

Technical manual BA1109



Filling level



Hydrocont S – Hydrocont D

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 +140 °C

Various usability, especially for hygienic applications

Humidity resistant variant for climatic extreme conditions
like high air humidity or also at condensed water formation

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
for connection to PROFIBUS-PA

ACS-CONTROL-SYSTEM
know how mit system



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Application description

The devices of the series **Hydrocont S / D** 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 +140°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.

The device variant **Hydrocont D** is especially suitable for the use in areas with high air humidity and condensed water formation, where conventional devices can not or can only be operated with a expensive installed pressure compensation capillary.

Function

The device **Hydrocont S / D** 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 +140°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 transmitted 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.

Variant differences

	Hydrocont S50	Hydrocont D50
Humidity resistant system		X
Use in explosion hazardous areas – ATEX	X	X
Measuring range limits	-1...20 bar	0,2...10 bar
Process temperature -40...+100°C	X	
Process temperature -40...+125°C – temperature decoupler	X	X
Process temperature -40...+125°C – neck tube	X	
Process temperature -10...+140°C – diaphragm seal type H	X	X

Available pressure ranges – permissible negative resp. burst pressure

	Hydrocont S50	Hydrocont D50
pressure range	negative / burst pressure in bar	negative / burst pressure in bar
-1...+1 bar	0 _{abs} / 18 _{rel}	n. a. ¹⁾
0...0,05 bar	0,7 _{abs} / 4 _{rel} 0 _{abs} / 4 _{rel} at process connection 8 / R	n. a. ¹⁾
0...0,1 bar	0,7 _{abs} / 4 _{rel} 0 _{abs} / 4 _{rel} at process connection 8 / R	n. a. ¹⁾
0...0,2 bar	0,5 _{abs} / 6 _{rel} 0 _{abs} / 4 _{rel} at process connection 8 / R	0 _{abs} / 18 _{rel}
0...0,4 bar	0 _{abs} / 6 _{rel}	0 _{abs} / 18 _{rel}
0...1 bar	0 _{abs} / 10 _{rel}	0 _{abs} / 18 _{rel}
0...2 bar	0 _{abs} / 18 _{rel}	0 _{abs} / 25 _{rel}
0...4 bar	0 _{abs} / 25 _{rel}	0 _{abs} / 40 _{rel}
0...10 bar	0 _{abs} / 40 _{rel}	0 _{abs} / 40 _{rel}
0...20 bar	0 _{abs} / 40 _{rel}	n. a. ¹⁾

¹⁾ not available (n. a.)

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 for membrane, process connection and gaskets must be chosen according to the respective application requirements (used liquid, 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.

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 (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

II 1/2 D Ex iaD 20/21 T60°C / T102°C (T57°C)

II 2 D Ex ibD 21 T102°C

II 2 D Ex ibD 21 T125°C

II 1/2 G Ex ia IIC T4

II 2 G Ex ib IIC T4

II 2 G Ex ib IIC T4

T_a liquid

-20... +60 °C

-20...+85 °C

-20...+125 °C

-20... +60 °C

-20...+85 °C

-20...+125 °C

T_a housing

-20...+85 °C (+40 °C)

-20...+85 °C

-20...+50 °C

-20...+85 °C

-20...+85 °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 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 of the filling level 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 (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 devices of the series Hydrocont S / D are free of maintenance.

Special substances can lead to solid coatings on the membrane. Such depositions can lead to faulty measuring results of the device. In the case of coat forming liquids the membrane must be regularly cleaned.

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

Repair

A repair may only be carried out by ACS.

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 for 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
Hydrocont S / D type P	9...32V DC	9...24V DC

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

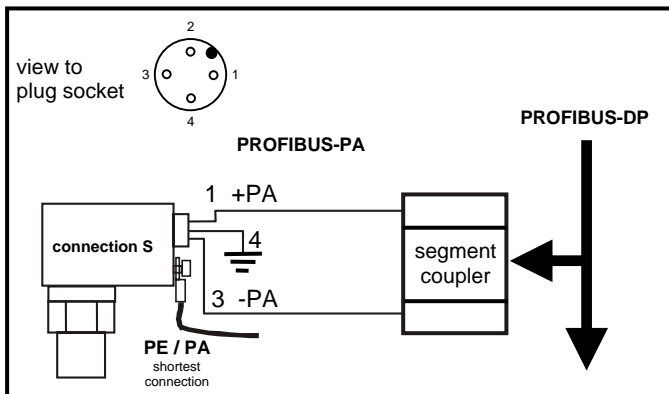
Because of the low current consumption (11mA ±1mA – Hydrocont S / 12,5mA ±1mA – Hydrocont D) up to the following device count can be powered at a bus segment installed acc. to FISCO:

Variant	not Ex	Ex ia/ib(D) IIC	Ex ib(D) IIB
Hydrocont S type P	32	9	21
Hydrocont D type P	32	8	19

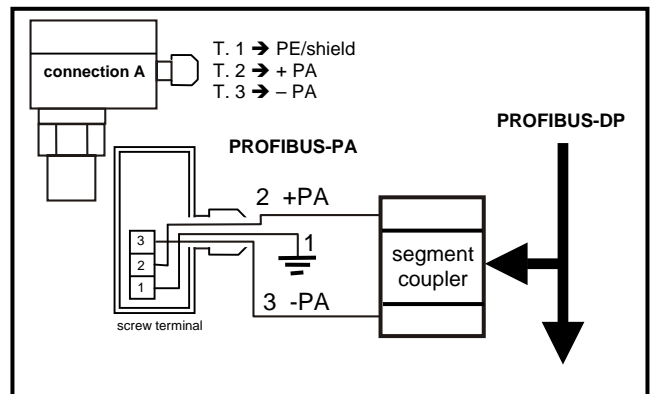
Further informations to PROFIBUS-PA can be found in the PNO directive.

Assignment

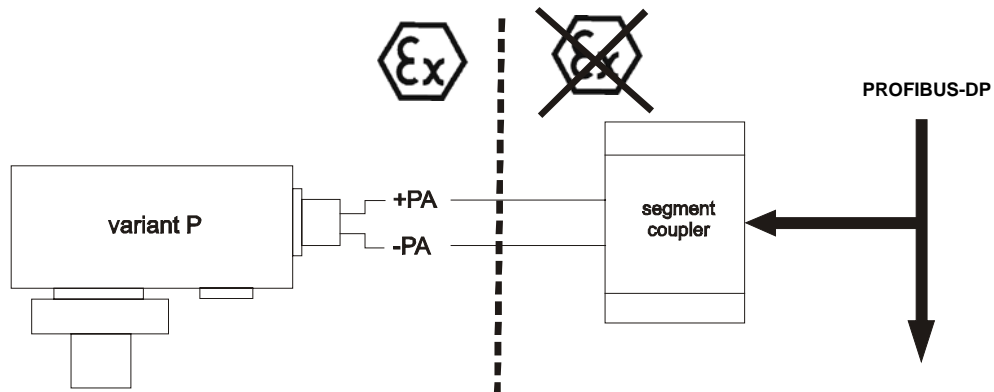
**connection type S
plug M12x1**



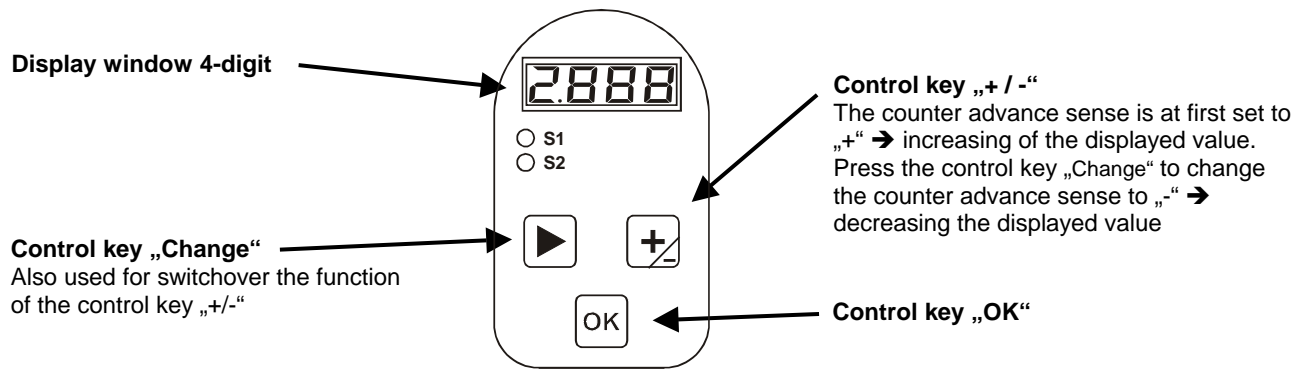
**connection type A
terminal box**



Electrical connection in an explosion hazardous area



Operation and display elements



Function modes

run mode

The filling level transmitter records the hydrostatic 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.

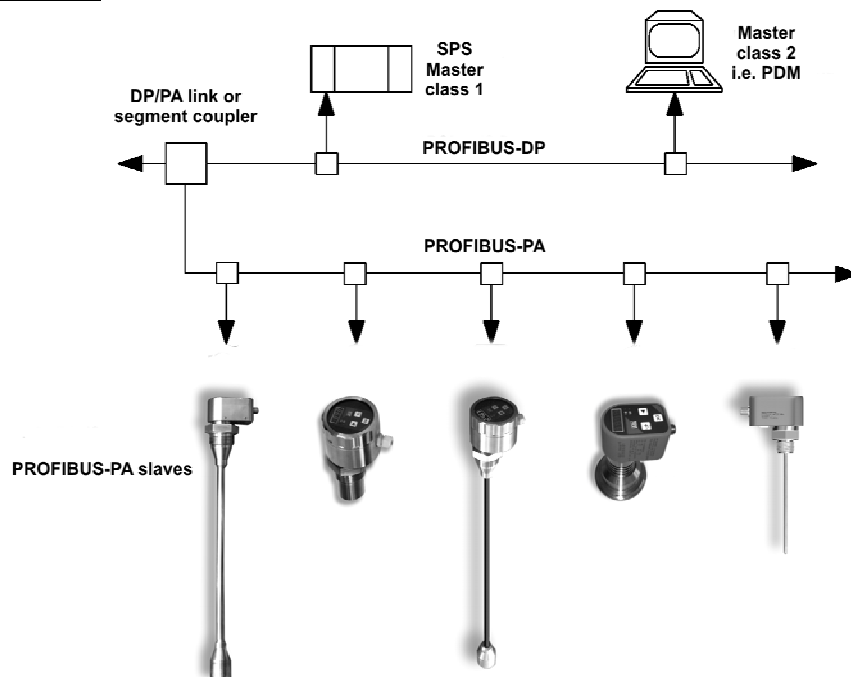
The exceeding of the frame specifications, abnormal behavior conditions or also device malfunctions are displayed by the display values $\bar{\bar{\bar{E}}}$ resp. $-\bar{\bar{\bar{E}}}$.

Programming mode

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

Function description variant P PROFIBUS-PA

System architecture



Operation

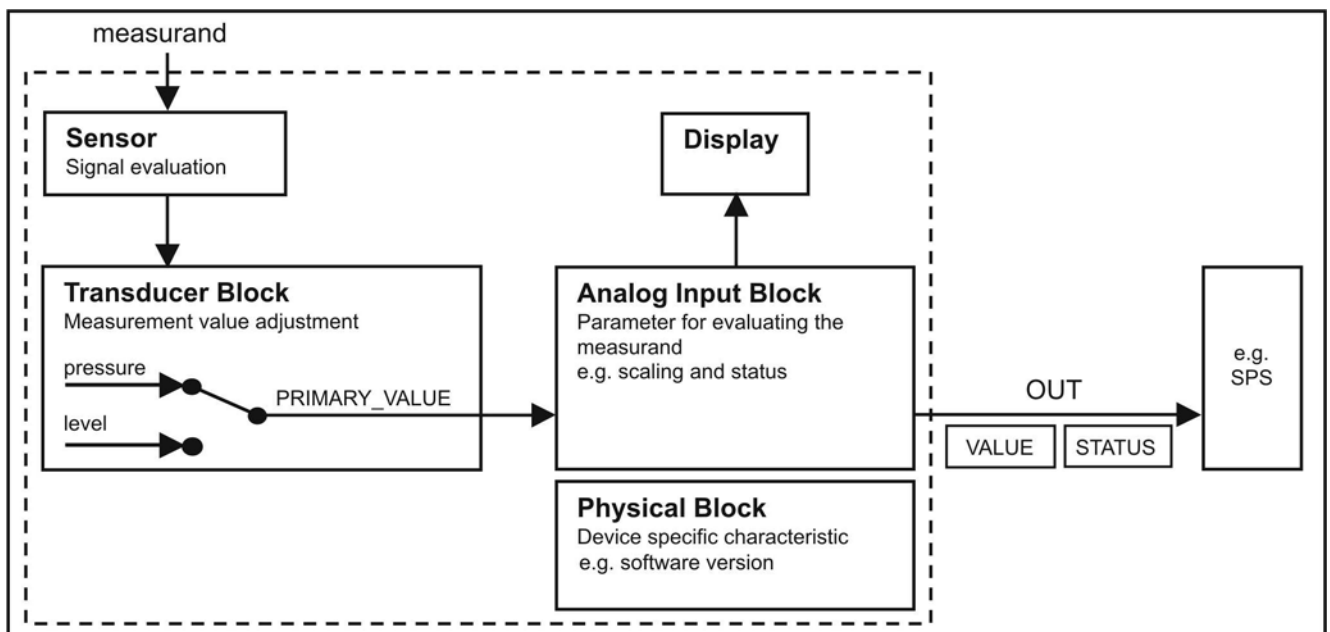
For the configuration special configuration and operation programs, offered from different manufacturers, like e.g. the operation program Simatic-PDM from Siemens, are available for the user.

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 Hydrocont S / D and the master class 1 (e.g. SPS)

Using the configuration software of your SPS you can create the cyclic data telegram.

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 → Hydrocont S / D

With the Data_Exchange service a SPS can read output data from the Hydrolog S / D 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 Hydrocont S / D → SPS

With the Data_Exchange service a SPS can read input data from the Hydrolog S / D 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 Hydrocont S / D 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

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 Hydrocont S / D 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 is 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 Hydrocont S / D 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.

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

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

Hydrocont S – Hydrocont D

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	

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:

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

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

Example

40 F0 00 00 hex = 0100 0000 1111 000 000 000 0000 binary

$$\text{Value} = (-1)^0 \times 2^{(129-127)} \times (1 + 2^{-1} + 2^{-2} + 2^{-3})$$

$$= 1 \times 2^2 \times (1 + 0,5 + 0,25 + 0,125) = 1 \times 4 \times 1,875 = 7,5$$

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 $nE \text{ t } R$ (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".

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

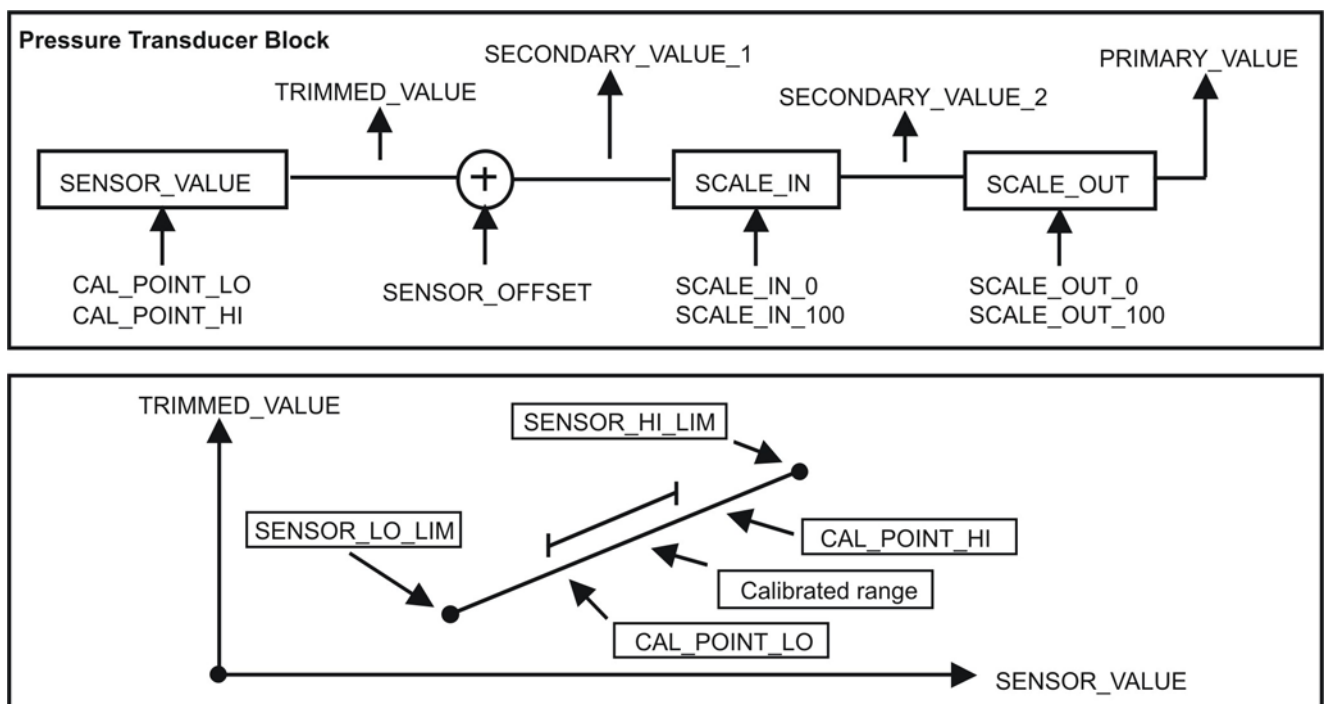
Position adjustment

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.

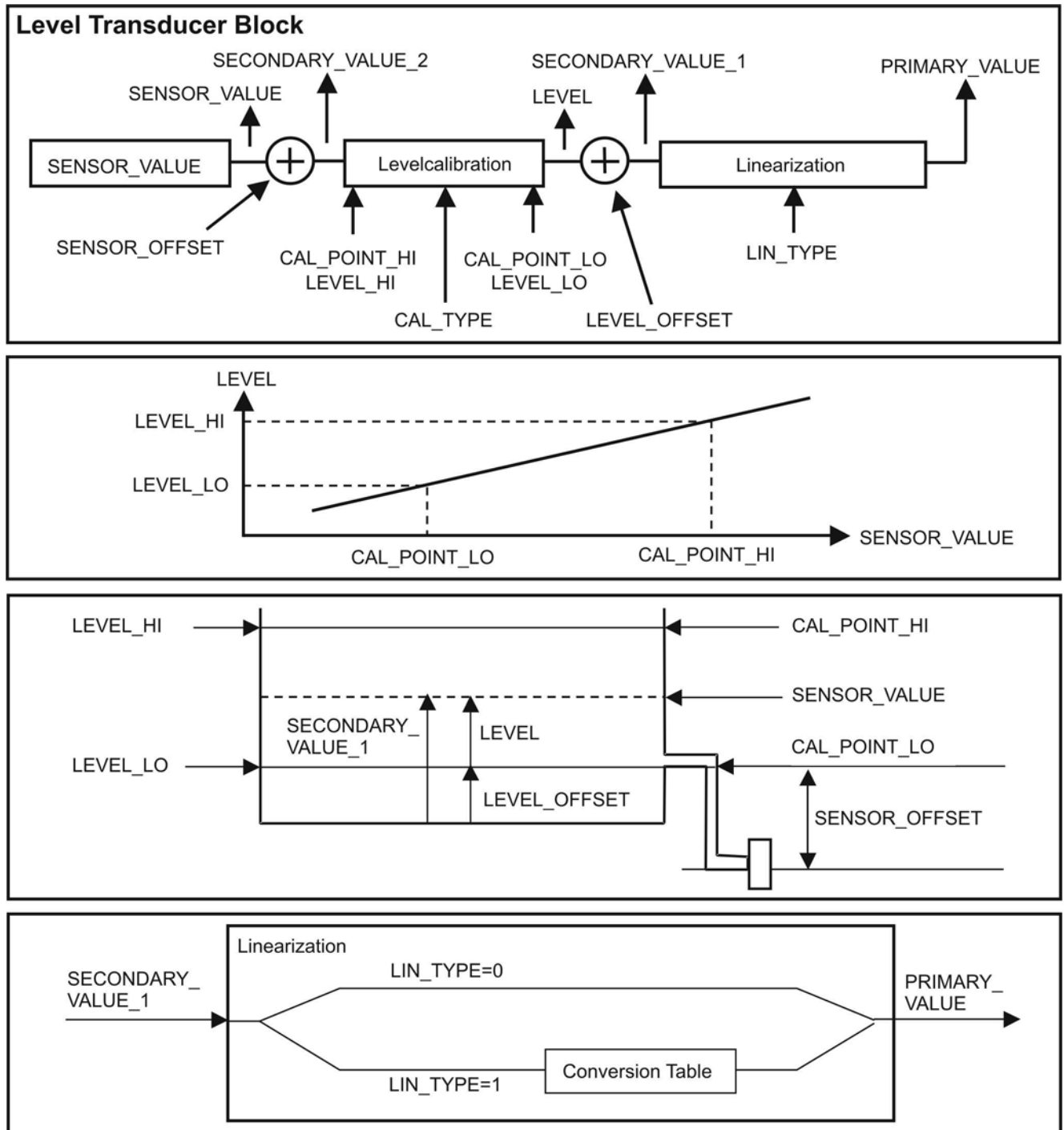
Example:

- 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: $\text{MESSWERT}_{\text{new}} = \text{MESSWERT}_{\text{old}} + \text{Sensor_Offset}$
- MESSWERT (after input for position offset) = 0.0 mbar

Pressure measurement



Filling level measurement



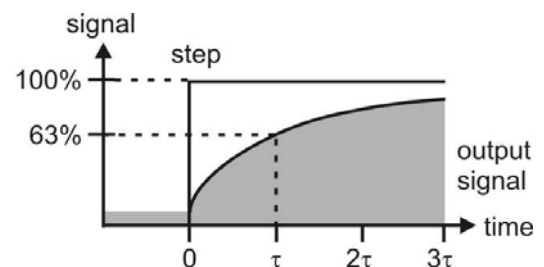
Damping

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 5τ .

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



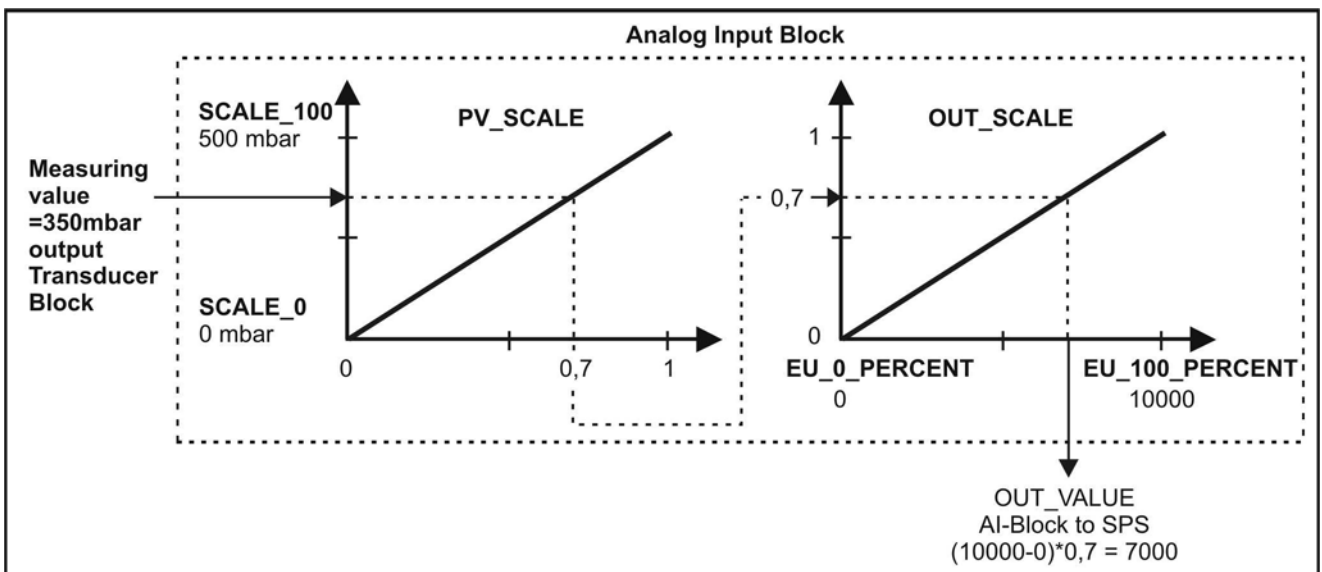
Scaling OUT Value

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.

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
Hydrocont S	Profile GSD	0x9700	PA139700.gsd
	Manufacturer specific GSD	0x0B6D	ACS_0B6D.gsd
Hydrocont D	Profile GSD	0x9700	PA139700.gsd
	Manufacturer specific 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.

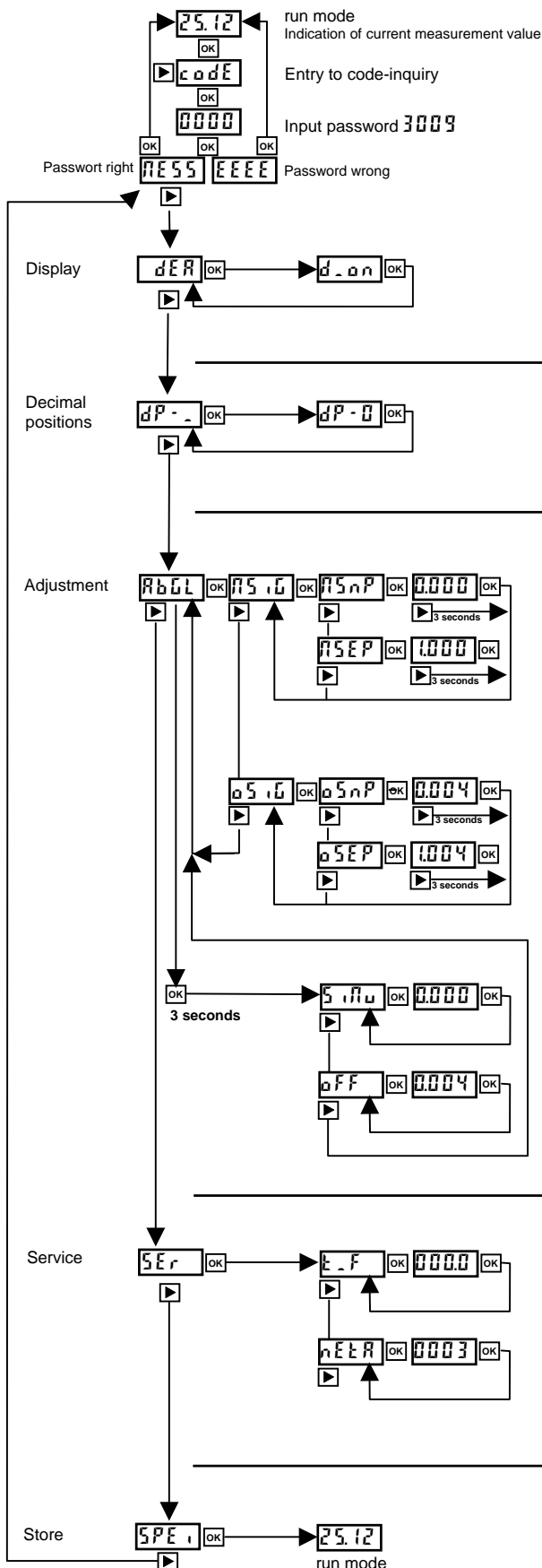
The following options are available by the parameter FSAFE_TYPE:

- *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.

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

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

Adjustment with applied signal (direct effect to Sensor_Value)

R S n P – 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.

R S E P – 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)

a S n P – 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.

a S n P – 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.

S . n u – Simulation

The set display value is transmitted (OUT_Value)
 Cancel with „OK“

a F F – 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“

n E t A – 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“

S P E . – Store

Loss protected storage of all parameters

Technical data

Auxiliary supply

Permitted supply voltage:	reverse polarity protected			
	<i>Hydrocont S</i>	9...32 V DC	Ex	9...24 V DC
	<i>Hydrocont D</i>	9...32 V DC	Ex	9...24 V DC
Ripple voltage:	$\leq 2 V_{PP}$	condition:	within the permitted supply voltage range	
Supply current:	<i>Hydrocont S</i>	11 mA \pm 1mA	acc. to IEC 61158-2, Clause 21	
	<i>Hydrocont D</i>	12,5 mA \pm 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 \leq 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:	IEC61158-2

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)} :	<i>Hydrocont S50</i>	$T_k ^{4)} \text{ Zero} \leq \pm 0,10\% \text{ FS } ^{2)} / 10 \text{ K}$ $\text{max. } \leq \pm 0,75\% \text{ FS } ^{2)} (-20...+80^\circ\text{C})$ $T_k ^{4)} \text{ Span} \leq \pm 0,10\% \text{ FS } ^{2)} / 10 \text{ K}$ $\text{max. } \leq \pm 0,5\% \text{ FS } ^{2)} (-20...+80^\circ\text{C})$ $\text{max. } \leq \pm 0,8\% \text{ FS } ^{2)} (-20...+80^\circ\text{C}) \leq 0..0,4 \text{ bar}$ besides $-20...+80^\circ\text{C}$ with factor 2 for T_k
	<i>Hydrocont D50</i>	$T_k ^{4)} \text{ Zero} \leq \pm 0,20\% \text{ FS } ^{2)} / 10 \text{ K}$ $\text{max. } \leq \pm 1,5\% \text{ FS } ^{2)} (-20...+80^\circ\text{C})$ $T_k ^{4)} \text{ Span} \leq \pm 0,20\% \text{ FS } ^{2)} / 10 \text{ K}$ $\text{max. } \leq \pm 1,0\% \text{ FS } ^{2)} (-20...+80^\circ\text{C})$ besides $-20...+80^\circ\text{C}$ 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⁾ :	<i>Hydrocont S50</i>	$\leq 0,18 \text{ mbar}$
	<i>Hydrocont D50</i>	$\leq 0,05 \text{ mbar}$

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⁾ At limit value adjustment acc. to IEC 60770

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

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

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

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

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

¹²⁾ Higher values for special measuring range

Hydrocont S – Hydrocont D

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
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 – ethylene-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

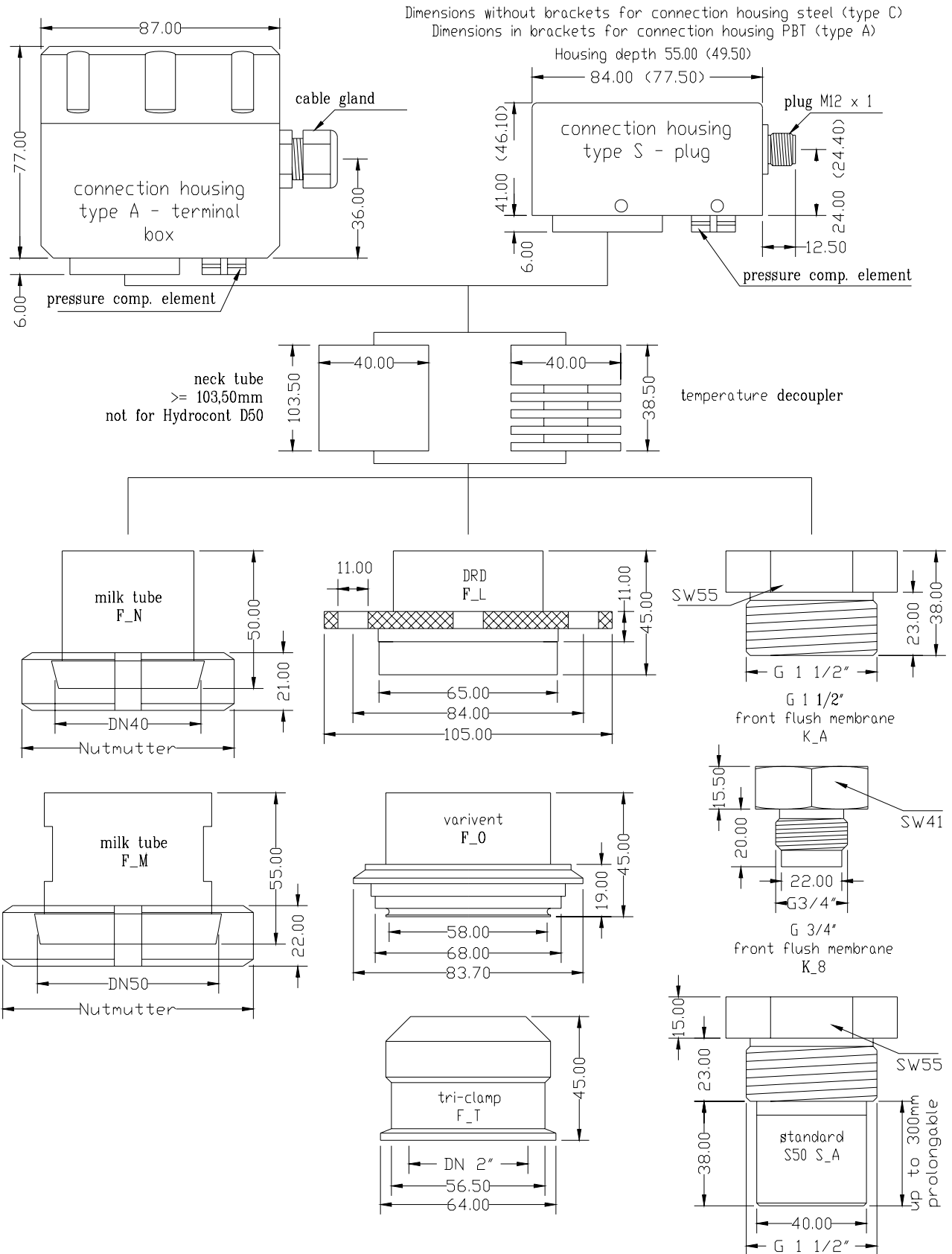
additional limitations by material	Environmental temperature range
Connection housing PBT	-25...+85°C
Connection housing PP	-10...+85°C

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

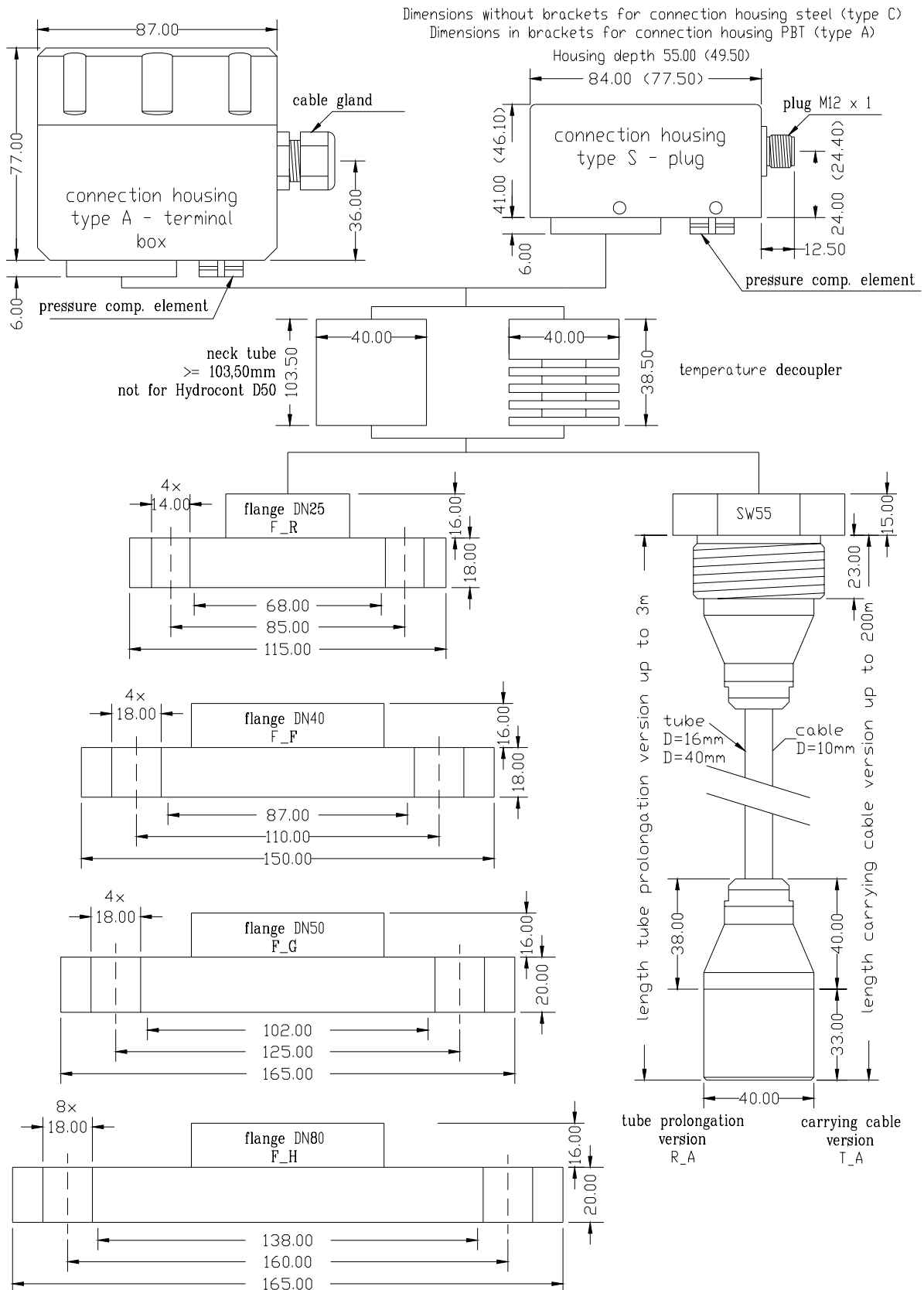
Limitations by variant	Process temperature range
Temperature decoupler / neck tube	-40...+125°C
High temperature variant	-10...+140°C
Carrying cable variant	-20...+70°C
additional limitations by material	Process temperature range
Gasket FPM	-25...+140°C
Gasket EPDM	-40...+130°C
Gasket CR	-40...+120°C
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 DIN EN 60592
Climatic classification:	4K4H DIN EN 60721-3
Vibration classification	4 g 5 - 100 Hz
EM – compatibility:	emission DIN EN 61326 operation device class B immunity DIN EN 61326 industrial range
Reference conditions:	DIN IEC 60770 T = 15...35 °C, relative humidity 45...75 %, environmental air pressure 860...1060 kPa

Dimension drawings



Dimension drawings



Order code overview Hydrocont S50

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...+140°C	Process diaphragm seal with metallic membrane, welded
Y	others on request	

Accuracy measuring system ¹⁾ – material measuring membrane (medium contact):

O	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	DIN EN ISO228-1	front flush membrane	not for variant membrane H / K	99,9%
A	G 1½" A	DIN EN 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:

P	PROFIBUS-PA
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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
D	POM – polyoxymethylene (Delrin®)	not for electrical connection type S

Electrical connection:

S	Plug M12x1
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	ethylene-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:

O	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 _ _ _ _ **P** _ _ _ _ _

¹⁾ Higher values for special measuring range

Order code overview Hydrocont D50

Digital hydrostatic filling level transmitter with **ceramic capacitive membrane** – humidity resistant
from -1...+10 bar

Type:

D50 Standard
ExD50 ATEX II 1/2 G Ex ia IIC T4
XDD50 ATEX II 1/2 D Ex iaD 20/21 T60°C/T102°C

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...+140°C diaphragm seal with metallic membrane, welded
Y others on request

Accuracy measuring system ¹⁾ – material measuring membrane (medium contact):

O	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	DIN EN ISO228-1	front flush membrane	not for variant membrane H / K	99,9%
A	G 1½" A	DIN EN 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:

P PROFIBUS-PA

Measuring range:

0	0...0,2 bar	3	0...2 bar
1	0...0,4 bar	4	0...4 bar
2	0...1 bar	5	0...10 bar
		Y	special measuring range separate spec. necessary

Material connection housing:

C CrNi-steel

Electrical connection:

S Plug M12x1
A Terminal box

Process temperature / material process connection (medium contact):

2 -40°C...+125°C temperature decoupler 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	ethylene-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:

O No prolongation
E Carrying cable FEP -20...+70°C
A Carrying cable PE -20...+70°C
C Tube Ø 40mm
D Tube Ø 16mm
Y others on request

Probe length incl. process connection: measure in mm

Hydrocont _ _ _ _ P _ C _ _ _ _

¹⁾ Higher values for special measuring range