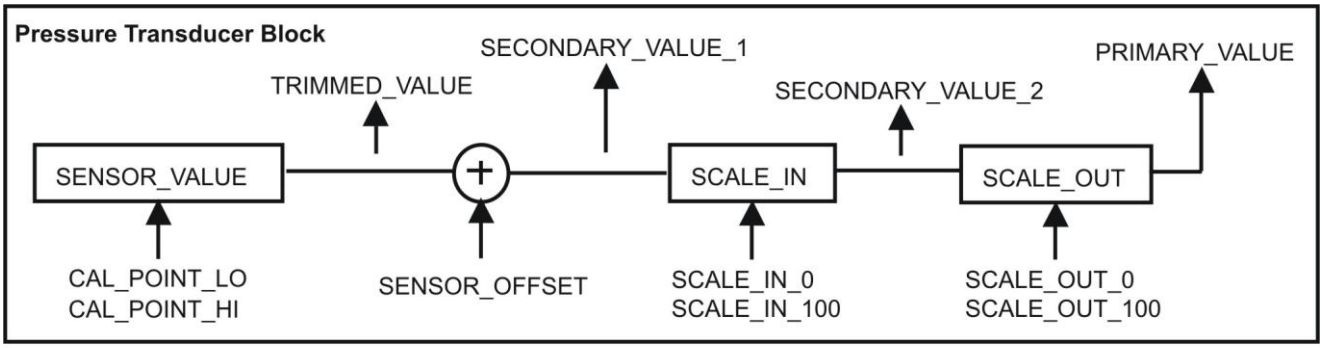
Select operation mode
There are the following operation modes available, selectable in the parameter CHANNEL:

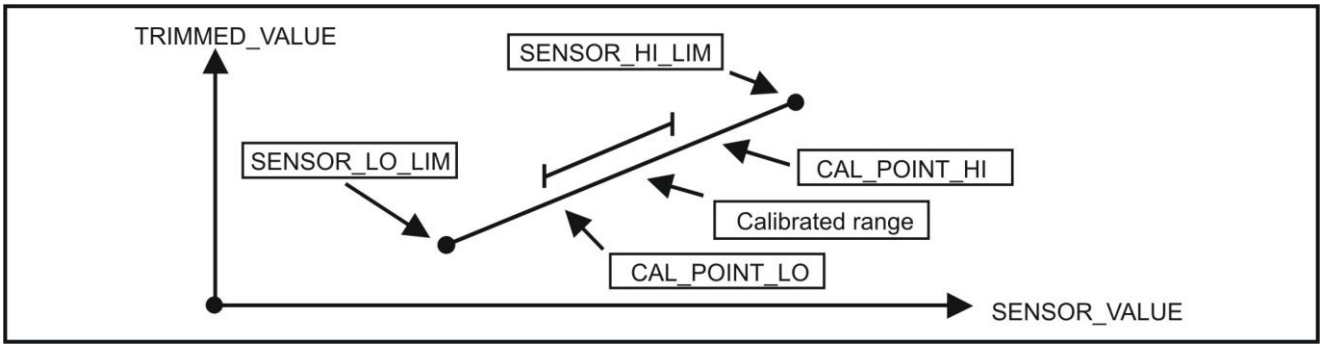
- Pressure
- Filling level

Position adjustment
Due to the mounting position of the device, a shifting of the measuring value can occur, i.e. at an empty container the measuring value is not zero. A value (SENSOR_OFFSET) can be input, by that the pressure characteristic, that means zero and end pressure value together, will be shifted.
Example:

- MESSWERT = 3,4 mbar
- Input the value by the parameter Sensor_Offset by that the MESSWERT should be corrected. To correct the MESSWERT to 0,0 mbar, the value -3,4 must be input.
  Equation: MESSWERTnew = MESSWERTold + Sensor_Offset)
- MESSWERT (after input for position offset) = 0.0 mbar

Pressure measurement





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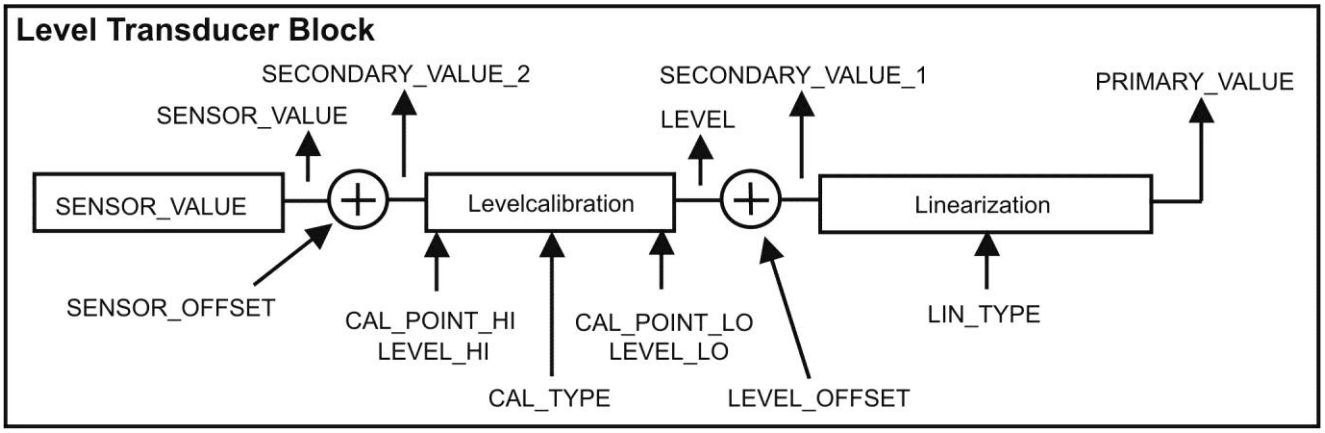
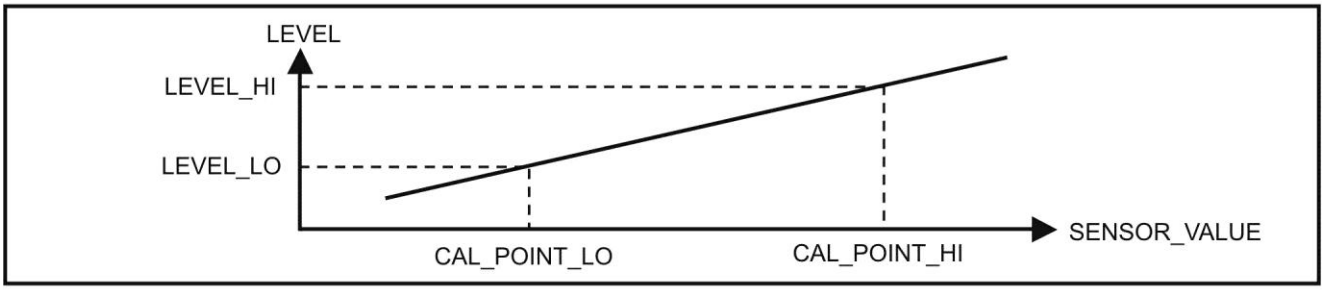
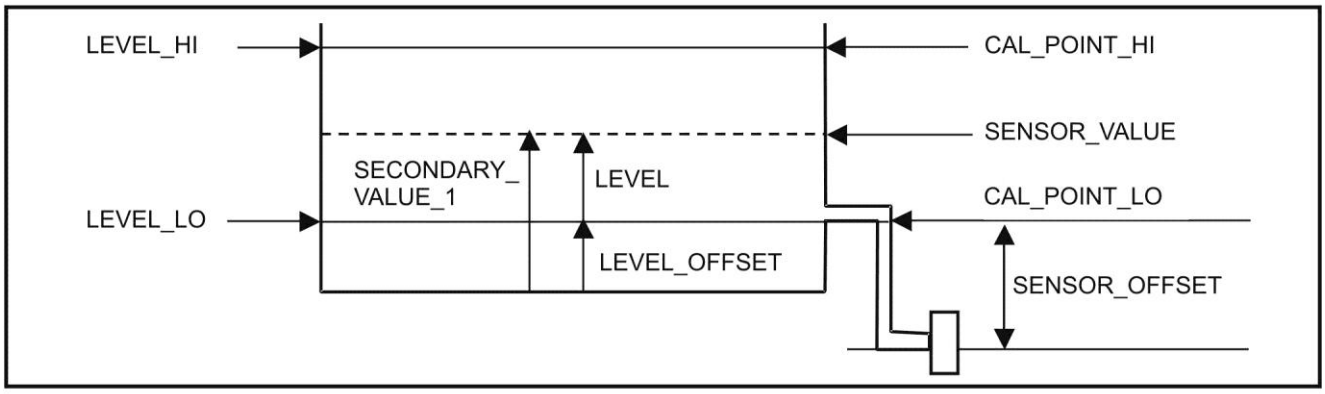
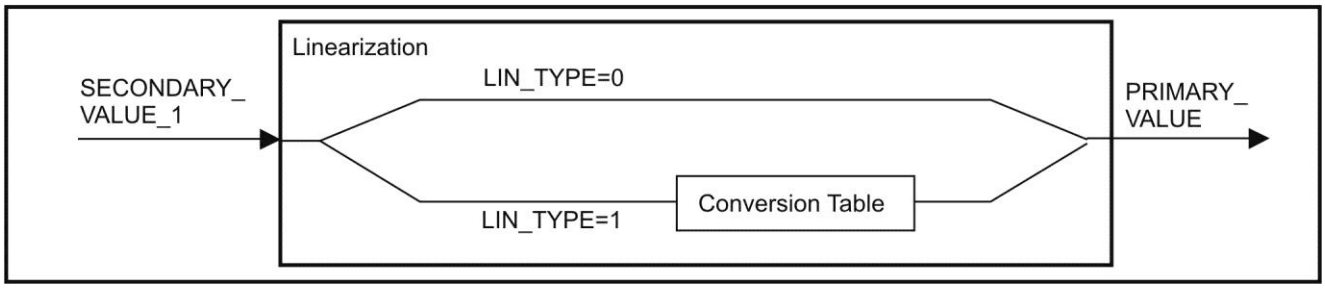
Filling level measurement



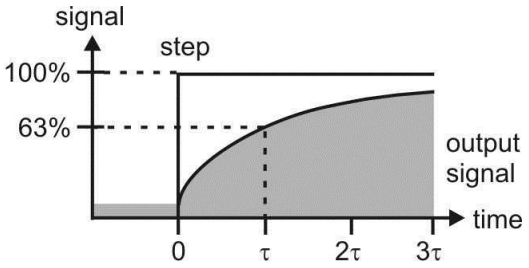






Damping

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 5 τ.



The damping time constant τ can be adjusted from 0,0...40,0 seconds in 400 steps, whereby one step equals 0,1 seconds.

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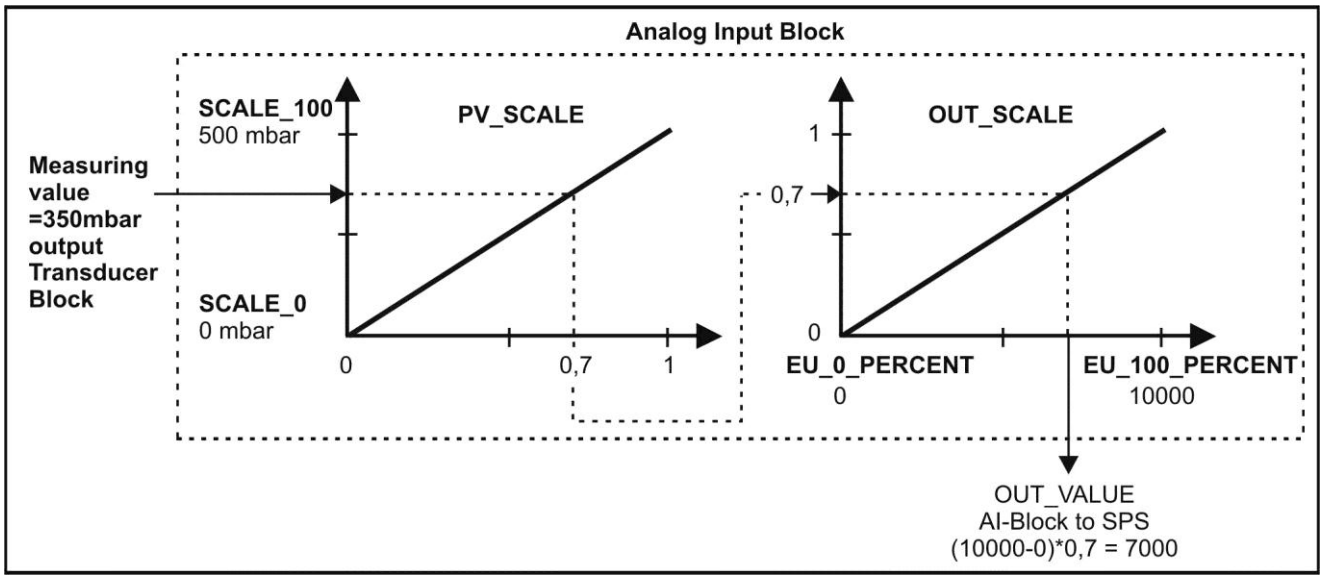
Scaling OUT Value

In the Analog Input Block the input value resp. the input range can be scaled acc. to the automation requirements.

Example:
The measuring range from 0...500 mbar should be rescaled to 0...10000.

- Chose group PV SCALE.
  - Input SCALE_0 "0".
  - Input SCALE_100 "500".
- Chose group OUT SCALE.
  - Input EU_0_PERCENT "0".
  - Input EU_100_PERCENT "10000".
  - Select for UNITS_INDEX e.g. "user unit".
    The selected unit has not effect on the scaling.
- Result:
  At a pressure of 350 mbar the OUT Value 7000 is transmitted to the SPS.



Note

- At a change of the unit within a operation mode, the limits for PV SCALE and OUT SCALE will not be converted.
- At a change of the operation mode, there is no conversion.
  The device must be newly adjusted after a change of the operation mode.

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System integration

Device-Master-Data (GSD)-file
After the inauguration by the class 2 master (Simatic-PDM) the device is prepared for the system integration
To include the field devices into the bus system, the PROFIBUS PA system needs a description of the device like device identification, ID number, supported communication characteristics, module structure (combination of cyclic input/output telegram's) and the meaning of the diagnosis bit's.
These data's are included in a Device-Master-Data (GSD)-file, that is supplied to the PROFIBUS DP master (e.g. SPS) at the inauguration of the communication system.

When using devices, that supports the profile "PA devices", the following version of the GSD are possible:
- Manufacturer specific GSD:
  With this GSD the unlimited functionality of the field device is guaranteed. All device specific process parameter and functions are available.
- Profile GSD:
  Alternatively to the manufacturer specific GSD the PNO provides general data base file with the name PA139700.gsd for devices with an Analog Input Block.
  If a system is projected with the Profile GSD's, the exchange of devices of different manufacturer can take place.

The following Device-Master-Data (GSD)-files can be used:

Name of the device	Note	ID-number	GSD
Precont S	Profile GSD	0x9700	PA139700.gsd
	Manufacturer specific GSD	0x0B6D	ACS_0B6D.gsd

The Device-Master-Data (GSD)-files for ACS devices can be found like follows:
- Internet ACS: http://www.acs-msr.de ➔ search for "GSD"
- Internet PNO: http://www.profibus.com (Products ➔ Product Guide)
- On CD-ROM from ACS

The Profile-Device-Master-Data (GSD)-files of the PNO can be found like follows:
- Internet PNO: http://www.profibus.com (Products ➔ Profile GSD Library)

Working with the Device-Master-Data (GSD)-files
The Device-Master-Data (GSD)-files must be embedded into a specific subdirectory of the PROFIBUS DP configuration software of the used SPS.
Dependent on the used software, these files can be copied into the program specific directory resp. read into the data base by an import function within the configuration software.
Detailed instruction to the directories, where the Device-Master-Data (GSD)-files must be saved, can be found in the manuals of the respective configuration software.

Troubleshooting

Analog Input Block
Contains the Analog Input Block an input resp. simulation value with the state BAD, the Analog Input Block will operate with the error behaviour, that is defined by the parameter FSAFE_TYPE.
The following options are available by the parameter FSAFE_TYPE:
- *LastValidOutValue*
  The last valid value with the state UNCERTAIN will be used for further processing.
- *FSsafeValue* – factory setting
  The value, that is provided by the parameter FSAFE_VALUE with the state UNCERTAIN will be used for further processing.
- *Status bad*
  The current value with the state BAD will be used for further processing.

Note
The error behaviour will also be activated, if the option „Out of Service O/S" is chosen by the parameter TARGET_MODE.

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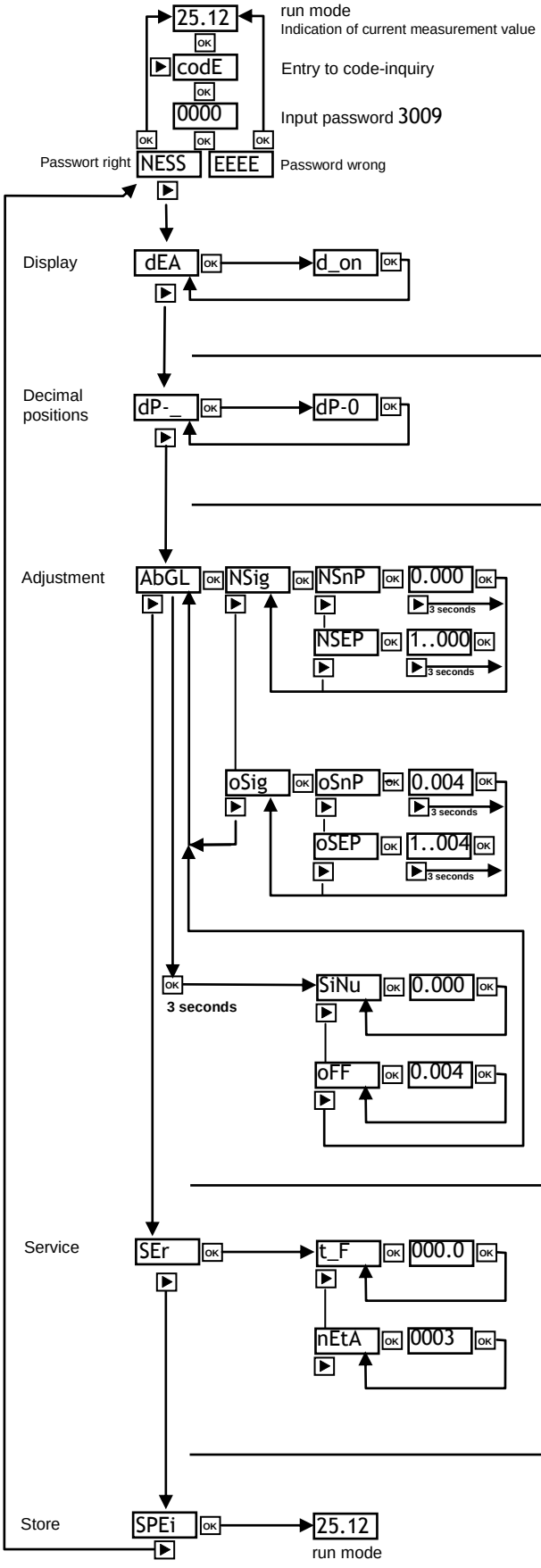
Adjustment menu – password 3009



OK	Enter the respective submenu and capturing the set values
▶	Jump from menu to menu / changing the direction of the „+/-„ key / changing between the different possibilities in selection menu
±	Change the indicated values. Function direction (higher or lower) can be changed by the key „Change“.

d_on – Display on – LED display active
dofF – Display off – LED display deactive in run mode.
Entering code inquiry by pushing the key „OK“ will activate the display again.

dp-0 – No **decimal point**, the measuring value is displayed without decimal point
dp-1 – One decimal point, the measuring value is displayed with one decimal point
dp-2 – Two decimal points, the measuring value is displayed with two decimal points
dp-3 – Three decimal points, the measuring value is displayed with three decimal points

Adjustment with applied signal (direct effect to Sensor_Value)

NSnP – The current pressure value, will be assigned as lower pressure reference value to the display value, that is adjustable by „+“ resp. „-“.
Set with „OK“, cancel by pressing „Change“ for 3 seconds.

NSEP – The current pressure value, will be assigned as upper pressure reference value to the display value, that is adjustable by „+“ resp. „-“.
Set with „OK“, cancel by pressing „Change“ for 3 seconds.

Adjustment without applied signal (direct effect to Sensor_Value)

oSnP – The display value, that is adjustable by „+“ resp. „-“ will be assigned to the calibrated pressure zero value (CAL_POINT_LO).
Set with „OK“, cancel by pressing „Change“ for 3 seconds.

oSnP – The display value, that is adjustable by „+“ resp. „-“ will be assigned to the calibrated pressure end value (CAL_POINT_HI).
Set with „OK“, cancel by pressing „Change“ for 3 seconds.

SiNu – Simulation
The set display value is transmitted (OUT_VALUE)
Cancel with „OK“

off – Offset adjustment
The set pressure value in bar will be added to the calibrated pressure value (Sensor_Value) as zero value shift (Sensor_Offset).
Set with „OK“

t_F – **System damping**
Input of the **system damping τ** for neutralization of short pressure blows or also for calming down cyclic fluctuating pressure signals.
Adjustment range 0,0...40,0 seconds, set with „OK“

nEtA – Network address
Used for identification of the device in the PROFIBUS-PA network.
Adjustment range from 2 to 125, factory value 126
Set with „OK“

SPEi – Store
Loss protected storage of all parameters

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Technical data

Auxiliary supply

Permitted supply voltage:	reverse polarity protected 9…32 V DC	Ex	9...24 V DC
Ripple voltage:	≤ 2 V_{PP}	condition:	within the permitted supply voltage range
Supply current:	11 mA ± 1mA	acc. to IEC 61158-2, Clause 21	

PROFIBUS-PA

Function:	Slave
Transmission rate:	31,25kBit/s
Read cycle:	cyclic: max.: 100/s / typical value: 20/s acyclic: max.: 20/s / typical value: 10/s
Cycle time (update time):	The cycle time in a bus segment at the cyclic data traffic depends on the device count, the used segment coupler and the internal SPS cycle time The min. cycle time is approx. 20 ms per device.
Response time:	cyclic approx. 20ms per request / acyclic ≤ 50 ms
Fail signal:	optional –9999, +9999 or HOLD (last value), or adjustable in the analog input block (Last Valid Out Value, Fsafe Value, Status bad)
Communication resistor:	PROFIBUS-PA termination resistor
Physical layer:	IEC 61158-2

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Measuring accuracy

Characteristic deviation [3) 5) 6) 12)]:	Membrane ceramic	≤ ±0,1% / 0,2% FS [2)]
	Membrane metallic	≤ ±0,5% FS [2)]
	Membrane metallic	≤ ±1,0% FS [2)] at pressure range 0..0,1 / 0,25 bar
Nonlinearity [6) 12)]:	Membrane ceramic	≤ ±0,1% / 0,2% FS [2)]
	Membrane metallic	≤ ±0,3% FS [2)]
	Membrane metallic	≤ ±0,6% FS [2)] at pressure range 0..0,1 / 0,25 bar
Hysteresis [6) 12)]:	Membrane ceramic	negligible
	Membrane metallic	≤ ±0,1% FS [2)]
Long term drift [6) 12)]:	Membrane ceramic	≤ ±0,1% FS [2)] / year not cumulative
	Membrane metallic	≤ ±0,15% FS [2)] / year not cumulative
Temperature deviation [6) 12)]:	Membrane ceramic (*-20..80°C)*	T_k [4)] Zero ≤ ±0,10% FS [2)] / 10 K max. ≤ ±0,75 % FS [2)] (-20...+80°C) T_k [4)] Span ≤ ±0,10% FS [2)] / 10 K max. ≤ ±0,5 % FS [2)] (-20...+80°C) max. ≤ ±0,8 % FS [2)] (-20...+80°C) ≤ 0..0,4 bar besides -20...+80°C with factor 2 for T_k
	Membrane metallic (*≥ 40 bar / -40..+100°C)*	T_k [4)] Zero ≤ ±0,20% FS [2)] / 10 K T_k [4)] Span ≤ ±0,20% FS [2)] / 10 K max. ≤ ±1,0 % FS [2)] (-20...+80°C) besides -40...+100°C with factor 2 for T_k
	Membrane metallic (*≤ 25 bar / 0..80°C)*	T_k [4)] Zero ≤ ±0,20% FS [2)] / 10 K Range 0..0,4 bar ≤ ±0,25% FS [2)] / 10 K Range 0..0,25 bar ≤ ±0,4% FS [2)] / 10 K Range 0..0,1 bar ≤ ±1,0% FS [2)] / 10 K T_k [4)] Span ≤ ±0,20% FS [2)] / 10 K besides 0...+80°C with factor 2 for T_k

Precont S70
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)]:	*Precont S10 / S40*	≤ 0,18 mbar
	Precont S20 / S30	Process connection G ¼“ / G ½“ ≤ 4 mbar Process connection G 1“ ≤ 10 mbar

Precont S70
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 TD [7)] = 1
At TD [7)] ≥ 1 (adjusted measuring range ≤ nominal measuring range):
Specification at adjusted measuring range = specification at nominal measuring range x TD [7)]
7) Turn-Down TD = nominal measuring range (FS [2)]) / adjusted measuring range)
10) Device rotated by 180°, process connection upside.
12) Higher values for special measuring range

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Materials

Membrane: (medium contact)	Precont S10 / S40	Ceramic AL_2O_3 96% resp. 99,9%
	Precont S20 *front flush*	Steel 1.4571 (AISI 316Ti)
	≥ 40 bar	Steel 1.4571 (AISI 316Ti)
	< 40 bar	Steel 1.4542 (AISI 630) / 1.4534
	Precont S30	Steel 1.4435 (AISI 316L)
	Precont S70	Steel 1.4404 (AISI 316L)
Process connection: (medium contact)	Precont S10 / S40	Steel 1.4404 (AISI 316L) / Steel 1.4571 (AISI 316Ti)
	Precont S20	Steel 1.4571 (AISI 316Ti)
	Precont S30	Steel 1.4435 (AISI 316L)
	Precont S70	Steel 1.4404 / 1.4435 (AISI 316L)
Temperature decoupler:	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	
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®) NBR – nitril-butadien-rubber
	others	➔ FPM – fluorelastomere (Viton®) Silicone

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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

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

Limitations by variant	Process temperature range
Temperature decoupler at S10 / S40	-40...+125°C
Precont S30	-20...+150°C
Precont S70	-10...+100°C
Temperature decoupler B at S70	-10...+140°C
Temperature decoupler C at S70	-10...+250°C
Capillary tube at S70	-10...+370°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
Gasket NBR	-30...+110°C

Process pressure ranges: depends on variant, maximum – 1 bar ...1000 bar

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

Vacuum strength: 0 $mbar_{abs}$

Ceramic membrane –0,1...0 bar resp. 0...0,1 bar ➔ 700$mbar_{abs}$
(at S40 process connection 8 / R ➔ 0 $mbar_{abs}$)

Ceramic membrane –0,1...+0,1 bar resp. 0...0,2 bar ➔ 500$mbar_{abs}$
(at S40 process connection 8 / R ➔ 0$mbar_{abs}$)

Pressure transmitting liquid:

Precont S20	Synthetic oil	ranges ≤ 0...25 bar
Precont S30	Synthetic oil	FDA listed
Precont S70	Food oil / Silicone oil / high temperature oil	

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	

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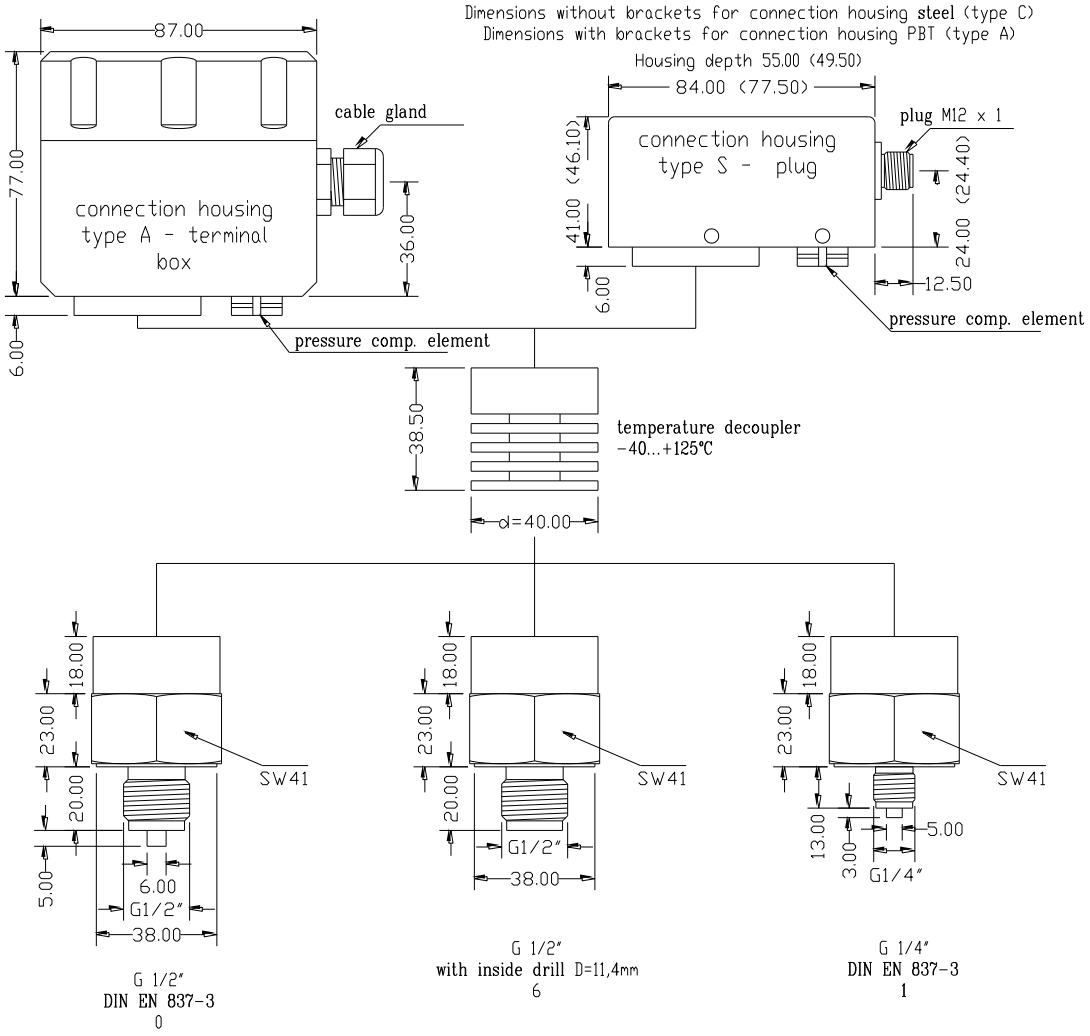
Dimension drawings Precont S10



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Order code overview Precont S10

Digital pressure transmitter with **inside placed ceramic capacitive membrane** from –1 to 60 bar

Type:

S10	Standard	
ExS10	ATEX II 1/2 G Ex ia IIC T4	
XDS10	ATEX II 1/2 D Ex iaD 20/21 T60°C/T102°C	only with material connection housing type C - steel

Process connection:

0	G ½“ A	ISO228-1	DIN EN 837-3	manometer connection
6	G ½“ A	ISO228-1		inside drill 11,4 mm
1	G ¼“ A	ISO228-1	DIN EN 837-3	manometer connection

Electronic - output:

P PROFIBUS-PA

Material process connection (medium contact):

V Steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)

Material connection housing:

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

Measuring range:

01	0...0,1 bar	10	0...10 bar
02	0...0,2 bar	11	0...16 bar
03	0...0,4 bar	12	0...20 bar
04	0...0,6 bar	13	0...40 bar
05	0...1 bar	14	0...60 bar
06	0...1,6 bar	15	-0,1...0 bar
07	0...2,5 bar	16	-1...0 bar
08	0...4 bar	17	-1...+1 bar
09	0...6 bar	18	-0,1...+0,1 bar
		YY	special measuring range separate spec. necessary

Gaskets (medium contact):

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

Process temperature:

0	Standard	-40°C to +100°C	
1	Extended	-40°C to +125°C	with temperature decoupler

Pressure type:

R Relative pressure

A Absolute pressure

Accuracy measuring system *) – material measuring membrane (medium contact):

2	0,2%		ceramic AL_2O_3	96%
1	0,2%		ceramic AL_2O_3	99,9% (highly clean)
0	0,1%	Linearization protocol	ceramic AL_2O_3	96%
3	0,1%	Linearization protocol	ceramic AL_2O_3	99,9% (highly clean)

Electrical connection:

S Plug M12x1

A Terminal box

Precont _ _ P V _ _ _ _ _ _ _

*) Higher values for special measuring range

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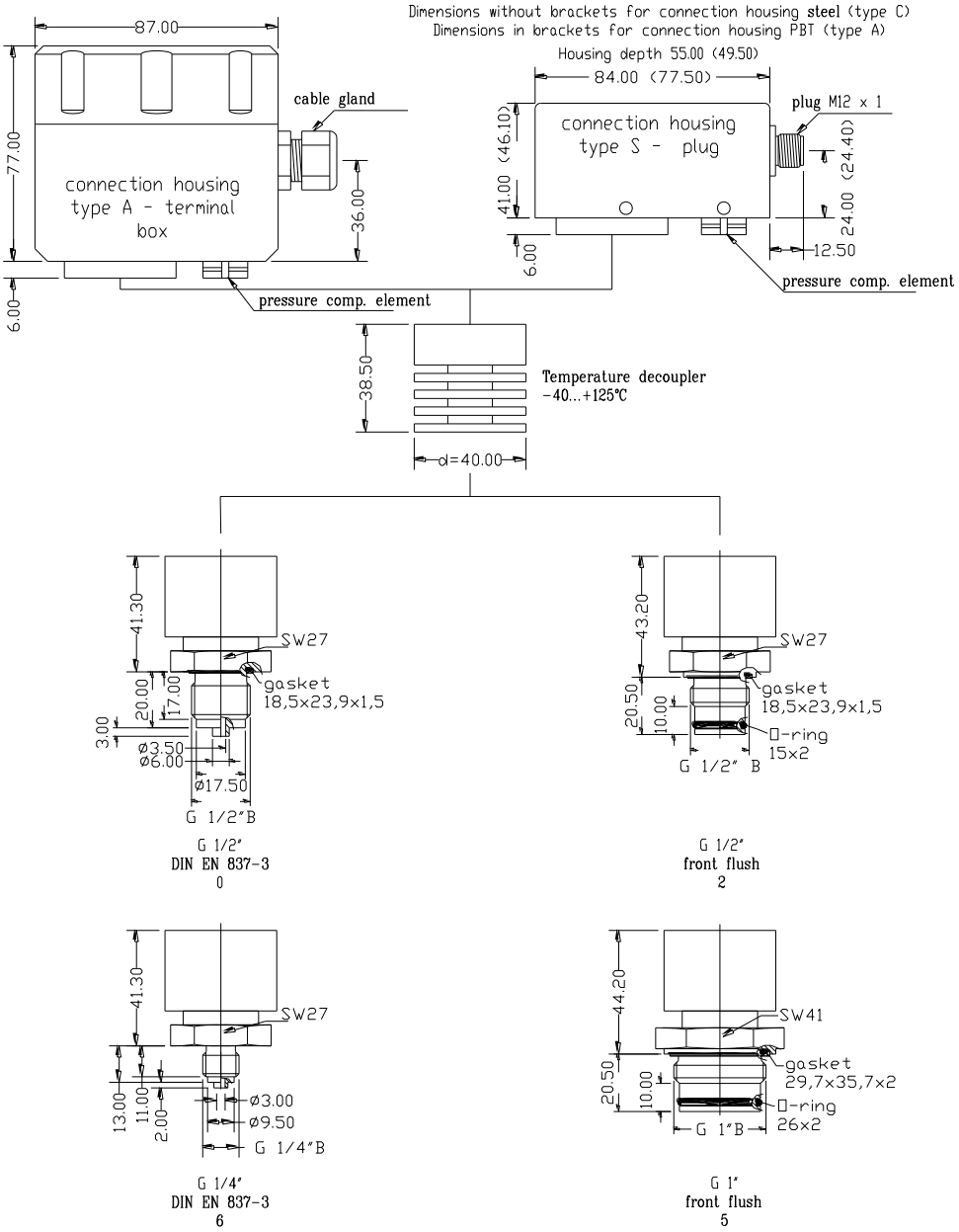
Dimension drawings Precont S20



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Order code overview Precont S20

Digital pressure transmitter with **metallic strain gauge membrane** from –1 to 1000 bar

Type:

S20	Standard	
ExS20	ATEX II 1/2 G Ex ia IIC T4	
XDS20	ATEX II 1/2 D Ex iaD 20/21	T60°C/T102°C only with material connection housing type C – CrNi-steel

Process connection:

0	G ½“ B	ISO228-1	DIN EN 837-3	manometer connection
2	G ½“ B	ISO228-1		front flush, with radial O-ring, up to max. 600 bar not for ranges 0.. 0,4 bar, 0..1 bar and –1…0 bar
5	G 1“ B	ISO228-1		front flush, with radial O-ring for ranges 0.. 0,4 bar, 0..1 bar and –1…0 bar
6	G ¼“ A	ISO228-1	DIN EN 837-3	manometer connection

Electronic - output:

P PROFIBUS-PA

Material process connection (medium contact):

V Steel 1.4571 (AISI 316Ti)

Gaskets (medium contact):

0	NBR	nitril-butadien-rubber	
1	FPM	fluorelastomere (Viton®)	
3	EPDM	etylene-propylene-dienmonomere	for food applications

Measuring range:

03	0...0,4 bar	20	0...160 bar	
05	0...1 bar	21	0...250 bar	
08	0...4 bar	22	0...320 bar	
09	0...6 bar	23	0...400 bar	
10	0...10 bar	24	0...600 bar	
11	0...16 bar	25	0…1000 bar	not for front flush G ½“ B - type 2
12	0...25 bar	16	-1...0 bar	
13	0...40 bar	17	-1...+1 bar	
14	0...60 bar	YY	special measuring range	separate spec. necessary
19	0...100 bar			

Material connection housing:

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

Process temperature:

0	Standard	-40°C to +100°C	
1	Extended	-40°C to +125°C	with temperature decoupler

Pressure type:

R	Relative pressure	
A	Absolute pressure	not for measuring ranges ≥ 40 bar

Accuracy measuring system *) – material measuring membrane (medium contact):

4	0,5%	Process connection type 2 / 5	Steel 1.4571 (AISI 316Ti)
		Measuring range ≥ 40 bar	Steel 1.4571 (AISI 316Ti)
		Measuring range < 40 bar	Steel 1.4542 (AISI 630) / 1.4534

Electrical connection:

S Plug M12x1

A Terminal box

Precont _ _ P V _ _ _ _ _ 4 _

*) Higher values for special measuring range

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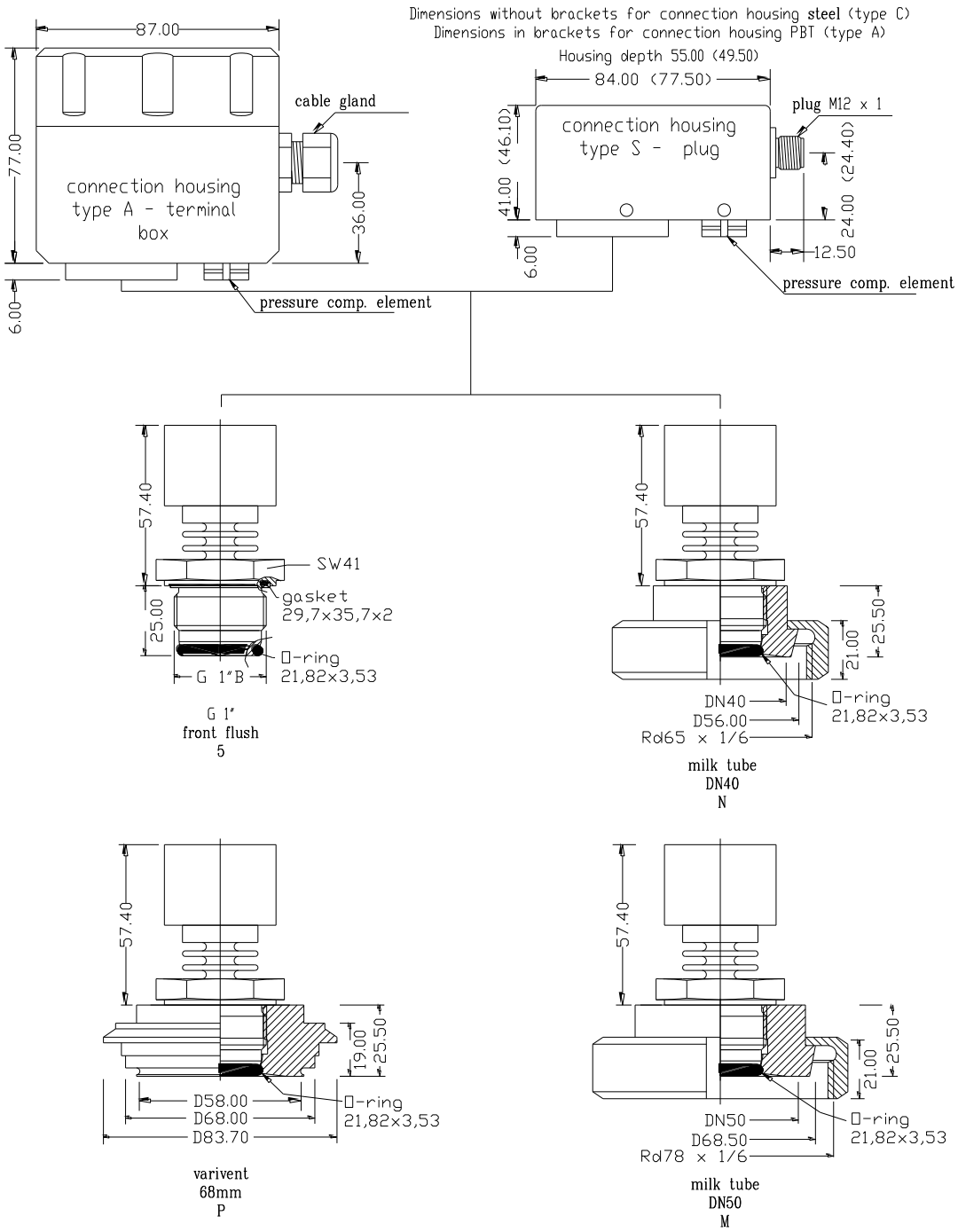
Dimension drawings Precont S30



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Order code overview Precont S30

Digital pressure transmitter with **front flush metallic strain gauge membrane** from –1 to 25 bar

Type:

S30	Standard	
ExS30	ATEX II 1/2 G Ex ia IIC T4	
XDS30	ATEX II 1/2 D Ex iaD 20/21 T60°C/T102°C	only with material connection housing type C – CrNi-steel

Process connection:

5	G 1“ B	ISO228-1		front flush, with radial O-ring, EHEDG conform	
N	Milk tube	DN 40, PN 40	DIN 11851		
M	Milk tube	DN 50, PN 40	DIN 11851		
P	Varivent	68 mm	DN40-80 / DN1½“..6“, PN25	DN100 / DN4“, PN20	DN125 / DN6“, PN10

Electronic - output:

P	PROFIBUS-PA

Material process connection (medium contact):

V	Steel 1.4435 (AISI 316L)

0

Measuring range:

01	0...0,1 bar	
02	0...0,25 bar	
03	0...0,4 bar	
04	0...0,6 bar	
05	0...1 bar	
07	0...2,5 bar	
08	0...4 bar	
09	0...6 bar	
10	0...10 bar	
11	0...16 bar	
12	0...25 bar	
16	-1...0 bar	
17	-1...+1 bar	
YY	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
D	POM – polyoxymethylene (Delrin®)	not for electrical connection type S

Process temperature:

1	Standard	-40°C to +150°C

Pressure type:

R	Relative pressure
A	Absolute pressure

Accuracy measuring system *) – material measuring membrane (medium contact):

4	0,5%	Steel 1.4435 (AISI 316L)

Electrical connection:

S	Plug M12x1
A	Terminal box

Precont _ _ P V 0 _ _ 1 _ 4 _

*) Higher values for special measuring range

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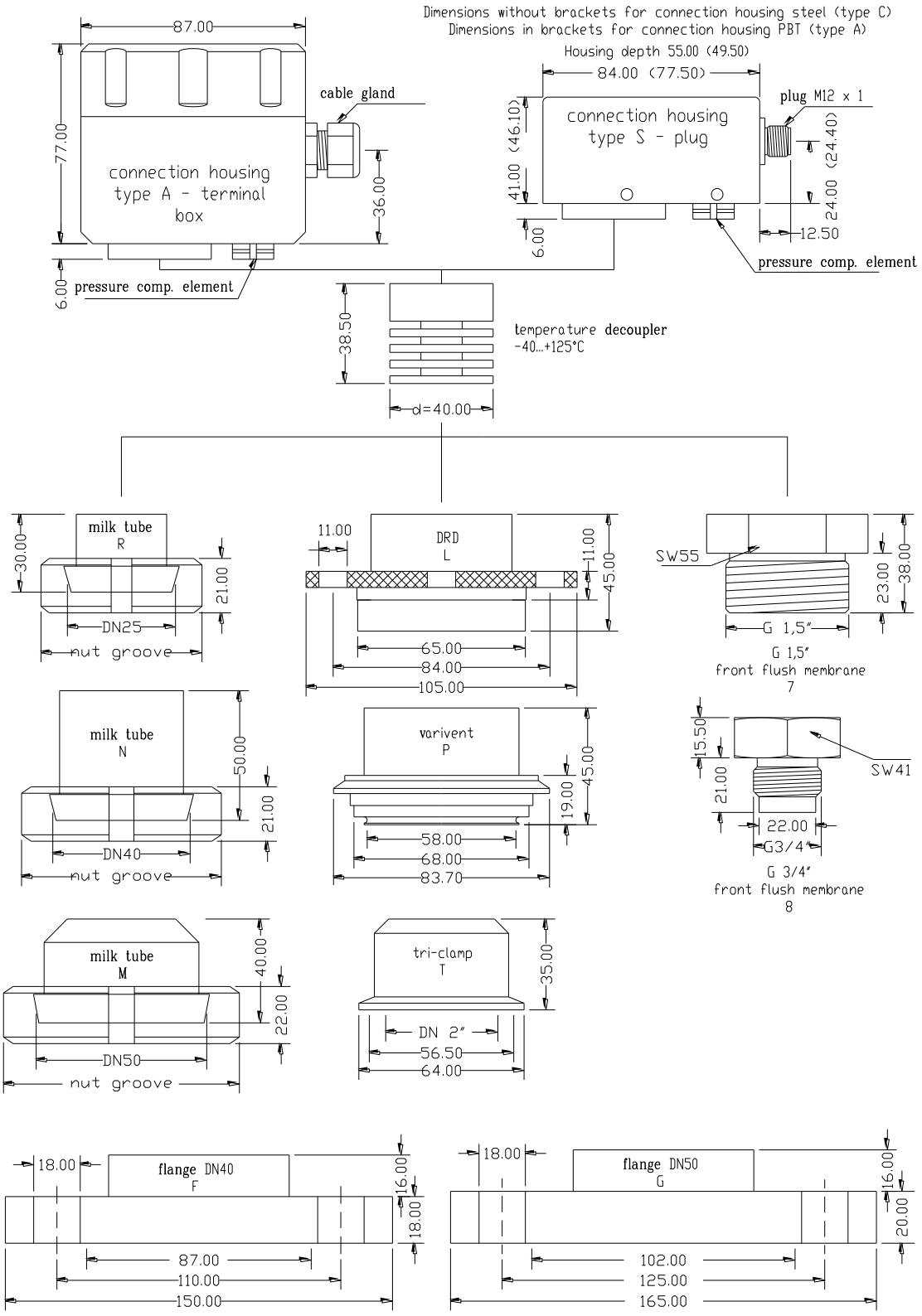
Dimension drawings Precont S40



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Order code overview Precont S40

Digital pressure transmitter with **front flush ceramic capacitive membrane** from –1 to 60 bar

Type:

S40	Standard	
ExS40	ATEX II 1/2 G Ex ia IIC T4	
XDS40	ATEX II 1/2 D Ex iaD 20/21 T60°C/T102°C	only with material connection housing type C – CrNi-steel

Process connection:

7	G 1½“ A	ISO228-1	front flush membrane		
8	G ¾“ A	ISO228-1	front flush membrane	not for variant membrane 1 / 3	99,9%
R	Milk tube	DN 25, PN 40	DIN 11851	not for variant membrane 1 / 3	99,9%
N	Milk tube	DN 40, PN 40	DIN 11851		
M	Milk tube	DN 50, PN 40	DIN 11851		
P	Varivent	68 mm	DN40-80 / DN1½“..6“, PN25	DN100 / DN4“, PN20	DN125 / DN6“, PN10
L	DRD	65 mm	DN 50, PN 40		
T	Tri-Clamp	DN 2“, PN 16	ISO 2852		
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	

Electronic - output:

P	PROFIBUS-PA

Material process connection (medium contact):

V	Steel 1.4404 (AISI 316L) / 1.4571 (AISI 316Ti)

Material connection housing:

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

Measuring range:

01	0...0,1 bar	10	0...10 bar	
02	0...0,2 bar	11	0...16 bar	
03	0...0,4 bar	12	0...20 bar	
04	0...0,6 bar	13	0...40 bar	not for process connection 8 / R
05	0...1 bar	14	0...60 bar	not for process connection 8 / R
06	0...1,6 bar	15	-0,1...0 bar	
07	0...2,5 bar	16	-1...0 bar	
08	0...4 bar	17	-1...+1 bar	
09	0...6 bar	18	-0,1...+0,1 bar	
		YY	special measuring range	separate spec. necessary

Gaskets (medium contact):

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

Process temperature:

0	Standard	-40°C to +100°C	
1	Extended	-40°C to +125°C	with temperature decoupler

Pressure type:

R	Relative pressure
A	Absolute pressure

Accuracy measuring system *) – material measuring membrane (medium contact):

2	0,2%		ceramic AL_2O_3	96%
1	0,2%		ceramic AL_2O_3	99,9% (highly clean)
0	0,1%	Linearization protocol	ceramic AL_2O_3	96%
3	0,1%	Linearization protocol	ceramic AL_2O_3	99,9% (highly clean)

Electrical connection:

S	Plug M12x1
A	Terminal box

Precont _ _ P V _ _ _ _ _ _ _

*) Higher values for special measuring range

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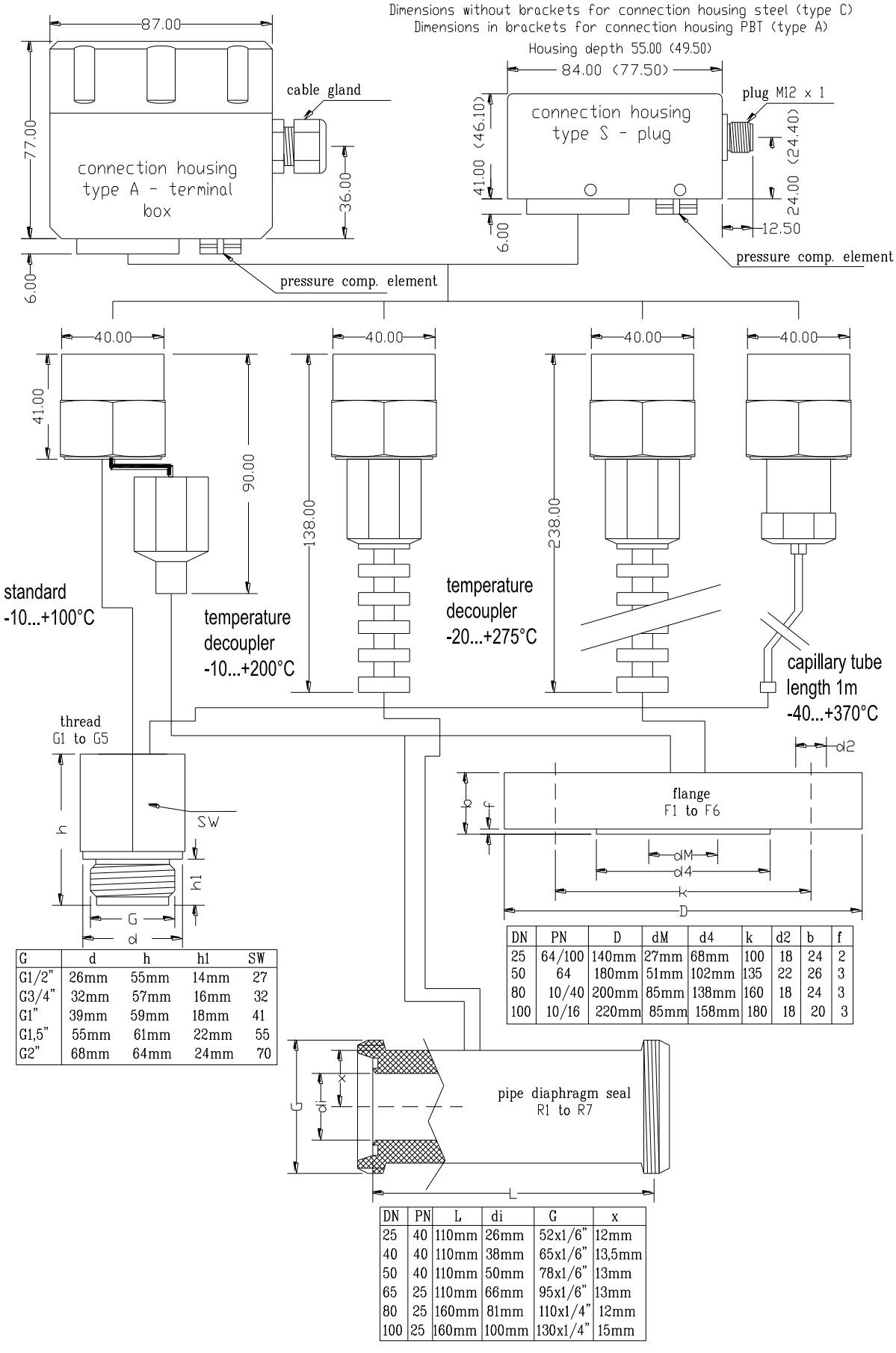
Dimension drawings Precont S70



G	d	h	h1	SW
G1/2"	26mm	55mm	14mm	27
G3/4"	32mm	57mm	16mm	32
G1"	39mm	59mm	18mm	41
G1,5"	55mm	61mm	22mm	55
G2"	68mm	64mm	24mm	70

DN	PN	D	dM	d4	k	d2	b	f
25	64/100	140mm	27mm	68mm	100	18	24	2
50	64	180mm	51mm	102mm	135	22	26	3
80	10/40	200mm	85mm	138mm	160	18	24	3
100	10/16	220mm	85mm	158mm	180	18	20	3

DN	PN	L	di	G	x
25	40	110mm	26mm	52x1/6"	12mm
40	40	110mm	38mm	65x1/6"	13,5mm
50	40	110mm	50mm	78x1/6"	13mm
65	25	110mm	66mm	95x1/6"	13mm
80	25	160mm	81mm	110x1/4"	12mm
100	25	160mm	100mm	130x1/4"	15mm

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Order code overview Precont S70

Digital pressure transmitter with **diaphragm seal for applications to 370 °C** from –1 to 400 bar

Type:

S70	Standard	
ExS70	ATEX II 1/2 G Ex ia IIC T4	
XDS70	ATEX II 1/2 D Ex iaD 20/21 T60°C/T102°C	only with material connection housing type C – CrNi-steel

Process connection:

G1	G ½“ A	ISO228-1	DIN 3852-2-A		
G2	G ¾“ A	ISO228-1	DIN 3852-2-A		
G3	G 1“ A	ISO228-1	DIN 3852-2-A		
G4	G 1½“ A	ISO228-1	DIN 3852-2-A		
G5	G 2“ A	ISO228-1	DIN 3852-2-A		
F1	Flange	DN 25, PN 64-100	DIN 2526-E		
F3	Flange	DN 50, PN 64	DIN 2526-E		
F5	Flange	DN 80, PN 10-40	DIN 2526-E		
F6	Flange	DN 100, PN 25-40	DIN 2526-E		
R1	Pipe diaphragm seal	DN 25, PN 40	DIN 11851	double sided thread	Ex variant on request
R3	Pipe diaphragm seal	DN 40, PN 40	DIN 11851	double sided thread	Ex variant on request
R4	Pipe diaphragm seal	DN 50, PN 40	DIN 11851	double sided thread	Ex variant on request
R5	Pipe diaphragm seal	DN 65, PN 25	DIN 11851	double sided thread	Ex variant on request
R6	Pipe diaphragm seal	DN 80, PN 25	DIN 11851	double sided thread	Ex variant on request
R7	Pipe diaphragm seal	DN 100, PN 25	DIN 11851	double sided thread	Ex variant on request

Process temperature:

A	Standard	-10°C to +100°C	silicone oil FS20	
B	Extended	-10°C to +200°C	food oil FD1	with temperature decoupler
C	Extended	-20°C to +275°C	silicone oil FS100	with temperature decoupler
D	Extended	-40°C to +370°C	high temperature oil FH	with capillary tube 1m

Electronic - output:

P PROFIBUS-PA

Material process connection resp. diaphragm seal membrane (medium contact):

V Steel 1.4404 / 1.4435 (AISI 316L)

Material connection housing:

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

Measuring range:

01	0...0,1 bar	13	0...40 bar	
02	0...0,2 bar	14	0...60 bar	
03	0...0,4 bar	19	0...100 bar	
04	0...0,6 bar	20	0...160 bar	
05	0...1 bar	21	0...250 bar	
06	0...1,6 bar	22	0...320 bar	
07	0...2,5 bar	23	0...400 bar	
08	0...4 bar	15	-0,1...0 bar	
09	0...6 bar	16	-1...0 bar	
10	0...10 bar	17	-1...+1 bar	
11	0...16 bar	18	-0,1...+0,1 bar	
12	0...20 bar	YY	special measuring range	separate spec. necessary

Pressure type:

R	Relative pressure	
A	Absolute pressure	not for measuring ranges ≥ 100 bar

Accuracy measuring system *) – variant measuring membrane:

2	0,2%		capacitive ceramic membrane	ranges ≤ 60 bar
0	0,1%	Linearization protocol	capacitive ceramic membrane	ranges ≤ 60 bar
4	0,5%		strain gauge metallic membrane	ranges ≥ 100 bar

Electrical connection:

S Plug M12x1

A Terminal box

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*) Higher values for special measuring range

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