Operating Instructions Edition 12/2003

sitrans p

DS III PA-SERIES

Transmitter for pressure, differential pressure and flow, filling level, absolute pressure from differential pressure
7MF4*34-...

SIEMENS

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SITRANS P, DS III PA series
7MF4*34-...

Edition 12/2003

Operating Instructions

Transmitters for Pressure, Differential Pressure and Flow, Filling Level
Absolute pressure from differential pressure series and absolute pressure from pressure series, DS III series with PROFIBUS-PA

Edition of operating manual	Firmware identification License plate	System integration	Installation path PDM
02	FW: 300.01.03 FW: 300.01.04 FW: 300.01.05 FW: 300.01.06	PDM V.5.02 + SP1; Dev. R.1/2	SITRANS P DSIII
03	FW: 300.01.07	PDM V.5.02 + SP1; Dev. R.1/2	SITRANS P DSIII
04	FW: 300.01.07	PDM V.5.02 + SP1; Dev. R.1/2	SITRANS P DSIII

Table 1 History of this instruction manual

Table of contents

Classification of safety–related notices

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:

DANGER

indicates an immenently hazardous situation which, if not avoided, **will** result in death or serious inury.

WARNING

iindicates a potentially hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION

used with the safety alert symbol indicates a potentially hazardous situation which, if not avoided, **may** result in minor or moderate injury.

CAUTION

used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE

indicates a potential situation which, if not avoided, may result in an undesirable result or state.

NOTE

ihighlights important information on the product, using the product, or part of the documentation that is of particular importance and that will be of benefit to the user.

Siemens AG
Bereich Automatisierungs- und Antriebstechnik
Geschäftsgebiet Process Instrumentation
D-76181 Karlsruhe

General notes

This device has left the factory in a perfect condition as regards safety. The notes and warnings in these Operating Instructions must be observed by the user if this state is to be maintained and hazard-free operation of the device assured.

NOTE

Dear customer,

You have purchased a modular device in which you can exchange the electronics. In the event of an exchange, please observe the instructions enclosed with the component to be exchanged.

For reasons of clarity the manual does not contain detailed information about all types of products and cannot take into account every conceivable case of installation, operation or maintenance.

If you require further information or should problems occur which are not sufficiently explained in the manual, you can consult your local Siemens branch to obtain the necessary information.

May we also draw your attention to the fact that the contents of the manual are not part of a previous or existing agreement, approval or legal relationship or an amendment thereof. All obligations of the Siemens AG result from the contract of purchase which also contains the full and solely valid warranty agreement. These contractual warranty conditions are neither extended nor restricted by the contents of the manual.

The contents reflect the technical state at the time of going to print. Subject to technical modifications in the course of further development.

WARNING

Explosion-proof devices may only be opened when the power is off.

Intrinsically safe devices lose their license as soon as they are operated on circuits which do not meet the test requirements valid in your country.

The device may be operated with high pressure and corrosive and dangerous media. Therefore serious injuries and/or considerable material damage cannot be ruled out in the event of improper handling of the device.

The perfect and safe operation of this equipment is conditional upon proper transport, proper storage, installation and assembly as well as on careful operation and commissioning.

The equipment may only be used for the purposes specified in the instruction manual.

Excluded Liability

The user is responsible for all changes made on the device, provided that these are not explicitly mentioned in the instruction manual.

Qualified Personnel

are persons familiar with the installation, assembly, commisioning and operation of the product and who have the appropriate qualifications for their activities such as:

- training or instruction or authorization to operate and maintain devices/systems according to the standard of safety technology for elecrical circuits, high pressures and corrosive as well as hazardous media.
- for devices with explosion protection: training or instruction or authorization to be allowed to work on electrical circuits for potentially explosive systems.
- training or instruction according to the standards of safety engineering in the care and use of suitable safety equipment.

CAUTION

Modules which are sensitive to electrostatic charge may be destroyed by voltages which are far below the human level of perception. These voltages occur already when you touch a component or electrical connections of a module without first discharging yourself electrostatically. The damage incurred by a module as a result of an overvoltage is not usually immediately perceptible but only becomes noticeable after a long time in operation. Therefore, a suitable equipotential bonding must be guaranteed when repairing the device.

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Technical description 1

NOTE

The transmitter must warm up for about 5 minutes after switching on the power in order to obtain stable measured values.

1.1 Application range

The SITRANS P, Series DS III PA transmitter measures the pressure of non-corrosive and corrosive as well as critical gases, vapors and liquids. You can use it in the following applications

- Pressure
- Differential pressure
- Level
- Volume
- Volume flow
- Mass flow rate

The transmitters are available with different designs of pressure-transmitting seals for special applications, e.g. measuring highly viscous substances.

The device can be operated as a stand-alone unit or using its PROFIBUS interface.

1.2 Product features

- Transmitter with bus connection according to IEC 61158-2 and EN 50170
- Transmitter designs with intrinsic safety against explosion can be installed in

areas where there is an explosion hazard.
- The certificate of conformity meets the European rules (CENELEC).
- Data transmission and auxiliary power (9 to 32 V) via bus connection together
- Bus connection independent of polarity and fixed bus current limiting in the event of an error
- Contact separation (test voltage 500 V AC)
- Intrinsically-safe and flameproof version for use in explosion protected area (Ex-area)
- Can communicate through PROFIBUS-PA (profile version 3.0, Class B);
- The transmitter can be parameterized locally using three buttons or externally via SIMATIC PDM.

1.3 Measuring type

1.3.1 Pressure

This version of the device measures the pressure of non-corrosive and corrosive as well as critical gases, vapors and liquids. Can be operated with measuring cells from 1 to 400 bar.

1.3.2 Differential pressure and flow

This version of the device is used to measure

- the differential pressure, e.g. the active pressure,
- of a small positive or negative excess pressure,
- of the flow q ~ $\sqrt{\Delta p}$ (together with a flow control valve)

non-corrosive and corrosive and ciritical gases, vapors and liquids. Can be operated with measuring cells from 20 mbar to 30 bar

1.3.3 Filling level

This version of the device with mounting flange measures the filling level of non-corrosive and corrosive as well as critical liquids in open and closed containers. Can be operated with measuring cells from 250 mbar to 5 bar The nominal width of the mounting flange is DN 80 or DN 100 or 3 or 4 inch.

In the filling level measurement on an open container the low pressure connection of the measuring cell remains open (measurement "compared to atmospheric"), in the measurement on a closed container this connection is usually connected to the vessel to compensate the static pressure.

The wetted parts are made of different materials (see chapter 9, pg. 103) according to the required corrosion resistance.

1.3.4 Absolute pressure

This version of the device measures the absolute pressure of non-corrosive and corrosive as well as critical gases, vapors and liquids.

There are two series: one “differential pressure” series and one “pressure” series. The “differential pressure series” is characterized by a high overload capacity.

Can be operated with measuring cells from 250 mbar to 30 bar

1.4 Design and functional principle

1.4.1 Design

The device consists of different components depending on what the customer has specified in the order. The possible variants are listed in chapter 12, pg. 123.

The rating plate (Figure 1, pg. 13 and Figure 4, pg. 15) with the order number is on the side of the housing. You can determine the optional constructional details and the possible measuring range (physical properties of the built-in sensor element) with the specified number and specifications in chapter 12, pg. 123.

1 Order number
2 Serial number

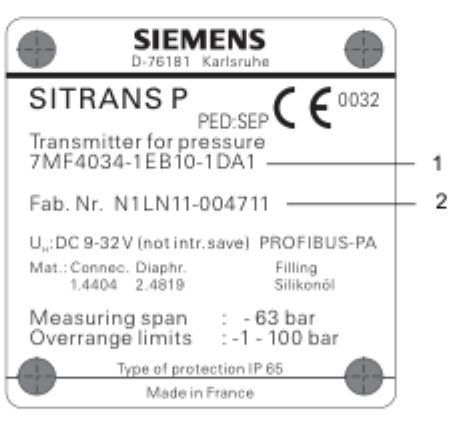


Figure 1 Example for a rating plate

Opposite it is the license plate (Figure 2, pg. 14 and Figure 4, pg. 15). This contains information about the hardware and firmware versions among other thing.

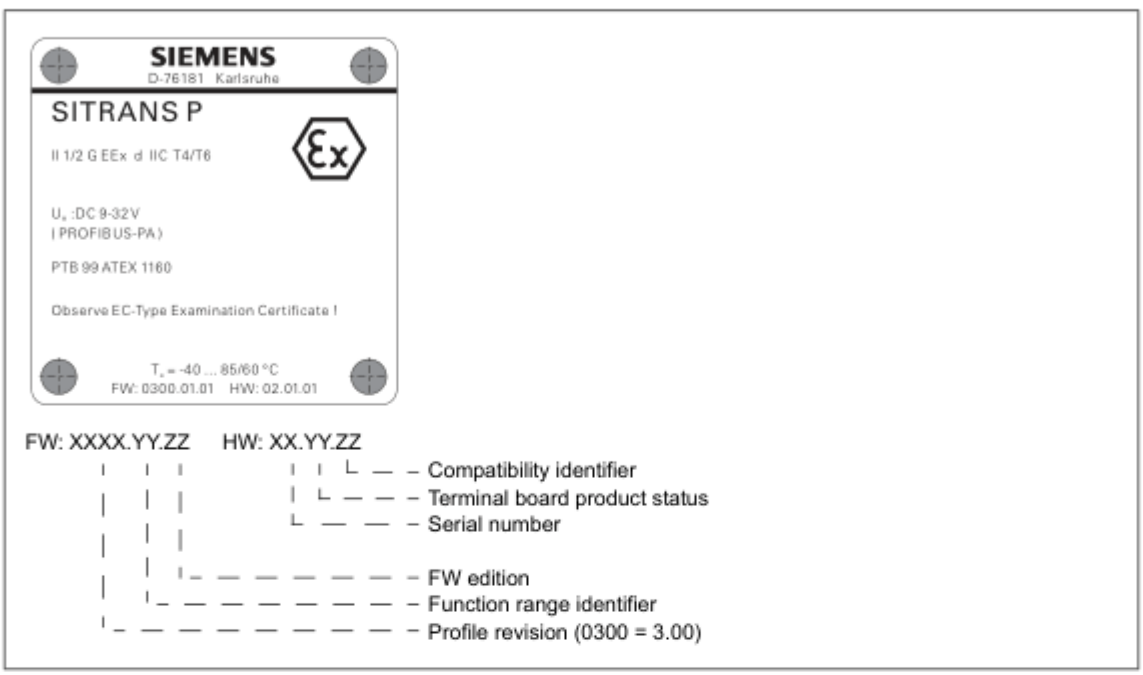


Figure 2 Example of approval plate

The electronics housing is made of diecast aluminum or stainless steel precision casting. There is an unscrewable, round cover on the front and rear. The front cover (4, Figure 3, pg. 15) can be designed as a window in order to be able to read measured values directly from the digital display. The inlet (2, Figure 3, pg. 15) to the electrical connection box is located on the side, either left or right. The opening which is not used is sealed by a blanking plug (e.g. 5, Figure 4, pg. 15). The PE conductor terminal (2, Figure 4, pg. 15) is mounted at the front of the housing.

The electrical connection box is accessible for power supply and screen when the rear cover (1, Figure 4, pg. 15) is removed. The bottom part of the housing contains the measuring cell with process connection (8, Figure 3, pg. 15). This is secured turning by a locking screw (7, Figure 3, pg. 15). The modular concept of the SITRANS P, Series DS III PA allows the measuring cell and electronics to be exchanged as required.

At the top of the housing you can see a plastic cover (3, Figure 3, pg. 15) which can be opened. The input keyboard is beneath this.

1 Rating plate
2 Inlet with cable gland
3 Plastic access cover to the input keys
4 Screwable cover, optional with window
5 Digital display
6 Measuring point plate
7 Locking screw
8 Process connection

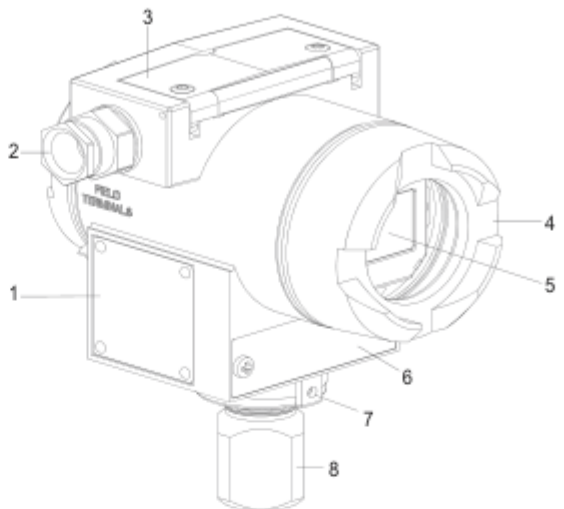


Figure 3 Front view of device SITRANS P, Series DS III PA, pressure series

1 Unscrewable cover for access to electrical connection box
2 PE conductor connection
3 Alternative measuring point plate
4 License plate
5 Blanking plug

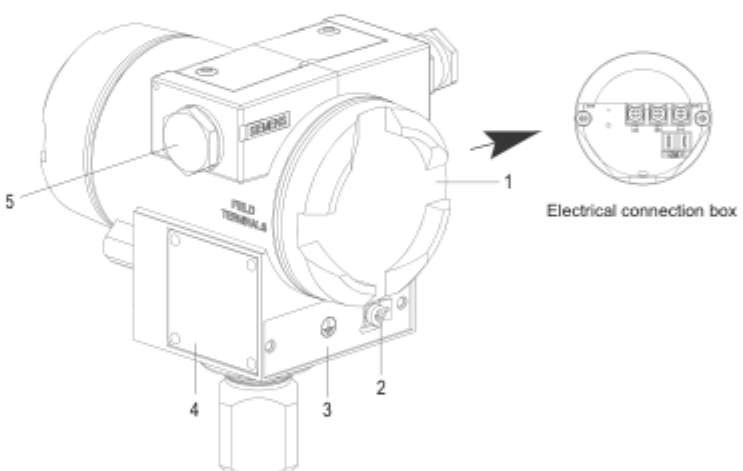


Figure 4 Rear view of device SITRANS P, Series DS III PA, pressure series

1.4.2 Mode of operation

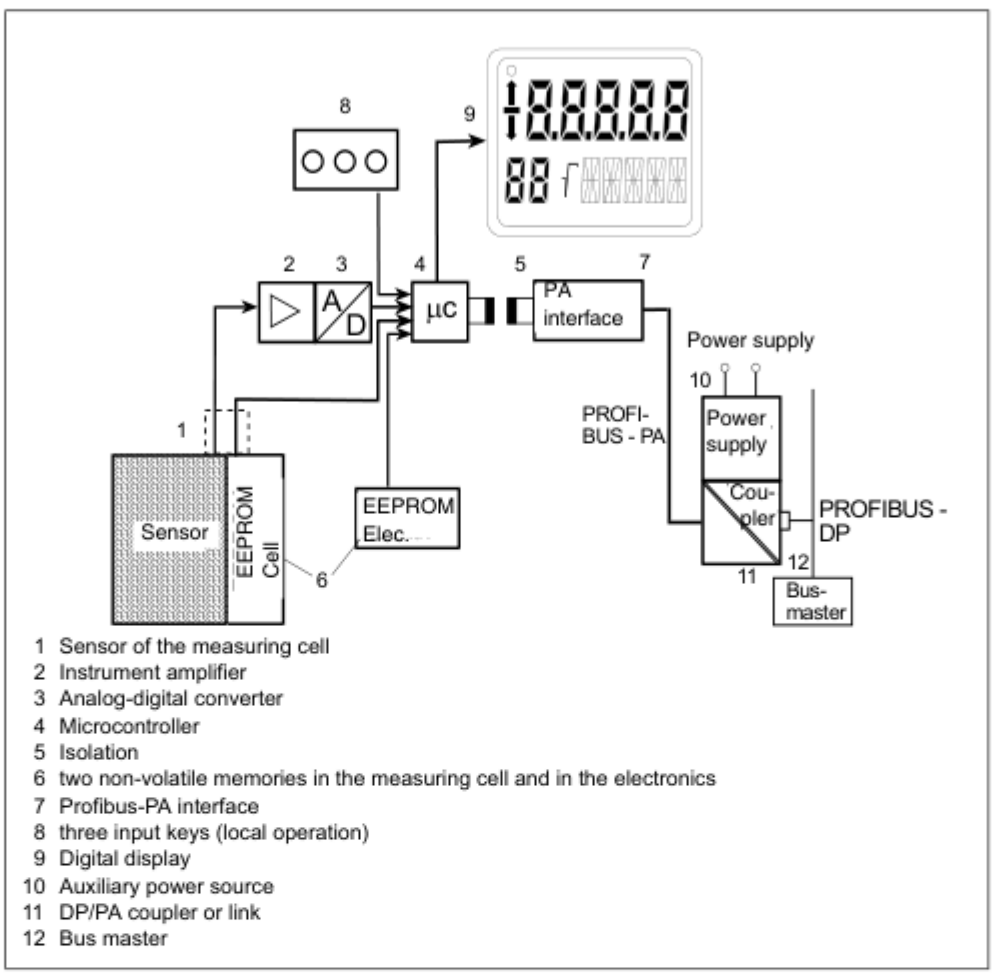
This chapter describes how the transmitter operates and what protection and safety measures you need to observe. First of all the electronics are described on a Funktionsplanebene (functional level), then the sensors used for the individual measuring modes in the various versions of the device.

The process variable to be measured is referred to generally in the following sections as the input variable.

1.4.2.1 Mode of operation of the electronics

The input variable provided by the sensor (1, Figure 5) is amplified by an instrument amplifier (2) and converted into a digital signal via an analog-digital converter (3). This is evaluated in a microprocessor (4), its linearity and temperature behavior corrected and made available using the isolated interface (5) on the PROFIBUS-PA (7). The measuring cell-specific data of the electronics and the data for transmitter parameterization are stored in two non-volatile memories (6).

You can parameterize the transmitter directly at the measuring point with the three input keys (8) and view measuring results, error messages and modes of operation on the digital display (9), which is securely screwed onto the device. You can get the measuring results with status values and diagnosis using the PROFIBUS-PA's cyclical data transmission (see chapter 3.1, pg. 33). Using the acyclical data transmission (see chapter 3.2, pg. 41), you carry out the parameterization and can view all results and error messages. To do this, you require a tool, for example the SIMATIC PDM.



1 Sensor of the measuring cell
2 Instrument amplifier
3 Analog-digital converter
4 Microcontroller
5 Isolation
6 two non-volatile memories in the measuring cell and in the electronics
7 Profibus-PA interface
8 three input keys (local operation)
9 Digital display
10 Auxiliary power source
11 DP/PA coupler or link
12 Bus master

Figure 5 Transmitter SITRANS P, Series DS III PA, electronics

1.4.2.2 Pressure

The pressure p_e is fed in through the process connection (3, Figure 6, pg. 18) of the measuring cell (2). It is passed further through the seal diaphragm (4) and the filling liquid (5) to the silicon pressure sensor (6) and its measuring diaphragm flexes as a result. Four piezo-resistors in bridge circuit doped in the measuring diaphragm change their resistance as a result. The change in resistance causes a bridge output voltage proportional to the input pressure.
The transmitters with measuring spans ≤ 63 bar measure the input pressure compared with atmospheric, those with measuring spans ≥ 160 bar compared with a vaccum.

CAUTION

If the measuring signal fails due to a sensor break, the isolating diaphragms may also be destroyed. In this case,process medium may leak from the threaded collar of the device in pressure transmitters with relative pressure cell (≤ 63 bar).

1 Reference pressure
2 Measuring cell
3 Process connection
4 Seal diaphragm
5 Filling liquid
6 Silicon pressure sensor
p_e Input variable pressure

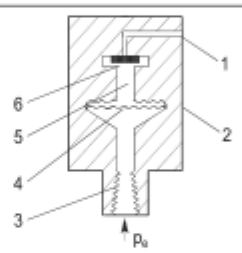


Figure 6 Pressure measuring cell, functional diagram

1.4.2.3 Differential pressure and flow

The differential pressure is transmitted via the seal diaphragms (7, Figure 7, pg. 19) and the filling liquid to the silicon pressure sensor (5). On exceeding the measuring limits, the overload diaphragm (6) flexes until one of the seal diaphragms (7) comes into contact with the body of the measuring cell (4) and protects the silicon pressure sensor (5) against overloading. The seal diaphragm is deflected by the resulting differential pressure. Four piezo-resistors in bridge circuit doped in the measuring diaphragm change their resistance as a result. The change in resistance causes a bridge output voltage proportional to the differential pressure.

1 Input pressure P_+
2 Process flange
3 O-ring
4 Body of the measuring cell
5 Silicon pressure sensor
6 Overload diaphragm
7 Seal diaphragm
8 Filling liquid
9 Input pressure P_-

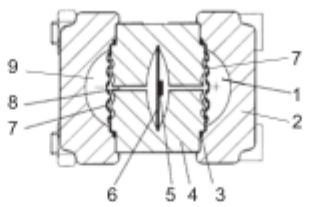


Figure 7 Measuring cell for differential pressure and flow, functional diagram

1.4.2.4 Filling level

The input pressure (hydrostatic pressure) acts through the seal diaphragm (10, Figure 8, pg. 19) at the mounting flange hydraulically on the measuring cell. The differential pressure applied at the measuring cell is transmitted via the seal diaphragms (6) and the filling liquid (7) to the silicon pressure sensor (3). On exceeding the measuring limits, the overload diaphragm (5) is deflected until one of the seal diaphragms (6) comes into contact with the body of the measuring cell (4) and protects the silicon pressure sensor (3) against overloading. The measuring diaphragm is flexed by the differential pressure. Four piezo-resistors in bridge circuit doped in the measuring diaphragm change their resistance as a result. The change in resistance causes a bridge output voltage proportional to the differential pressure.

1 Process flange
2 O-ring
3 Silicon pressure sensor
4 Body of the measuring cell
5 Overload diaphragm
6 Seal diaphragm at the measuring cell
7 Filling liquid of the measuring cell
8 Capillary tube with filling liquid of the mounting flange
9 Flange with tube
10 Seal diaphragm at the mounting flange

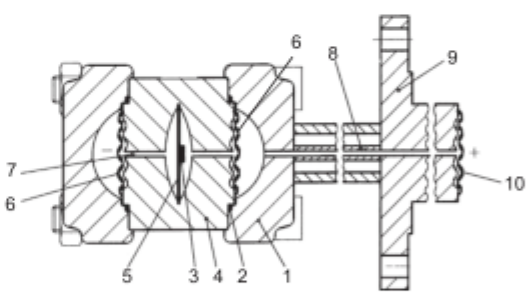


Figure 8 Measuring cell for filling level, functional diagram

1.4.2.5 Absolute pressure from the differential pressure series

The absolute pressure is transmitted via the seal diaphragm (6, Figure 9, pg. 20) and the filling liquid (7) to the silicon pressure sensor (3). On exceeding the measuring limits, the overload diaphragm (5) is deflected until the seal diaphragm (6) comes into contact with the body of the measuring cell (4) and protects the silicon pressure sensor (3) against overloading. The pressure difference between the input pressure (p_e) and the reference pressure (8) on the low pressure side of the measuring cell flexes the measuring diaphragm. Four piezo-resistors in bridge circuit doped in the measuring diaphragm change their resistance as a result. The change in resistance causes a bridge output voltage proportional to the absolute pressure.

1 Process flange
2 Seal diaphragm at the measuring cell
3 O-ring
4 Body of the measuring cell
5 Silicon pressure sensor
6 Overload diaphragm
7 Filling liquid of the measuring cell
8 Reference pressure
p_e Input variable pressure

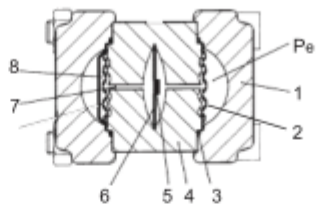


Figure 9 Measuring cell for absolute pressure, functional diagram

1.4.2.6 Absolute pressure from the pressure series

The pressure is transmitted via the seal diaphragm (3, Figure 10, pg. 20) and the filling liquid (4) to the absolute pressure sensor (5) and flexes its measuring diaphragm. Four piezo-resistors in bridge circuit doped in the measuring diaphragm change their resistance as a result. The change in resistance causes a bridge output voltage proportional to the input pressure.

1 Measuring cell
2 Pressure connection
3 Seal diaphragm
4 Oil filling
5 Absolute pressure sensor
p_e Input variable pressure

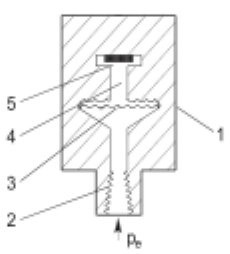


Figure 10 Measuring cell for absolute pressure from pressure series, functional diagram

Communication structure for PROFIBUS PA

2

This chapter describes the mode of operation of the device-specific function blocks with the aid of a graphic block model, which is broken up sequentially into its individual levels. Knowledge of the physical block is assumed: Therefore it is not described in this chapter.

2.1 Block model for recording and processing measured values

The functions of the device are divided into blocks for different areas or responsibility (Figure 11). They can be parameterized by acyclic data transfer (see chapter 3.2, pg. 41).

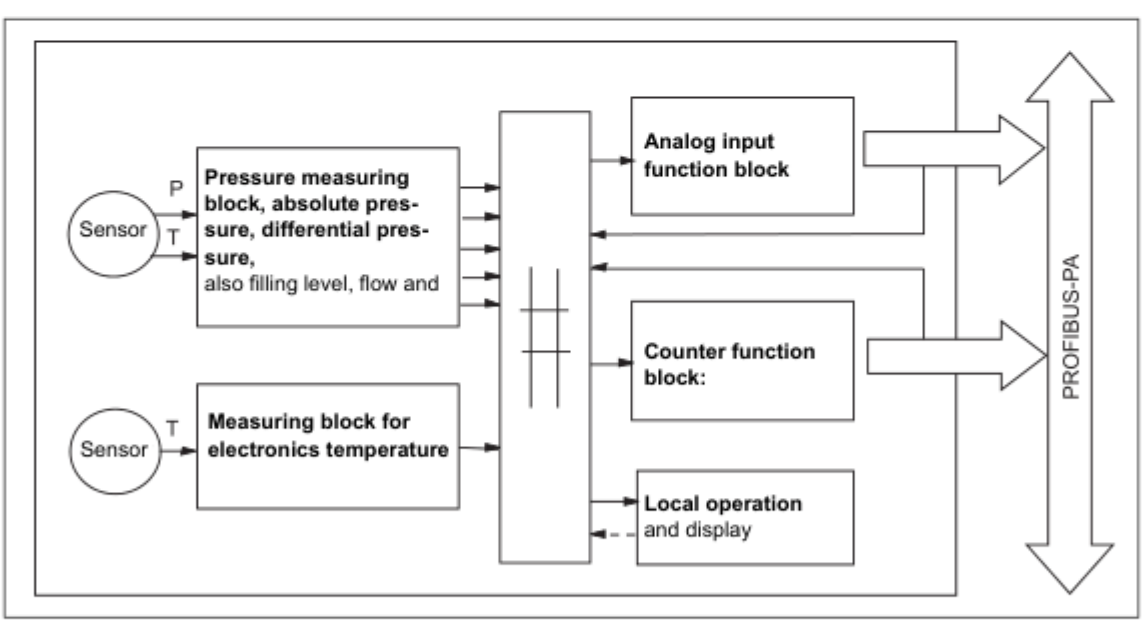


Figure 11 Block connection diagram for recording and processing measured values

2.1.1 Pressure measuring block

The pressure measuring block (Figure 11) carries out adjustments to the sensor. Its initial value is the linearized and temperature-compensated measuring result. For measurement of the filling level and flow, the required conversions take place here. An example is the conversion of an input pressure into level or volume for hydrostatic filling level measurement.

The pressure sensor temperature measurement is also processed here and the pressure and temperature limits are constantly monitored.

2.1.2 Electronics temperature measuring block

The electronics temperature measuring block (Figure 11) carries out the required temperature measurement functions and monitors the permitted temperature limits.

2.1.3 Analog input function block

In the analog input function block (Figure 11), the selected measured value is processed further and is adjusted to the automation task.

Example: For a flow measurement, the volume flow needs to be converted into the number of containers filled. The output of this block supplies the measured value and the associated status information to the PROFIBUS.

2.1.4 Counter function block

For flow measurement, the volume or mass which has flowed through can be totalled in the counter function block (Figure 11). Its function, therefore, is very similar to that of a water clock. The output of this block supplies the total values and the associated status information to the PROFIBUS.

2.1.5 Local operation and display

With local operation (Figure 11), the desired measured value can be set and displayed with its physical unit.

2.1.6 Connection between the blocks using parameters

The output values of the pressure and electronics temperature measuring blocks can be fed into the analog input and counter function blocks as input values for further processing. For this, the parameter “Channel” must be set accordingly in the relevant function block.

Measuring block	Output value (Parameter)	Usable in analog input function block	Usable in counter function block
Pressure	Temperature	X	
	Secondary variable 1	X	
	Secondary variable 2	X	
	Primary variable	X	X
	Secondary variable 3	X	X
Electronics temperature	Electronics temperature	X	

Table 2 Connection between the blocks

2.1.7 Parameters for measured value display

The values of the following parameters from the measuring and function blocks can be presented on the digital display. For this, the parameter “Source for the display” must be set accordingly (see chapter 4.2.6, pg. 49).

Block	Parameter	Can be presented on the digital display
Pressure measuring block	Temperature	X
	Secondary variable 1	X
	Secondary variable 2	
	Primary variable	X
	Secondary variable 3	X
	Non-linearized pressure value	X
Electronics temperature measuring block	Electronics temperature	X
Analog input function block	Output	X
Counter function block:	Counter output	X

Table 3 Display on the digital display

2.2 Description of individual blocks

2.2.1 Pressure measuring block (Transducer Block 1)

Figure 12 shows the signal flow of measured values from the measuring cell through the pressure measuring block (which also processes filling level, flow and sensor temperature) into the respective output values (temperature, measured value (primary variable) etc.). The parameters of the individual functions (measuring range, output range etc.) can be changed via acyclic access.

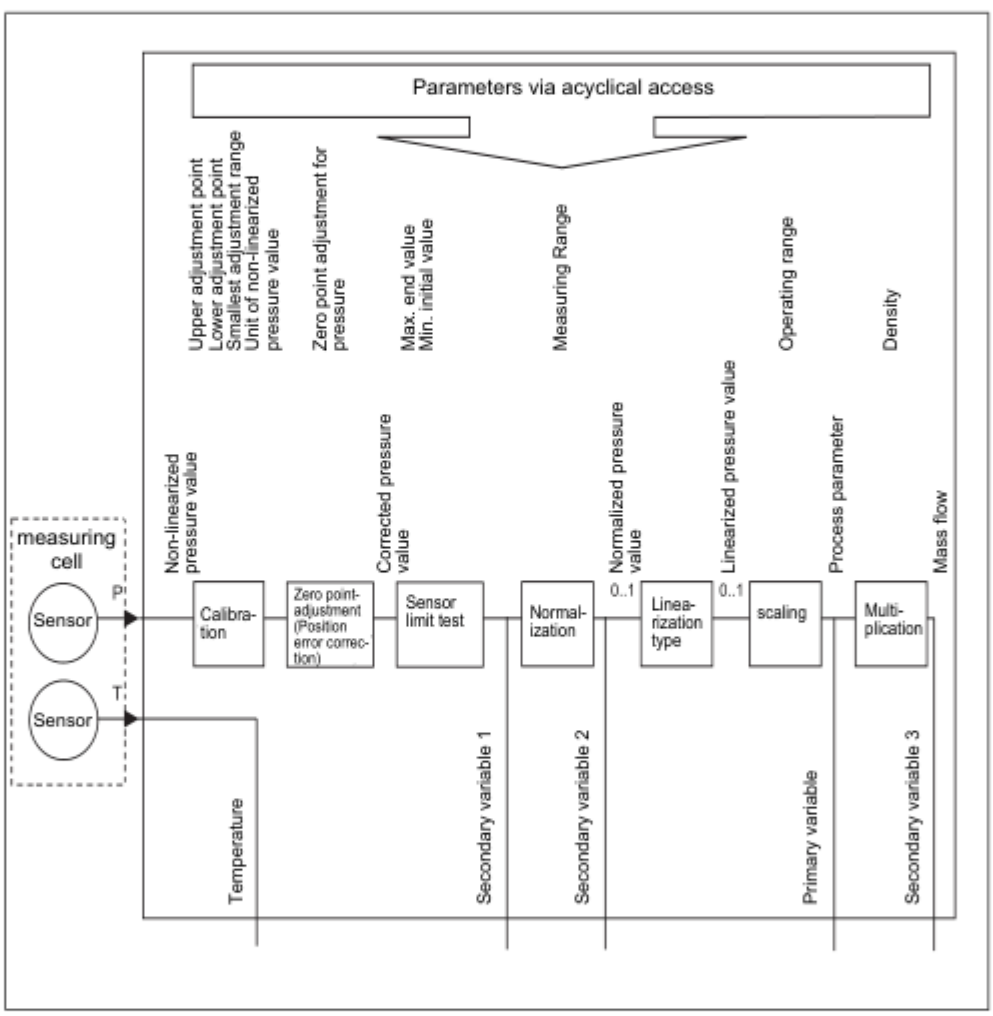


Figure 12 Pressure measuring block function groups

Functioning mode

The **non-linearized pressure value** first of all passes through an **adjustment**. The resulting **corrected pressure value** is checked for its **sensor limits**. If the limits are

exceeded, this results in a “Bad” status and the error message “Error in recording measured value”. The corrected pressure value is stored in **Secondary variables 1**.

Next, it undergoes **normalization**, whereby the input signal is mapped onto the range 0 to 1 (percent/100). The **normalized pressure value** is stored in **Secondary variables 2**.

After this – depending on the measuring task – it goes through one of four **types of linearization** (see following chapter). The **scaling** maps the normalized and linearized measured value (pressure, level, volume or volume flow) onto the actual process value using the specification of the **operating range**. This is stored in measured values (**Primary variables)**.

By **multiplying** by the **density**, for a volume flow, the **mass flow** can be calculated It is stored in **Secondary variables 3**.

The **pressure sensor temperature value** is available in the **"Temperature"** parameter.

2.2.1.1 Type of linearization function group

The **normalised pressure** is passed through **linearization algorithms**, which are presented in Table 4, to adjust it to the relevant process requirements. The algorithm is changed using the **"Characteristic curve type"** parameter.

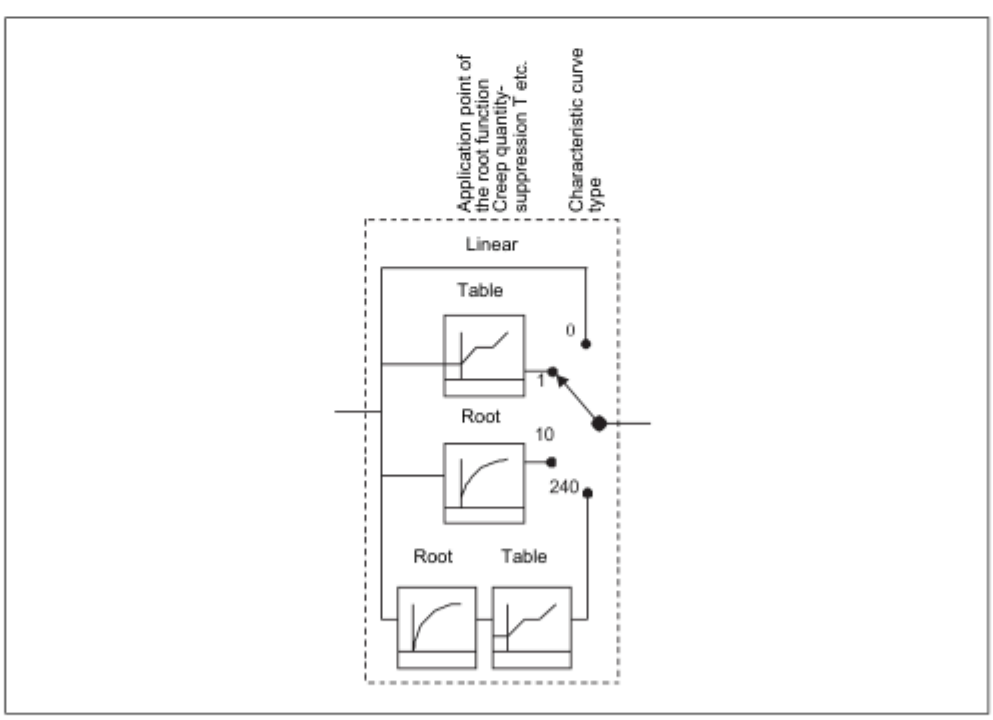


Figure 13 Linearization type function group

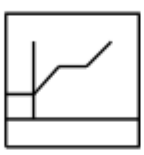
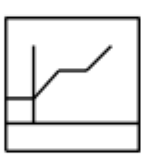
Measuring task	Linearization symbol	Characteristic curve type	Description
Pressure measurement	–	Linear	No linearization
Filling level: Level	–	Linear	No linearization
Filling level: Volume		User-defined (table)	Linearization of container characteristic curves. The relationship between filling level and volume is described by a maximum of 31 points with any intervals.
Flow: Mass-/ Volume flow without correction		Extracted	Root extraction of the input value for measurement according to the screening method. Additional parameters for the root function Root function application point and creep quantity suppression, see Table 5
Flow: Mass-/ volume flow with correction	 	Extracted and table	Root extraction of the input value for measurement according to the screening method with linearization. For the screening method, the highest level of accuracy is achieved when the operating point is at the design point. If there are deviations, the measured deviation also increases, therefore the measuring accuracy is corrected using a characteristic curve with a maximum 31 points.

Table 4 Linearization functions available

Table 5 describes the manufacturer-specific parameters, which are used in the flow measuring type to supplement the root function. See also PROFIBUS profile parameters in the Appendix.

To enter a characteristic curve, select the characteristic curve type “User-defined (table)”. Enter the “New number of interpolation points”, which you subsequently want to enter.

The interpolation points must always be entered in pairs. For each point x[n] in the operating range, a point y[n] is required.

The device checks between which two interpolation points the pressure (secondary variable 1) related to the measuring range lies and uses the characteristic curve sec-

tion (straight line) to map the pressure to the measured value (primary variable) in the operating range.

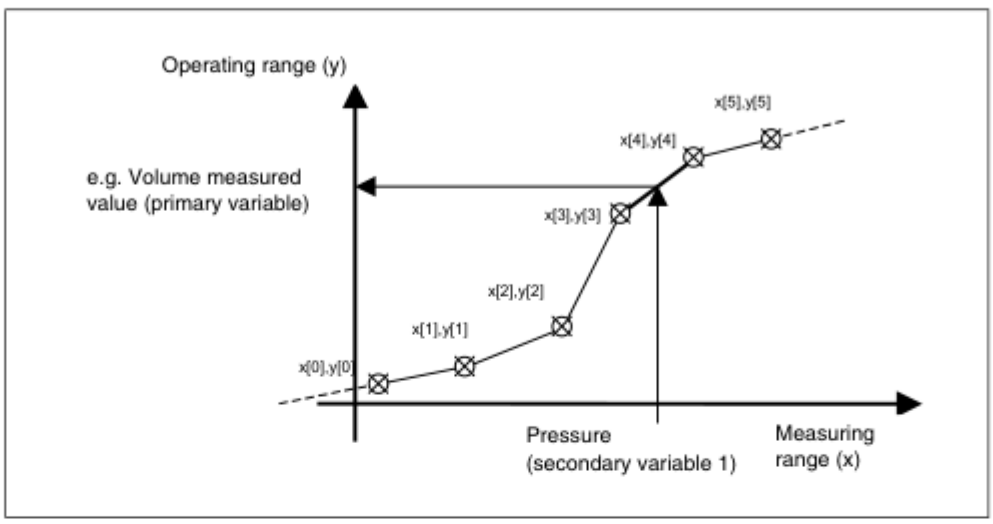


Figure 14 Entry of user-defined characteristic curve using interpolation points x(i), y(i)

Parameter	Description
Application point of the root function	This parameter determines the flow point in %, below which the differential pressure is set in a linear relationship to the flow.
Creep quantity suppression	This parameter determines the flow point in %, below which the flow becomes 0.

Table 5 Manufacturer-specific parameters for flow measurement

2.2.1.2 Units for the pressure measuring block

In the pressure measuring block, there are four different points where you have the possibility of selecting units. Depending on the measuring type, units from the following measuring functions are permitted:

Variable	Measuring type				
	Pressure	Filling level	Volume	Volume flow	Mass flow
Non-linearized pressure value	P	P	P	P	P
Secondary variable 1	P	P	P	P	P
Measured value (Primary variable)	P	L	V	F	F
Secondary variable 3	---	---	---	---	M

Table 6 Overview of the available units

P: Pressure
L: Filling level
V: Volume
F: Volume flow
M: Mass flow

For all measuring types, you can set the unit “%” as a measured value (primary variable).

For all measuring types, secondary variable 2 has a standardized value of 1. The unit is fixed as “none”.

For each of the measuring functions P, L, V, F and M, the physical units are listed in chapter 4.2.7, pg. 51.

2.2.2 Electronics temperature measuring block

This measuring block is manufacturer-specific and is not described in the profile. It is responsible for monitoring the internal temperature of the device electronics and cannot change the pressure value, only its status.

The permitted limits correspond to those of the permitted ambient temperature. If a limit is exceeded, the status changes to “GOOD – Active Critical Alarm – High/Low-limit”. The status of the corrected pressure value in the pressure measuring block (see chapter 2.2.1, pg. 24) receives the status “UNCERTAIN – Value not accurate – high/low-limit”. This action is accompanied by a PROFIBUS diagnostic message “Electronics temperature too high”.

Furthermore, indicators for maximum and minimum values are available (see chapter 5.2.10, pg. 73)

2.2.3 Analog input function block

The analog input function block is one of the standard functions of transmitters. Figure 15 shows the processing of measured values up to the **output**.

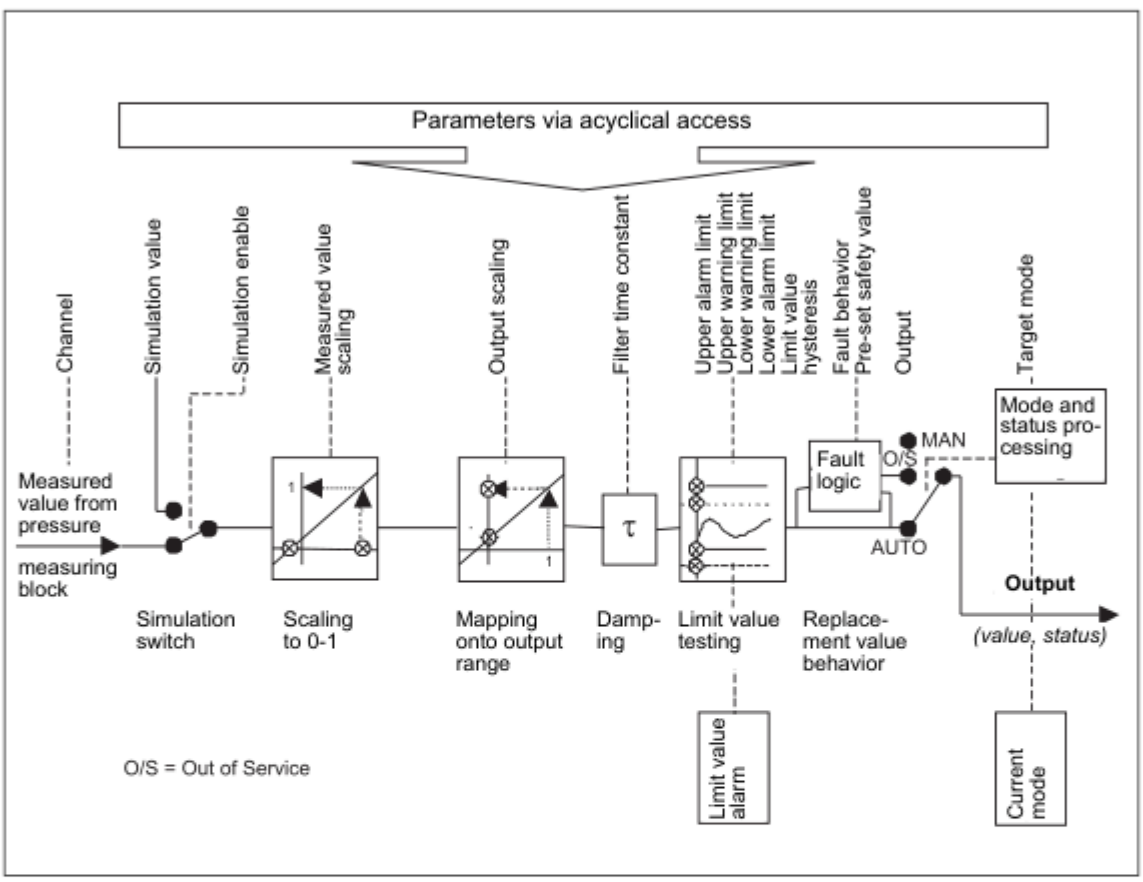


Figure 15 Analog input function block function groups

Functioning mode

The **measured value from the pressure measuring block** – or a **simulation value** given by the **simulation switch** – undergoes a further **normalization** (measured value scaling) and **mapping onto the output range** using output scaling (application-specific measured variable).

The signal is then **filtered** (damping) and checked to see that it is within given **limits**. For this, **upper and lower warning and alarm limits** are available.

If the measured value has the status "bad", the **fault logic** can output a **preset safety value**: This can be set as the last usable measured value or a given substitute value.

Using the **target mode** selected in **mode and status processing** you can choose between output of the automatically-recorded measured value (AUTO setting) or a

manually-set simulation value (MAN setting). If the function block is not working (O/S), the preset safety value will also be output.

The analog input function block deals with the numerical value separately from the physical unit. This means that you can set around 1000 pre-defined units. The most important are listed in chapter 4.2.7, pg. 51.

2.2.4 Counter function block

The counter function block is one of the standard functions of transmitters. It is used for flow measurement. Figure 16 shows the processing of measured values up to the output values.

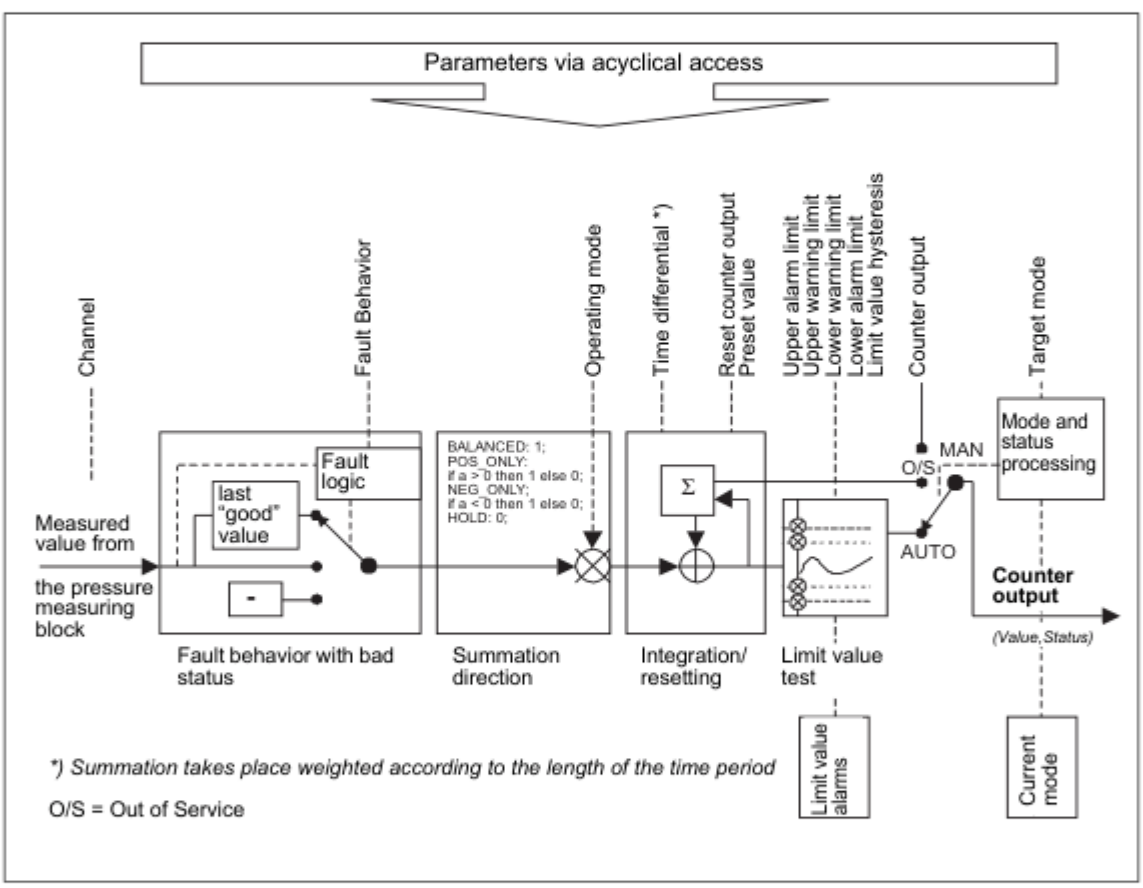


Figure 16 Counter function block function groups

Functioning mode

The function block processes the **measured values from the pressure measuring block.** If a value's status is "bad", the **fault behaviour** setting decides whether this value or the **last "good" value** is passed on for totalling.

The measured values now pass through fixing of the **summation direction**, to which you allocate either forwards, backwards or net counting.

Next, they are **integrated** with the time, so that the flow in a given time interval can be determined, and checked to see that they within the **limits**. Here, it is also possible to **reset** the total to a **pre-loaded value**.

You can configure the counter function block in such a way that you can reset or pre-set it not only using the acyclic services but also from the user programme via the cyclic data traffic. For more details see chapter 3.1.2.1, pg. 34.

Using the **target mode** selected in **mode and status processing** you can choose between output of the automatically-recorded measured value (AUTO setting) or a manually-set simulation value (MAN setting).

The possible units correspond to the volume and mass variables for the pressure measuring block (see chapter 2.2.1.2, pg. 28).

System integration 3

3.1 Cyclic data transmission

Using cyclic data transmission, the user data relevant for process automation is transferred between the class 1 Master (control or automation system) and the transmitter.

3.1.1 Setting the PROFIBUS address

Upon delivery, the PROFIBUS address is set to 126. You can set it on the device (chapter 4.2.8, pg. 54) or via the bus, with a parameterization tool such as SIMATIC PDM or HWKonfig.

The new address only becomes effective after a warm start or if the device has been disconnected from the bus for a short time.

3.1.2 Configuration

Information on the input and output range, as well as the consistency of the cyclically transmitted data is defined in the **D**evice**M**aster**D**ata file (DMD file) , tested with the device's configuration message and, if appropriate, declared to be valid. During the design, the user data which will be transmitted in cyclic operation is set. This means that it is possible to optimise the quantity of data to be transmitted. The DMD files for all common devices are already stored in the Siemens control system, however they are also accessible over the Internet (**http://www.ad.siemens.de/csi_e/gsd**) and can be subsequently imported.

3.1.2.1 Configuring the user data

The user data which is made available to the control system or the open-loop control via the PROFIBUS depends on the desired configuration selected (see chapter 5.2.3, pg. 63). In principle, it is supplied by the function blocks (see chapter 2.1.3, pg. 22 ff.) and put together in the following order:

The analog input function block supplies the content of the “Output” parameter, the counter function block supplies the content of the “Counter output” parameter. The configuration allows you to select the function block from which output data will be transmitted:

1. Output and/or
2. Counter output

For the “Counter output” parameter, you can add the following additional functions:

3. Reset counter output
4. Operating mode

Using “Reset counter output”, you can reset the integrator from the operator programme and change its functioning mode using “Operating mode”.

NOTE

For STEP 7, the configuring tool is HW-Konfig. For STEP 5, it is [redacted].

Function block/ Parameter	byte	User data sent to the Master	User data, sent by the Master	Meaning depending on further parameters
Analog input/output	1.-4.	Measured value	---	Pressure, level Volume, mass flow Volume flow, Sensor temperature Electronics temperature
	5.	Status		
Counter/ counter output	6.-9-	Measured value	---	Mass or volume
	5.	Status		

Table 7 User data, depending on the function block selected

Additional function	byte	User data sent to the Master	~User data sent by the Master	Meaning
Reset counter output	1.	---	Reset counter output	Counter reset function 0: Normal operation of the counter Integration is running 1: Stop integration and reset integrator to 0 2: Stop integration and preset integrator with the pre-loaded value
Operating mode	2.	---	Operating mode	Counter operating mode 0: Net counter, count upwards and downwards 1: Forward counter. 2: Backward counter 3: Stop count

Table 8 User data depending on the additional functions selected for the counter output function block

3.1.2.2 Transmission of user data via PROFIBUS

The user data is continuously updated by the cyclic service of PROFIBUS.

Bits	7	6	5	4	3	2	1	0
byte 1	VZ	2^7	E 2^6	2^5	2^4	2^3	2^2	2^1
2	E 2^0	2^{-1}	M 2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}
3	2^{-8}	2^{-9}	M 2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}
4	2^{-16}	2^{-17}	M 2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}

Table 9 Floating point illustration for the measured value according to IEEE standards

VZ: preceding sign; 0 = positive, 1 = negative
M: Mantissa
E: Exponent

3.1.2.3 Status

Status provides information about:

1. the usability of the measured value in the user programme
2. the device status (self-diagnosis/system diagnosis)
3. additional process information (process alarms)

The coding of the status byte is listed on the following pages. In addition, possible causes of an error are given, along with measures to remove it.

Hex	Digital display	PDM display	Cause	Measure
80	G_128	---	Normal operation	---
84	G_132	update.event	A parameter relevant for the behavior of the device has been changed . The display is extinguished after 10 s.	Note to the control system
89	G_137	Fallen below warning limit	Fallen below lower parameterized warning limit.	Correct error using user programme.
8A	G_138	Warning limit exceeded	Upper parameterized warning limit exceeded.	Correct error using user programme.
8D	G_141	Fallen below alarm limit	Fallen below lower parameterized alarm limit.	Correct error using user programme.
8E	G_142	Alarm limit exceeded	Upper parameterized alarm limit exceeded.	Correct error using user programme.
A4	G_164	Maintenance required	Maintenance interval has expired: Calibration or service	Maintenance work, calibration of the electronics or servicing of the measuring cell is required.

Table 10 Status coding for “Good quality”

Hex	Digital display	PDM display	Cause	Measure
00	B_000	---	Is used if no other information is available.	---
04	B_004	Configuration error	Adjustment range too small	Repeat the adjustment process with pressure values which are further apart from one another.
0B	B_011	Bad, not connected, value constant	Variable is not calculated	Correct the "Measuring transducer type" setting
0C	B_012	Bad, device error	Device has an irreparable error	Replace the electronics.
0F	B_015	Device error, value constant	Device has an irreparable error.	Change the electronics.
10	B_016	Sensor error	Sensor shows error.	Have the measuring cell checked by service personnel.
11	B_017	Sensor error, Fallen below limit value	Negative pressure too high Fallen below lower overload limit (<-20% of nominal measuring range).	Increase the pressure in a positive direction.
12	B_018	Sensor error, Limit value exceeded	Positive pressure too high Upper overload limit exceeded (>120% of nominal measuring range).	Reduce the pressure.
1F	B_031	Out of order, value constant	The function block is put out of order with a target mode command. A parametrized safety value is supplied.	For normal operation, reset the target mode to "AUTO".

Table 11 Status coding for "Quality bad"

Hex	Digital display	PDM display	Cause	Measure
47	U_071	Last usable value, value constant	Input condition “Fail Safe” is met, the parameterized safety setting is set to “keep last valid value”.	Check the recording of measured values.
48	U_072	Substitute value	Use of the totalizer block, if the measured value status = “Bad” and the parameterized safety setting is set to “keep last valid value”. The total value changes. Fault behavior = Safe operation	Check the recording of measured data.
4B	U_075	Substitute value constant	Value is not an automatic measured value. This identifies a parameterized, static substitute value or a preset value.	Check the recording of measured values.
4F	U_079	Initial value, value constant	After run-up, an initial value is entered in the device memory.	Reject the value in the user program.
50	U_080	Value inaccurate	Unreliable operating parameters or maintenance alarm	Check the operating parameters, e.g. the permitted ambient temperature. Immediate maintenance work required.
51	U_081	Value inaccurate, fallen below limit value	Fallen below lower nominal measuring range limit (< 10%)	Increase the pressure in a positive direction.
52	U_082	Value inaccurate, limit value exceeded	Upper nominal measuring range limit has been exceeded (> 110%)	Reduce the pressure.

Table 12 Status coding for “Quality uncertain”

3.1.2.4 Diagnosis

Alongside status information, the device can also actively report information on its own device status. Diagnoses are important information, which an automation system can use to introduce remedial measures.

Standard PROFIBUS DP mechanisms are used to transport diagnosis information and actively report it to the class –1 Master. For this, PROFIBUS DP provides a protocol to transmit information which is higher-ranked than user data to the class –1 Master.

The content of the “Device status” parameter from the physical block is reported and, in addition, information on whether a change of status has occurred (event arrived/ event gone).

The diagnostic object consists of 4 bytes. For SITRANS P, Series DS III PA, only the first two bytes are relevant.

byte	Bit	Meaning when "1"	Cause	Measure
byte 0	0			
	1			
	2			
	3	Electronics temperature too high	The measuring transducer monitors the temperature of the measuring transducer electronics. If this exceeds 85°C, then this message is generated.	Reduce the ambient temperature to within the permissible range.
	4	Memory error	During operation, the memories for the cell and the electronics are constantly checked for check sum errors and read/write errors. In case of error, this message is generated.	Replace the electronics and, if necessary, the measuring cell.
	5	Error in measured value recording	In case of a sensor failure or the overload limits being exceeded (<-20% or >+120% of the nominal measuring range)	Have the measuring cell checked by the service department.
	6			
	7			

Table 13 Diagnostic message

byte	Bit	Meaning when "1"	Cause	Measure
byte 1	0			
	1			
	2			
	3	Warm restart carried out (goes to "0" after 10s)	The supply current has been fed to the device or a warm start has been triggered using SIMATIC PDM or the internal watchdog has responded.	Check the cabling and the power unit.
	4	Restart (goes to "0" after 10s)	The device has been reset to its factory settings.	
	5	Servicing required	A calibration or service interval has expired.	Carry out the calibration or servicing and reset the messages using SIMATIC PDM.
	6			
	7	ID number changed	You have changed the parameter PROFIBUS Ident Number during cyclic operation. The device is reporting the violation of the Ident number and showing you a preliminary failure warning. In the case of a warm restart, the device will no longer participate in cyclical communication of reference data without a change in the system configuration.	Carry out an adjustment of the configuration data (change of GSD), so that it is consistent with the Ident number set in the device.

Table 13 Diagnostic message

NOTE

The device status can be simulated with the aid of SIMATIC PDM. This allows you to test the reaction of the automation system to errors.

3.2 Acyclic Data Transmission

Acyclic data transmission is mainly used for transmitting parameters during commissioning, maintenance, batch processes, or for displaying further variables which do not take part in cyclic user data traffic (Example: Non-linearized pressure value).

Data traffic occurs between a class-2 Master and the field device with so-called C2 connections. So that several class-2 Masters can simultaneously access the same transmitter, the device supports up to four C2 connections. However, you must ensure that they are not writing to the same data.

3.3 SIMATIC PDM

SIMATIC PDM is a software package for designing, parameterizing, commissioning, diagnosing and maintaining the SITRANS P, Series DS III PA and other process devices.

SIMATIC PDM contains a simple process monitoring of the process values, alarms and status signals of the device.

Using SIMATIC PDM you can

- display,
- set,
- change,
- compare,
- check the plausibility of,
- manage and
- simulate

process device data.

Local operation and display

4

4.1 General operating instructions

You can operate the device locally using the keys [M], [↑] and [↓] (Figure 21). These are accessible when you loosen the two screws on the protective cover and lift it up. The cover must be closed again after operation.

Under normal circumstances, the device is in the “measured value display” mode. You can select a mode using the [M]key. You can change a value in a mode using the keys [↑] and [↓]. By pressing the [M] key again, you switch to the next mode, whereby the setting is transferred, if it has been changed. Exceptions to this procedure are described in the following paragraphs.

4.1.1 Digital display

The digital display is used to locally display the measured value (1, Figure 17) and associated information, e.g. limits being reached.

1 Measured value
2 Unit/error code
3 Root display (flow)
4 Mode/key disable
5 Lower sensor limit reached
6 Sign for measured value
7 Upper sensor limit reached
8 Communication indicator

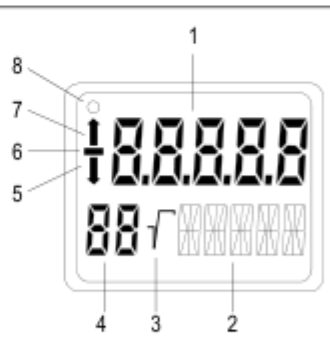


Figure 17 Structure of the digital display

4.1.2 Measured value display

The measured value display consists of five 7-segment fields with a sign (6, Figure 17) and overflow indicator (5 and 7). The measured value is displayed in a unit which can be selected. Additional symbols give you further information:

- ⬆ Upper warning, alarm or sensor limit reached.
- ⬇ Lower warning, alarm or sensor limit reached.
- ○ Communication active. This symbol becomes active for at least 0.3 s and represents communication currently taking place in terms of acyclic and/or cyclic data transmission.

4.1.3 Unit display

The unit display consists of five 14-segment fields to represent the physical unit.

Figure 18 Examples of measured value displays

4.1.4 Error signaling

If hardware or software errors occur in the transmitter, the “Error” message appears in the measured value display. A status code is displayed in the unit display (see chapter 4.2.2, pg. 47 and chapter 3.1.2.3, pg. 36), which indicates the type of error. This information is also available via the PROFIBUS interface.

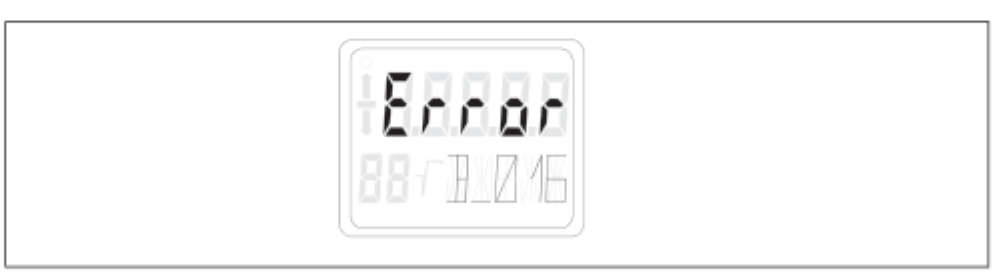


Figure 19 Error message, example “Sensor error”

4.1.5 Mode display

The mode display consists of two 7-segment fields which, in local operation, display the currently selected mode. In the following example (Figure 20) a damping of 0.2 s has been set in mode 4.

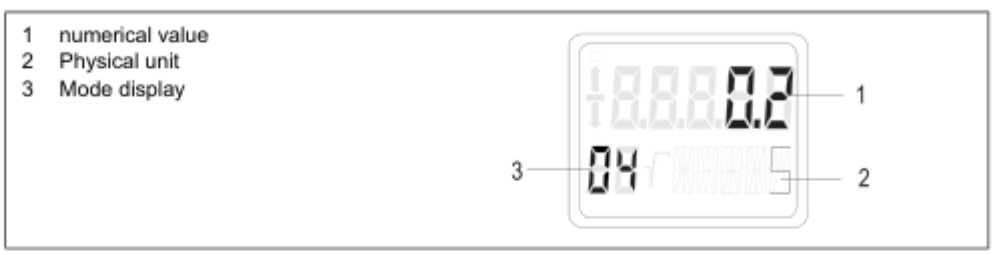


Figure 20 Example of a mode display

If no mode is selected, the digital display will be in the measured value display function. In this function, the mode display (3) can display

- active simulation “Si” (see chapter 5.2.8, pg. 70)
- active operator input inhibit “L”, “LC”, “LA”, “LL” (see chapter 5.2.15, pg. 77)

4.2 Operation with the keyboard

The position of the keyboard is as shown in Figure 21. You can use it to locally parameterize the transmitter. You can select and execute all the functions described in Table 14 with settable modes ([M] key). These are available as part of an extended range of functions via PROFIBUS (see chapter 5, pg. 59).

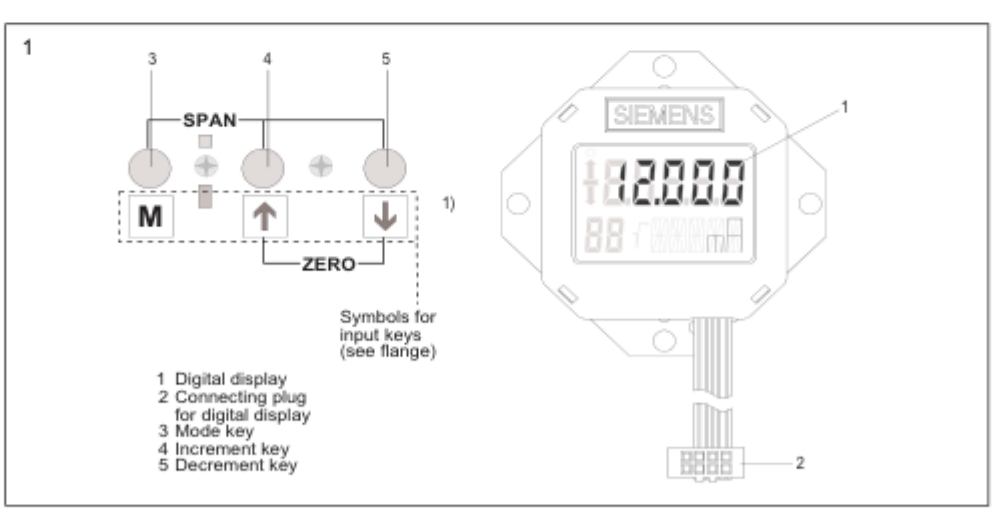


Figure 21 Position of the keyboard (three input keys)

- The keylock (see chapter 4.2.5, pg. 49) must be released for keyboard operation.
- If you hold down a key for longer than 1 s, a repetition function will be activated, which corresponds to around four key presses per second.
- If more than 2 minutes have elapsed since a key was last pressed, the setting is saved and the measured value display is returned to automatically.
- Numerical values are always set from the least significant digit still displayed. In the case of an overflow in key repetition mode, the device switches to the next significant digit and only this one continues to be counted. This allows rapid rough setting of a wide range of figures. For fine setting, you have to release the [↑] or [↓] key and press it again. Exceeding of the upper or lower measured value limits are represented on the display by ↑ or ↓ .
- In the case of disabled operation, it is possible to read parameters, but an attempt to change anything will be rejected (error code F_001: see chapter 4.2.2, pg. 47).

Function, Parameter in PDM	Mode	Key function			Display, explanations
	[M] 1)	[↑]	[↓]	[↑] and [↓]	
Measured value display					Display of the measured value selected in Mode 13
Error display					Error, if transmitter disturbed
Electric damping, time constant	4	greater	smaller		time constant T_{63} in s Setting range: 0.0 to 100.0
Zero point adjustment "Position correction" 2)	7	--	--	execute	
Key and/or function disable	10	change		5 s release	For locking variants see Table 32, pg. 77
Source of measured value display	13	select from several possibilities			display desired measuring result
Physical unit	14	select			Physical units
bus address	15	higher	lower		User address on PROFIBUS (0.. 126)
Device operating mode	16	change			Selection of device operating mode - conforms to profile 1 AI conforms to profile with extensions Previous device SITRANS P/PA - conforms to profile 1 AI, 1 TDT
Decimal point	17	change			Position of decimal point in the display
Zero point adjustment	18	-	-		Display of the remaining available measuring range
LO adjustment	19	Preset greater	Preset smaller	execute	Adjustment of the lower point of the characteristic curve
HI adjustment	20	Preset greater	Preset smaller	execute	Adjustment of the upper point of the characteristic curve

Table 14 Summary of operating functions using keys

1. If “L” appears in the display, the keylock is working.
2. If the [↑] and [↓]keys are pressed simultaneously for about 2 s, the displayed value disappears and the current value appears after about 2 s.
3. If “LA” or “LL” appears after releasing the keylock, there is an additional block on local operation via the bus. Chapter 5.2.15, pg. 77 explains how to release this using SIMATIC PDM. In measuring mode, if neither “L”, “LA” nor “LL” appear in the mode display, local operation is possible.
4. If the symbol ↑ or ↓ appears on the left-hand edge of the display, the measured pressure value is outside the sensor limits, or the parameterized warning or alarm limits have been reached.

4.2.1 Measured value display

In the “Measured value display” function, the measured value selected in Mode 13 is displayed. The physical unit is set in Mode 14, and the position of the decimal point in Mode 17.

4.2.2 Error display

Every measured value which can be diplayed is given a status to identify its quality. If ts is classified as “Bad” or “Uncertain”, the text “Error” alternates with the measured value in the display and the status code alternates with the unit.

If the status is not equal to 128 (80H) – irrespective of error signaling – its content is displayed as a decimal figure with preceding quality classification in the unit display. The status display has priority, therefore the physical unit is not visible at this moment.

Examples:

B_000: Quality bad (**B**ad), no further information available

B_016: Quality bad (**B**ad), sensor error

U_075: Quality uncertain (**U**ncertain), replacement value

G_138: Quality good (**G**ood), warning limit exceeded

The status codes can be found in chapter 3.1.2.3, pg. 36.

In the case of exceptional events, error messages can appear during local operation and are displayed for around 10 s after the occurrence of the error:

Error code	Meaning	Measure
F_001	Local operation disabled	Release write protection
F_002	Change of bus address not possible as the device is exchanging data with class 1 Master	End communication with class 1 Master.
F_003	Change of device operating mode not possible as device is exchanging data with class 1 Master	End communication with class 1 Master.
F_004	Display overflow	Check the physical unit and decimal point position settings, and adjust them to the current measured value.
F_005	Value is read only	–
F_006	Adjustent unsuccessful	Check adjustment range, repeat procedure.
F_007	Measurements across whole measuring range no longer possible after zero point adjustment.	Check measuring range, if necessary reduce inconsistency.
F_008	Local operation has been blocked with SIMATIC PDM	Set the “Local operation” parameter to “enable” with SIMATIC PDM

Table 15 Error messages available

4.2.3 Mode 4: Electric damping

You can set the time constant of the electric damping in steps of 0.1 s between 0 and 100 s with the input keyboard. This damping acts additionally to the device-internal basic damping.

- The electric damping is set as follows:
  - Set mode 4.
  - Select damping with [↑] or [↓]
  - Save with [M].

Damping only affects the output of the analog input function block.

4.2.4 Mode 7: Zero point adjustment (position error correction)

If the transmitter is installed and ready for operation, outside influences such as installation location, ambient temperature or installation-dependent admission pressures (e.g. hydraulic column in the pressure pipe to the transmitter) can move the original zero point. You can correct this inconsistency here within the following limits:

- Differential pressure: -100 % to +100 % of the nominal measuring range
- Pressure: -100 % (not more than –1 bar, however) up to +100 % of the nominal measuring range
- Absolute pressure: Mode 7 disabled.
- You execute a zero point adjustment as follows:
  - Create pressure alignment.
  - Set mode 7.
  - Press [↑] and [↓] simultaneously for around 2 s.

Depending on the nominal measuring range of the transmitter and the pressure unit selected, the value 0 appears in the display with the relevant number of decimal places.

4.2.5 Mode 10: Key lock

In this mode, you can protect against unwanted overwriting of data by local operation.

- You set the keylock as follows:
  - Set mode 10.
  - Activate keylock and function disable with [↑] and [↓]
  - Save with [M].

L appears in the mode display.
The keylock is released, if you press [↑] and [↓] for more than 5 s in Mode 10.

4.2.6 Mode 13: Source of measured value display

In this mode, you select the value to be displayed. The selections available depend on the device function set (in the factory or via the bus).The device function cannot be set locally.
In SIMATIC PDM this is the “Transmitter type” parameter.

- You select the source of the measured value display as follows:
  - Set mode 13.
  - Select the source for the measured value display using [↑] or [↓]
  - Save with [M].

The physical unit you can assign in Mode 14 depends on the source of the measured value display.

The following tables show the sources of the measured value display which you can select for each device function, and which units are available in each case. The sources of the measured value display given are the parameters which are reproduced in chapter 2, pg. 21 and in the table of PROFIBUS parameters in the Appendix.

Source of measured value display	Assistance in the unit display	Units available
From analog input function block:		
[0] : Output:	OUT	Pressure (P) and user-specific (U)
From pressure measuring block:		
[1] : Secondary variable 1	SEC 1	Pressure (P)
[2] : Measured value (Primary variable)	PRIM	Pressure (P)
[3] : Sensor temperature	TMP S	Temperature (T)
[4] : Electronics temperature	TMP E	Temperature (T)
[7] : Non-linearized pressure value	SENS	Pressure (P)

Table 16 Source of measured value display for absolute pressure, differential pressure and pressure device functions

Source of measured value display	Assistance in the unit display	Units available
From analog input function block: [0] : Output	OUT	Volume flow (F) or mass flow (M) and user-specific (U) *)
From pressure measuring block:		
[1] : Secondary variable 1	SEC 1	Pressure (P)
[2] : Prinary variable	PRIM	Volume flow (F)
[3] : Sensor temperature	TMP S	Temperature (T)
[4] : Electronics temperature	TMP E	Temperature (T)
[5] : Secondary variable 3	SEC 3	mass flow (M)
[7] : Non-linearized pressure value	SENS	Pressure (P)
From counter function block		
[6] : Counter output	TOTAL	Volume (V) or mass flow (ΣM) *)

Table 17 Source of measured value display for flow device function

*) The possible selections for physical units are also determined by the channel setting (mass or volume) of the analog input and counter function blocks.

Source of measured value display	Assistance in the unit display	Units available
From analog input block:		
[0] : Output	OUT	Filling level (L) and user-specific (U)
From pressure measuring block:		
[1] : Secondary variable 1	SEC 1	Pressure (P)
[2] : Prinary variable	PRIM	Filling level (L)
[3] : Sensor temperature	TMP S	Temperature (T)
[4] : Electronics temperature	TMP E	Temperature (T)

Table 18 Source of measured value display for filling level (level) device function

Source of measured value display	Assistance in the unit display	Units available
From analog input block:		
[0] : Output	OUT	Volume (V) and user-specific
From pressure measuring block:		
[1] : Secondary variable 1	SEC 1	Pressure (P)
[2] : Prinary variable	PRIM	Volume (V)
[3] : Sensor temperature	TMP S	Temperature (T)
[4] : Electronics temperature	TMP E	Temperature (T)

Table 19 Source of measured value display for filling level (volume) device function

4.2.7 Mode 14: Physical unit

The physical unit is set by selecting one option from a list. The group of units you can select from depends on the source of the measured value display (Mode 13):

- You set the physical unit as follows:
  - Set mode 14. The identifier of the current unit appears in the measured value display, and the associated plain text appears in the unit display.
  - Select a unit using [↑] and [↓]
  - Save with [M].

The following tables show the physical units available in each measuring type.

Unit	ID	Display
Pa	1130	Pa
MPa	1132	MPa
kPa	1133	KPa
hPa	1136	hPa
bar	1137	bar
mbar	1138	mbar
torr	1139	Torr
atm	1140	ATM
psi	1141	PSI
g/cm²	1144	G/ cm2
kg/cm²	1145	KGcm2
inH_20	1146	INH2O
$inH_2O(4°C)$	1147	INH2O
mmH_2O	1149	mmH2O
$mmH_2O(4°C)$	1150	mmH2O
ftH_2O	1152	FTH2O
inHg	1155	IN HG
mmHg	1157	mm HG

Table 20 Available units of pressure (P)

Unit	ID	Display
u	1010	u
cm	1012	cm
mm	1013	mm
ft	1018	FT
in	1019	IN
yd	1020	Yd

Table 21 Available units for filling level (L, level information)

Unit	ID	Display
m^3	1034	m3
dm^3	1035	dm3
cm^3	1036	cm3
mm^3	1037	mm3

Table 22 Available units for volume (V)

Unit	ID	Display
1	1038	L
cl	1039	cL
ml	1040	mL
hl	1041	hL
in^3	1042	IN3
ft^3	1043	FT3
yd^3	1044	Yd3
pint (US)	1046	Pint
quart (US)	1047	Quart
US gallon	1048	GAL
imp. gallon	1049	ImGAL
bushel	1050	BUSHL
barrel	1051	bbl
barrel liquid	1052	bblli

Table 22 Available units for volume (V)

Unit	ID	Display
m^3/s	1347	m3/S
m^3/min	1348	m3/m
m^3/h	1349	m3/h
m^3/d	1350	m3/d
l/s	1351	L/S
l/min	1352	L/min
l/h	1353	L/h
l/d	1354	L/d
Ml/d	1355	ML/d
ft^3/s	1356	CFS
ft ^{3}/min).	1357	CFM
ft^3/h	1358	CFH
ft^3/d	1359	CFD
US gallon/s	1362	GAL/S
US gallon/min	1363	GPM
US gallon/h	1364	GAL/h
US gallon/d	1365	GAL/d
bbl/s	1371	bbl/S

Table 23 Available units for Volume flow (F)

Unit	ID	Display
bbl/min	1372	bbl/m
bbl/h	1373	bbl/h
bbl/d	1374	bbl/d

Table 23 Available units for Volume flow (F) (Forts.)

Unit	ID	Display
g/s	1318	G/S
g/min	1319	G/min
g/h	1320	G/h
g/d	1321	G/d
kg/s	1322	KG/s
kg/min	1323	KG/m
kg/h	1324	KG/h
kg/d	1325	KG/d
t/s	1326	T/S
t/min	1327	T/min
t/h	1328	T/h
t/d	1329	T/d
lb/s	1330	lb/S
lb/min	1331	lb/m
lb/h	1331	lb/h
lb/d	1332	lb/d
STon/s	1334	ST/S
STon/min	1335	ST/m

Table 24 Available units for mass flow (M)

Unit	ID	Display
STon/h	1336	ST/h
STon/d	1337	ST/d
LTon/s	1338	LT/S
LTon/min	1339	LT/m
LTon/h	1340	LT/h
LTon/d	1341	LT/d

Table 24 Available units for mass flow (M)

Unit	ID	Display
kg	1088	KG
g	1089	G
t	1092	T
oz	1093	oz
lb	1094	lb
STon	1095	STon
LTon	1096	LTon

Table 25 Available units for total mass flow (ΣM)

Unit	ID	Display
K	1000	K
°C	1001	ξC
°F	1002	ξF
°R	1003	ξR

Table 26 Available units of temperature (T)

Unit	ID	Display
any	1995	Max. 16 characters For more than 5 characters, display is as light writing. Input of the characters to be displayed is possible via bus.
%	1342	%

Table 27 Available user-specific units (U)

NOTE

The profile allows a much greater number of possible units. Particularly for the analog input function block, it is not limited to certain physical values. If you have selected a unit which is not contained in the valid list, e.g. using SIMATIC PDM, the current measured value is output in the measured value display with no dimension.

4.2.8 Mode 15: PROFIBUS address

In Mode 15, you set the user address of the device on the PROFIBUS. The permitted range is from 0 to 126

The PROFIBUS address is set as follows:

- Set mode 15. The user address currently set appears in the measured value display.
- Change this, within the framework of the permitted range, using [↑] and [↓].
- Save with [M].

NOTE

Ensure that you are not changing the address of the device during operation of your system. Otherwise, the device can no longer be contacted from the user software.

4.2.9 Mode 16: Device operating mode

In relation to its behavior towards the DP Master, the SITRANS P, Series DS III PA device recognises three operating modes:

[0] conforms to profile: can be exchanged for transmitters according to PROFIBUS-PA profile 3.0 with analog input function block (without counter)
[1] conforms to profile with extensions full functional range of the SITRANS P, Series DS III PA with analog input and counter function blocks (supply status)
[2] can be exchanged for the forerunner device SITRANS P/PA
[128] conforms to profile: can be exchanged for pressure transmitter according to PROFIBUS-PA profile 3.0 with analog input function block and counter.

The device operating mode is set as follows:

- Set mode 16. The current device operating mode (0, 1, 2 or 128) appears in the measured value display
- Select the desired device operating mode using [↑] and [↓]
- Save with [M].

NOTE

Each device operating mode has a particular device master data file assigned to it.

[0]: pa_29700.gsd or pa_39700.gsd
[1]: siem80A6.gsd
[2]: sip1804B.gsd
[128]: pa_29740.gsd or pa_39740.gsd

If the configuration of your PROFIBUS-PA channel does not correspond to the device operating mode set, the device will not pick up the cyclic data exchange. Successful connection is confirmed by the communication display [o] at the top left of the digital display (see Figure 17, pg. 43).

4.2.10 Mode 17: Position of the decimal point

Measured values can be displayed to up to 4 decimal places.

The decimal point is shifted as follows:

- Set mode 17. A form with the current position of the decimal point appears in the measured value display.
- Select the desired display format using [↑] and [↓]
  8.8888 88.888 888.88 8888.8 88888
- Save with [M].

CAUTION

- If you place the decimal point too far to the right, the resolution of the display can turn out too low, i. e. the displayed value always remains 0.
- If you place the decimal point too far to the left, an overflow of the display can occur. In this case, instead of the measured value, the character string 9.9.9.9.9 is output and the error code F_004 is displayed.

4.2.11 Mode 18: Zero point adjustment display

In this mode, the measuring range (positive pressure) which remains after the zero point adjustment (Mode 7) or the adjustment process (Mode 19 and 20) is displayed.

You display the current adjustment range as follows:

- Set mode 18. The current adjustment range is displayed.
- Close with [M].

4.2.12 Mode 19: LO adjustment

In this mode you can change the slope of the characteristic curve. The characteristic curve rotates around the HI setting point. This function replaces the zero point adjustment (Mode 7), which is not permitted on absolute pressure transmitters.

You determine the unit in which you want to make the adjustment by setting the source of the measured value display (Mode 13) to 7 (non-linearized pressure value, SENS) and selecting the desired pressure unit with Mode 14.

NOTE

Changing this setting can constrict the measuring range to such an extent that the permitted sensor limits can be damaged by only a slight change in pressure.

You execute a LO adjustment as follows:

- Set mode 19. The value of the last adjustment process appears on the display with the associated unit.
- If you only want to view this information, you can leave the mode by pressing [M], otherwise you now apply the reference pressure.
- Press [↑] or [↓] The measured value display switches to the current measured pressure value. Using [↑] and [↓] you can input the value of the reference pressure starting at this value.
- Press [↑] and [↓] simultaneously and hold for 2 s to execute the adjustment. If the adjustment has been successful, the current measured value is displayed, which should correspond to the adjustment value if it is still close to the reference pressure.
  If the two adjustment points are too close to one another, F_006 is displayed. The smallest adjustment range depends on the nominal measuring range. Select either a higher reference pressure in Mode 20 or a lower reference pressure in Mode 19.
  As long as Mode 19 is active, this process can be repeated any number of times.
- Save with [M].

4.2.13 Mode 20: HI adjustment

In this mode you can change the slope of the characteristic curve. The characteristic curve rotates around the LO setting point.

You determine the unit in which you want to make the adjustment by setting the source of the measured value display (Mode 13) to 7 (non-linearized pressure value, SENS) and selecting the desired pressure unit with Mode 14.

NOTE

Changing this setting can constrict the measuring range to such an extent that the permitted sensor limits can be damaged by only a slight change in pressure.

You execute a HI adjustment as follows:

- Set mode 20. The value of the last adjustment process appears on the display with the associated unit.
- If you only want to view this information, you can leave the mode by pressing [M], otherwise you now apply the reference pressure.
- Press [↑] or [↓] The measured value display switches to the current measured pressure value. Using [↑] and [↓] you can input the value of the reference pressure starting at this value.
- Press [↑] and [↓] simultaneously and hold for 2 s to execute the adjustment. If the adjustment has been successful, the current measured value is displayed, which should correspond to the adjustment value if it is still close to the reference pressure.
  If you switch to the measured value display, without taking into account a sufficiently large adjustment range, the pressure status becomes “bad” B_004. The fault logic of the function block becomes active and the output leads to an “uncertain” value (U_0xx, depending on the setting).
  If the two adjustment points are too close to one another, F_006 is displayed. Select either a higher reference pressure in Mode 20 or a lower reference pressure in Mode 19.
  As long as Mode 20 is active, this process can be repeated any number of times.
- Save with [M].

Functions/Operation via PROFIBUS-PA

5

For operation via PROFIBUS-PA it is necessary to use PC software such as SIMATIC PDM. Please consult the appropriate operating instructions or online help for details of how to operate this. The full scope of functions of the SITRANS P, Series DS III PA is available via PROFIBUS-PA communication.

5.1 Measuring operation

In measuring operation, measured values such as pressure, filling level or flow are provided via the PROFIBUS interface. PROFIBUS-PA communication is signaled on the digital display by the communication character [o] (see chapter 4.1.1, pg. 43).

5.2 Settings

The SITRANS P, Series DS III PA handles numerous measuring tasks. You only need to carry out the following settings:

- Settings using a configuration tool, e.g. STEP 7, HW-Konfig: Here, you select the desired configuration according to which the cyclically transmitted user data will be structured (see chapter 3.1.2.1, pg. 34).
- Settings using SIMATIC PDM: Here you set parameters which also influence the cyclic user data.

If you are setting a new device, you select the measuring type – e.g. pressure or filling level – and obtain corresponding preset parameters in the SIMATIC-PDM interface. The following paragraphs only apply to those which you have to additionally set yourself.

In general, we recommend the following procedure:

- First of all read the current settings from the device, by initiating the action “Load to PG/PC",
- Check the current settings,
- Change the required settings,
- Load the parameter settings into the device and also save the parameter settings offline.

5.2.1 Pressure measurement

- Select the desired configuration “Output".
- Connect a device with the measuring type “Pressure”, “Differential pressure” or “Absolute pressure, differential pressure series”.

Start SIMATIC PDM. Special parameter settings are not required.

5.2.2 Filling level (level, volume and mass) measurement

- Select the desired configuration “Output".
- Connect a device with the measuring type “Filling level".

Depending on whether you want to measure a level, volume or mass, carry out the following settings.

5.2.2.1 Level measurement

- Start SIMATIC PDM and create an association between the pressure to be measured (measuring range) and the level to be recorded (operating range), by setting the following parameters:
  » Input
  » » Transducer block 1
  Measuring transducer type: Level
  » » » Measuring range
  Initial value, final value:
  » » » Operating range
  Unit: Unit of length [m, cm, mm, ft, in, yd]
  Initial value, final value

- Create an association between the measured level value and the initial value, by setting the following parameters:

» Output
» » Function block 1 – analog input
Channel: Measured value (primary variable)
» » » Measured value scaling
Initial value, final value: as for operating range
» » » Output scaling
Unit, initial value, final value: as for operating range

You can also adjust the output to the other process variables (see Chapter 5.2.4, p. 67). Associate the desired unit and the initial and final values in accordance with the measured value scaling with the parameters under the heading Output scaling.

5.2.2.2 Volume measurement

- Start SIMATIC PDM and create an association between the pressure to be measured (measuring range) and the volume to be recorded (operating range), by setting the following parameters:
  » Input
  » » Transducer block 1
  Measuring transducer type: Volume
  » » » Measuring range
  Initial value, final value:
  » » » Operating range
  Unit: Unit of volume [m^3, dm^3, cm^3, mm^3 ,l ...]
  Initial value, final value

- If your container does not have a linear relation between the level and the volume, you can also specify a characteristic curve:

  » Input
  » » Transducer block 1
  » » » Characteristic curve
  Characteristic curve type: User-defined (table)
  » » » Interpolation points
  New number of interpolation points: max. 31
  x[n] measuring range: Pressure value
  y[n] operating range: Associated volume value
  ...

- Create an association between the measured volume value and the initial value, by setting the following parameters:
  » Output
  » » Function block 1 – analog input
  Channel: Measured value (primary variable)
  » » » Measured value scaling
  Initial value, final value: as for operating range
  » » » Output scaling
  Unit, initial value, final value: as for operating range

You can also adjust the output to another process variable (see chapter 5.2.4, pg. 65). Associate the desired unit and the initial and final values in accordance with the measured value scaling with the parameters under the heading Output scaling.

5.2.2.3 Mass measurement

- Start SIMATIC PDM and create an association between the pressure to be measured (measuring range) and the volume to be recorded (operating range), by setting the following parameters:
  - » Input
  - » » Transducer block 1
    Measuring transducer type: Volume
  - » » » Measuring range
    Initial value, final value
  - » » » Operating range
    Unit: Unit of volume [m^3, dm^3, cm^3, mm^3 ,l ...]
    Initial value, final value

- If your container does not have a liner relation between the level and the volume, you can also specify a characteristic curve:
  - » Input
  - » » Transducer block 1
  - » » » Characteristic curve
    Characteristic curve type: User-defined (table)
  - » » » Interpolation points
    New number of interpolation points: max. 31
    x[n] measuring range: Pressure value
    y[n] operating range: Associated volume value
    ...

- Create an association between the measured mass value and the initial value, by setting the following parameters:
  - » Output
  - » » Function block 1 – analog input
    Channel: Measured value (primary variable)
  - » » » Measured value scaling
    Initial value: Initial value of operating range * density
    Final value: Final value of operating range * density
  - » » » Output scaling
    Unit: Unit of mass [kg, g, t ...]
    Initial value: Initial value as for measured value scaling * density
    Final value: Final value as for measured value scaling * density

You can also adjust the output to another process variable (see chapter 5.2.4, pg. 65). Associate the desired unit and the initial and final values in accordance with the measured value scaling with the parameters under the heading Output scaling.

5.2.3 Flow measurement

- Select the desired configuration with the configuration tool (see also chapter 3.1.2.1, page 36):

Desired configuration	Measuring type
Output	Current flow/time
Counter output	Flowed volume or flowed mass over a time period
Output, counter output	Current flow/time, flowed volume or flowed mass over a time period, Reset counter output (using SIMATIC PDM)
Output, counter output, reset counter output	Current flow/time, flowed volume or flowed mass over a time period, Dose
Output, counter output, reset counter output, operating mode	Current flow/time, flowed volume or flowed mass over a time period, Dose, Control operating mode of the counter (net, forwards, backwards, stop count) from the user program
Counter output, reset counter output	Flowed volume or flowed mass over a time period, Dose
Counter output, reset counter output, operating mode	Flowed volume or flowed mass over a time period, Dose, Control operating mode of the counter (net, forwards, backwards, stop count) from the user program

Table 28 Desired configuration for flow measurement

- Create a device with the measuring type “Flow”.
- Start SIMATIC PDM and create an association between the pressure to be measured (measuring range) and the volume or mass flow to be recorded (operating range), by setting the following parameters:
  » Input
  » » Transducer block 1
  Measuring transducer type: Flow

» » » Measuring range
Initial value: 0
Final value
» » » Operating range
Unit: Unit of volume/unit of time [m^3/s, m^3/h, l/s, ...] or
Unit of mass/unit of time [kg/s, t/min, ..]
Initial value: 0
Final value
» » » Characteristic curve
Characteristic curve type: Extracted

- To record the current flow, use the function block 1 – analog input. Create an association between the measured flow value and the initial value by setting the following parameters:
  » Output
  » » Function block 1 – analog input
  Channel: Measured value (primary variable)
  » » » Measured value scaling
  Initial value, final value: as for operating range
  » » » Output scaling
  Unit, initial value, final value: as for operating range

- To record the flowed quantity (mass or volume), use the counter function block.
  » Output
  » » Counter function block
  Channel: Measured value (primary variable)
  Unit (counter)

- If your reference configuration does not contain the operating mode settings (reset counter or operating mode), you should also set the following parameters using SIMATIC PDM:
  » Output
  » » Counter function block
  » » » Operating mode
  Operating mode: [Pos. and neg. values | only positive values]
  Counter output: Figures.

5.2.3.1 Application point for the root function, creep quantity suppression

If you want to avoid the error which occurs at low flow quantities, there are two possibilities, which you can also use in combination:

- The application point of the root function determines the point below which the root function becomes linear.
- Creep quantity suppression sets the measured flow quanity to 0, when the value falls below the preset limit.

In each case, enter the application point as a % of the operating range (volume flow).

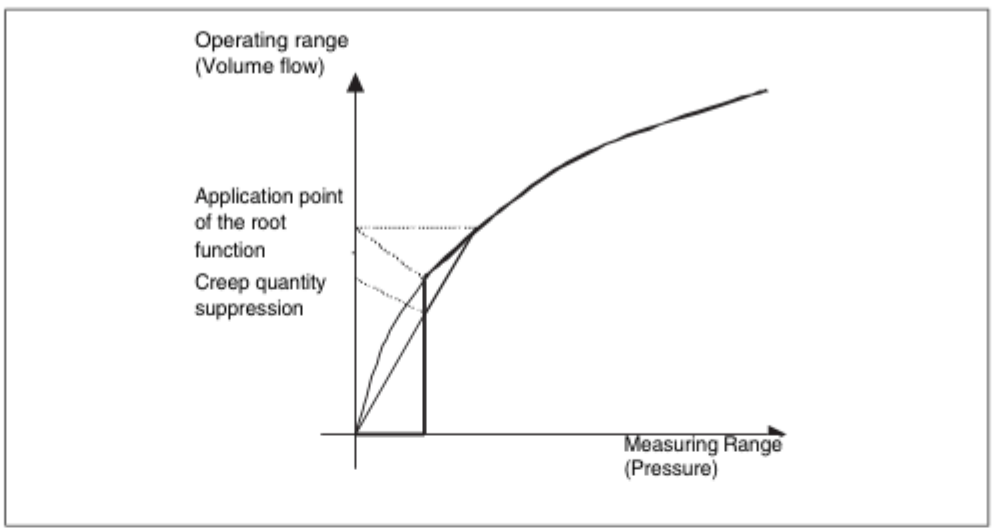


Figure 22 Application point of the root function and creep quantity suppression

5.2.3.2 Flow measurement correction

If you want to carry out a correction as part of your application (e.g. to take account of the flow coefficient α and the expansion coefficient ε), select:

- Characteristic curve type: Root-extracted and characteristic curve
- Points: For a maximum of 31 points, provide an input value (measured volume flow) and an output value (corrected volume flow).

5.2.4 Adjustment to the desired process variable

The analog input function block is responsible for mapping the measured value onto the process value. Normally, you will want to switch the measured value directly onto the bus: The input and output range is then taken from the operating range. If, however, the measured pressure, the filling level or the flow has only an indirect but linear relationship to the process variable, assign starting and end values for the input range and for the output range, as described in the following examples:

Example 1:

You would like to assign the input range 1 to 4 Pa to the output range 0 to 100%.

- Set the measuring type “Pressure” as outlined in chapter 5.2.1, pg. 60
- Set the following parameters:
  - In the pressure measuring block:
    Unit of the measured value (primary variable) Pa
  - In the analog input function block:
    Input starting value: 1,0
    Input end value: 4,0
    Output starting value: 0,0
    Output end value 100,0
    Unit (Output): %

Example 2:

You would like to convert the input range 0 to 400 m^3 into 200 l barrels. The output range is, for example, 0 to 2000 barrels.

- Set the measuring type “Volume level” as outlined in chapter 5.2.2, pg. 60.
- Set the following parameters:
  - In the pressure measuring block:
    Unit of the measured value (primary variable) m^3
  - In the analog input function block:
    Input starting value: 0,0
    Input end value: 400,0
    Output starting value: 0,0
    Output end value 2000.0
    Unit (Output): Text
    Unit text (Output): Barrels

NOTE

The digital display can only display some of the ASCII character set and cannnot display all ASCII characters in capitals and lower case. If you enter the lower case letters f, g, j, p, q, t, x, y, z in the parameter “Unit text (Output)” using SIMATIC PDM, they can only be reproduced in capitals. The umlauts ä, ö, ü and ß, as well as all ASCII characters with a coding higher than 125, are reproduced as a block symbol with all segments turned on. You should therefore avoid language-specific characters.

5.2.5 Electric damping

Electric damping acts like a 1st order filter. According to the filter time constant you preset as T_{63} the output has reached 63% of a sudden change in pressure.

Set the following parameter in the analog input function block:

- Filter time constant: Desired time in the range 0 to 100s

5.2.6 Warning and alarm limits

The analog input and counter function blocks each have upper and lower warning and alarm limits for output or counter output. To prevent unstable display of the warnings and alarms, you can also provide a hysteresis.

Set the following parameters, according to the process conditions, in the analog input and/or counter function blocks:

- Limit-value hysteresis
- Upper warning limit
- Upper alarm limit
- Lower warning limit
- Lower alarm limit

If limits are exceeded, the output/counter output is accompanied by a status value, which you can evaluate in your user program:

Exceeding of the	Status hex.	Digital display
lower warning limit	89	G_137
upper warning limit	8A	G_138
lower alarm limit	8D	G_141
upper alarm limit	8E	G_142

Table 29 Limits and status displays

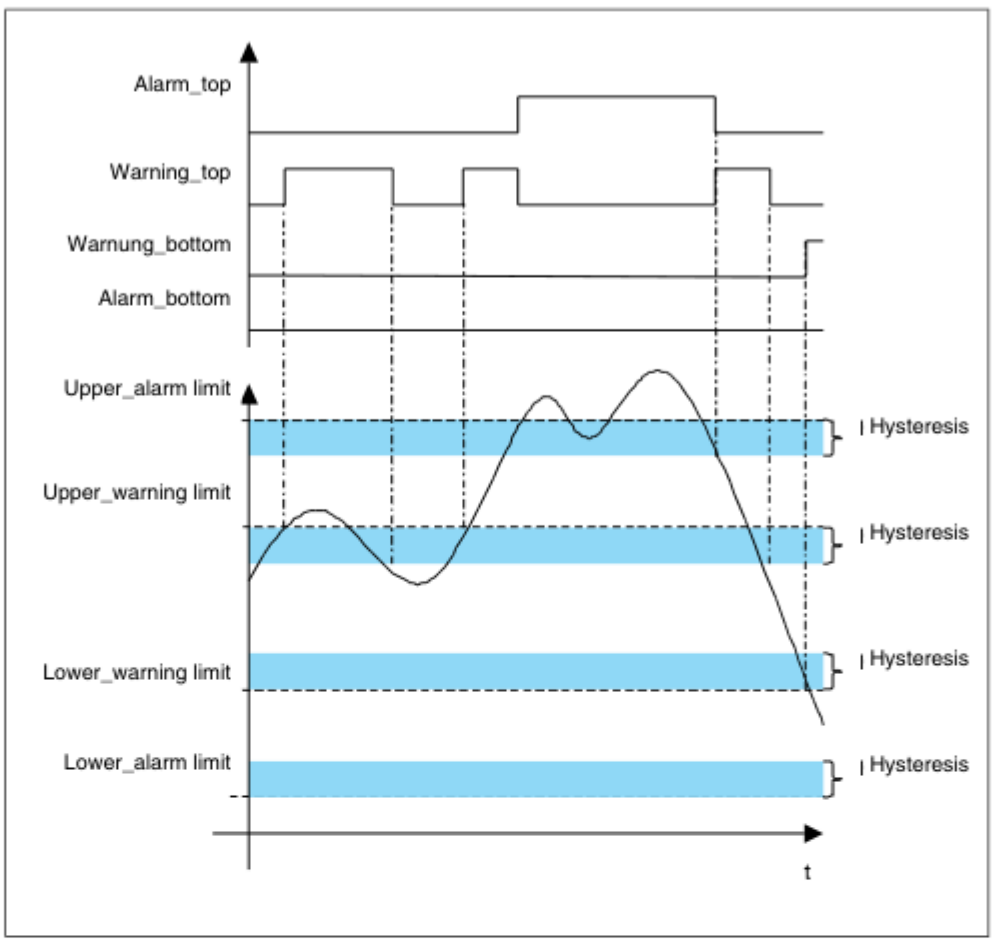


Figure 23 Warning and alarm limits

5.2.7 Fault Behavior

If the measuring block fails, the analog input and counter function blocks can take on behavior which you have preset. If the output variable of the measuring block is accompanied by a "bad" status due to an error, e.g. "Bad – sensor error", the function blocks actuate fault behavior. The output or counter output is then accompanied by an "uncertain" status.

5.2.7.1 Output

Set the fault behavior in the analog input function block:

Fault Behavior	Description
The replacement value is taken over to the output value	The predefined preset safety value is output (status code U_075)
Saving of the last valid output value	The last valid output value is output (status code U_071).
The incorrectly calculated measured value is close to the output. (Fault logic off)	The bad output value is accompanied by the status which the measuring block assigns to it (B_0xx)

Table 30 Fault behavior of the analog inpout function block

So that you can isolate the cause of the error with fault logic turned on, separate the primary or secondary variables including status using SIMATIC PDM.

5.2.7.2 Counter output

Set the fault behavior in the counter function block:

Fault Behavior	Description
Stop	If there are inputvalues with a bad status, the counting process is stopped (status code U_075)
Secure operation	The counting process continues with the last inputvalue before the fault which was accompanied by a "good" status (status code U_072)
Operation	The bad measured value is accompanied by the status which the measuring block assigns to it (status code B_0xx)

Table 31 Fault behavior of the counter function block

5.2.8 Simulation

Simulation functions assist you in commissioning part installations and the transmitter. You can create process values without recording actual values. The range of values of the simulated process values can be fully utilized: This means that errors can also be simulated.

From the output of the SITRANS P, Series DS III PA, you can gradually move closer and closer to the sensor, to test the measuring and function blocks.
On the digital display, you will see “Si” in the mode display when a simulation has been activated.

5.2.8.1 Output simulation

With output simulation, you can provide process values for cyclic user data traffic at the output of the SITRANS P, Series DS III PA using acyclic write accesses. In this way, you can test the processing of process values in the automation program

Carry out the following settings:

- Select output simulation.
- Set the target mode to MAN (manual).
- Enter the desired output value, the quality and the status.
- Transfer the settings from the program into the transmitter.

You can view the output behavior in e.g. SIMATIC PDM or using a table of variables (VAT module).

To return to normal operation, you have to set the target mode to AUTO.

5.2.8.2 Input simulation

With input simulation, you can test the adjustment of the measured value to the desired process variable, the monitoring of your preset process limits, electric damping and fault behavior.

Carry out the following settings:

- Select input simulation.
- Set the target mode to: AUTO
- Select the simulation mode “Enable”.
- Enter the desired input value, the quality and the status.
- Transfer the settings from the program into the transmitter.

You can view the behavior of the output in e.g. SIMATIC PDM.

To return to normal operation, you have to turn off the simulation.

5.2.8.3 Pressure sensor simulation

With pressure sensor simulation – as a fixed value or as a parameterizable slope (see Figure 24) – you can test adjustment, checking of the zero point movement, reaction to sensor limits being exceeded, as well as linearization and mapping onto the operating range.

With a parameterizable slope you can make the simulation value dynamic. It runs from a starting value to an end value in a step function, dwelling on each step for the preset period of time. At the end value, the direction is reversed.

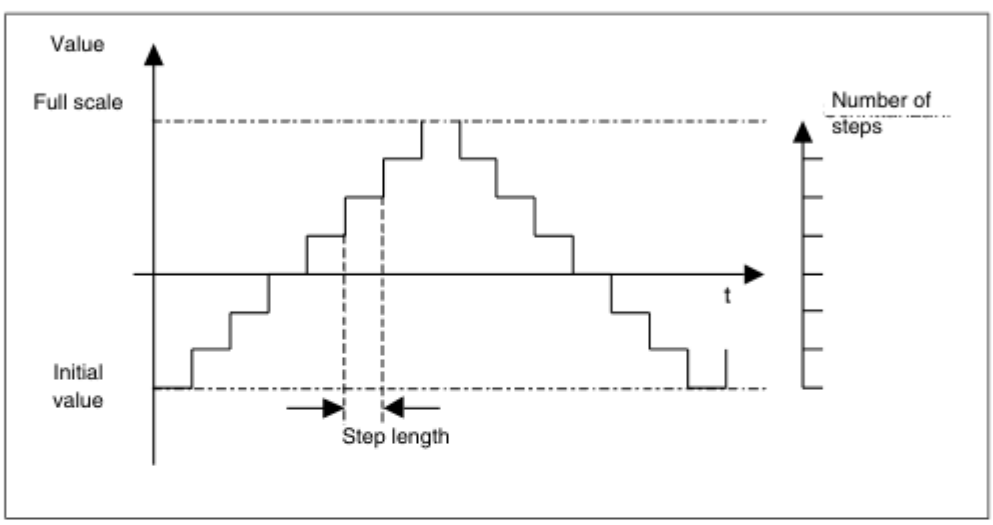


Figure 24 Parameterizable slope

Carry out the following settings:

- Select pressure sensor simulation.
- Set the simulation mode and the parameters:
  - simulation mode “fixed” and pressure value
  - simulation mode “slope” and slope parameters
- Transfer the settings from the program into the transmitter.

You can view the behavior of the measured values (primary variables), secondary variables 1, 2 and 3 and the output in SIMATIC PDM.

To return to normal operation, you have to turn off the simulation.

5.2.8.4 Simulation of the sensor and electronics temperature

With simulation of the sensor and electronics temperature, you can test, for example, the influence of too high a temperature on the measuring results:

- Select simulation of sensor and electronics temperature.
- Continue as for pressure sensor simulation (chapter 5.2.8.3, pg. 71).

You can view the reaction in the status of the measured values (primary variables), secondary variables 1,2, and 3 and the output using SIMATIC PDM.

To return to normal operation, you have to turn off the simulation.

5.2.9 Calibration interval and service interval

Two timers are contained in the SITRANS P, Series DS III PA:

- a timer for the calibration interval, which you can use to ensure regular calibration of the electronics,
- a timer for the service interval which draws attention to the fact that servicing of the measuring cell and its connections will soon be required.

The interval length can be selected. The timers can monitor in two stages and first issue a warning, then an alarm (see Figure 25).

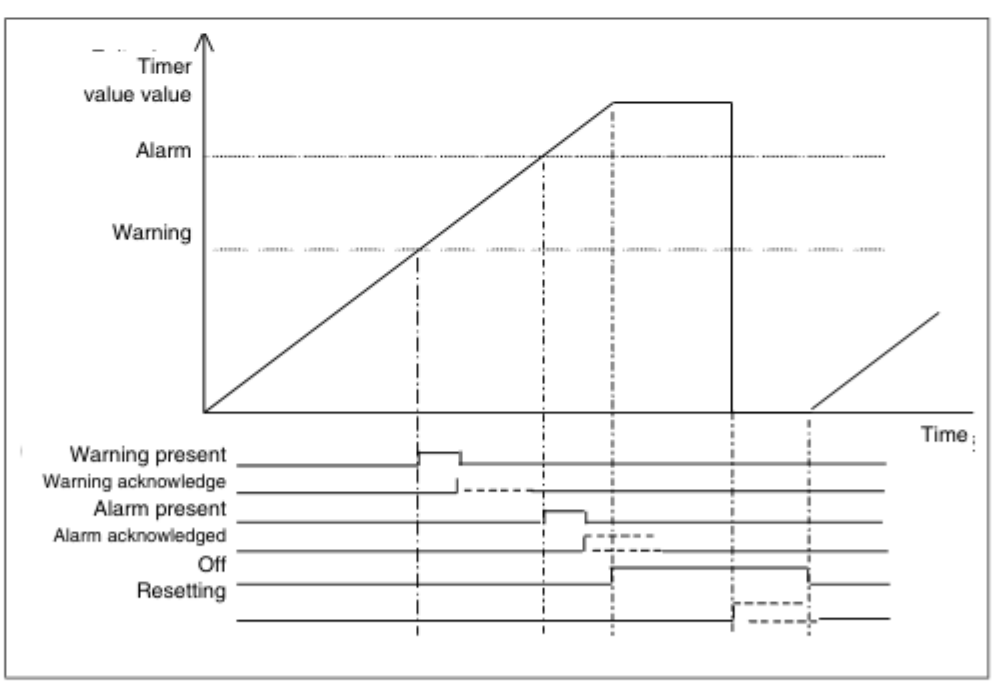


Figure 25 Calibration and service intervals

Set the calibration and service intervals as follows:

- Set the parameters for warning/alarm.
- Enter the time, after which a warning should be issued.
- Enter the additional time after which an alarm should be issued – when a warning has already occurred.

5.2.9.1 Warning

As soon as the warning interval has expired, the first monitoring stage issues a warning. Measured values are accompanied by the status “Good, maintenance required” and the diagnostic message “Maintenance required” is displayed. SIMATIC PDM can also display the calibration or service status and the value of the timer.

- Acknowledge the warning. The diagnostic message is removed and the status is reset to “Good”.
- Carry out the calibration or service and reset the timer.

5.2.9.2 Alarm

If calibration or servicing is not carried out at the correct time, the second monitoring stage issues an alarm, which draws attention once again to the fact that maintenance is urgently required. Measured values are accompanied by the status “Uncertain, value inaccurate” and the diagnostic message “Maintenance required” is displayed.

- Acknowledge the alarm. The diagnostic message is removed and the status is reset to “Good”.
- Carry out the calibration or service and reset the timer.

5.2.10 Slave pointers

The device contains three pairs of slave pointers with which you can monitor the three measuring variables pressure, sensor temperature and electronics temperature for negative and positive peak values. For every measuring variable, one resettable and one non-resettable slave pointer saves the maximum and minimum peak values.

The non-resettable slave pointers document the maximum and mimimum values which have occurred over the whole life cycle of the device.

The resettable slave pointers are updated manually or when the pressure sensor, sensor temperature or electronics temperature is simulated (see chapter 5.2.8.3, pg. 71 and chapter 5.2.8.4, pg. 72).

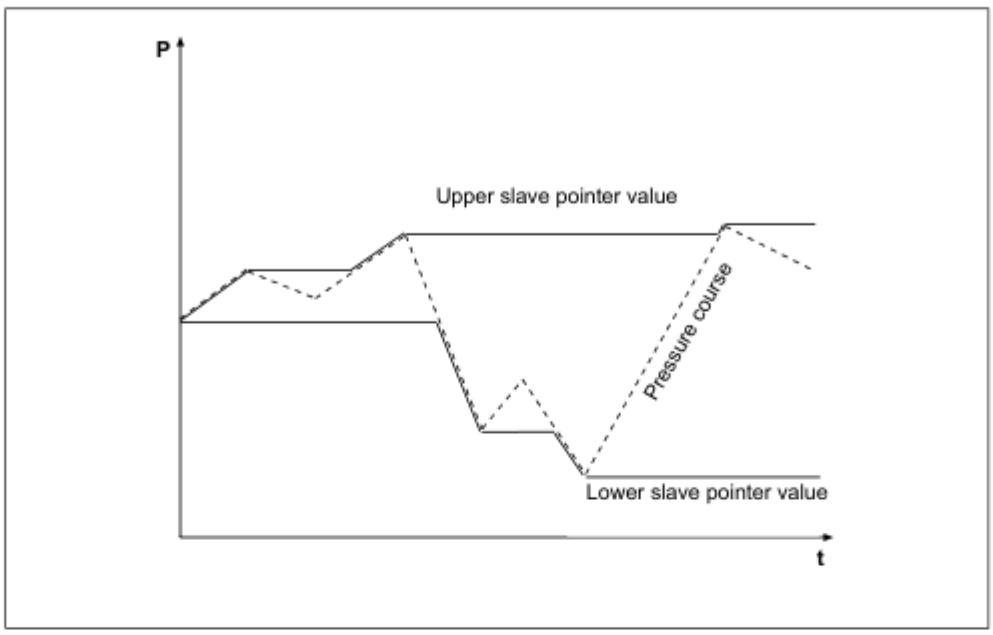


Figure 26 Principle display of slave pointers using pressure as an example

5.2.11 Operating hours counter

You can select one operating hours counter each for the electronics and the sensor. They are activated the first time the transmitter is started.

5.2.12 Sensor adjustment

Sensor adjustment allows you to calibrate the transmitter. In the same way as Mode 19 and 20 of local operation (see chapter 4.2.12, pg. 56 and chapter 4.2.13, pg. 57) you can change the slope of the characteristic curve of each transmitter.

You can determine the course of the characteristic curve using one lower and one upper adjustment point.

You can change the slope of the characteristic curve to a minimum of 0.9 and a maximum of 1.1. A larger deviation from a gradient of 1.0 does not lead to the relevant adjustment point being saved.

The lower adjustment point must be selected to be at least that distance away from the upper, which will observe the smallest adjustment range.

The smallest adjustment range is displayed in the sensor adjustment dialog and depends on the measuring range. If, during adjustment, the range falls below the smallest range set, the measured values are accompanied by the following status coding:

“Quality bad, configuration error”.

In this case, you should re-adjust the lower or upper adjustment point to give a sufficiently large adjustment range.

- An adjustment of the lower point is carried out as follows:
  - Call up the “Sensor adjustment" dialog.
  - Apply the reference pressure for the lower adjustment point.
  - Enter the value of the reference pressure in the “Lower adjustment point” field.
  - Click on “Transmit”.
  - In the field “Corrected non-linearized pressure value”, you can view the effect of the adjustment. In the “Lower adjustment point” field, you can see whether or not the new adjustment point has been transferred.
- An adjustment of the upper point is carried out as follows:
  - Call up the “Sensor adjustment" dialog.
  - Change to the “Upper adjustment” tab.
  - Apply the reference pressure for the upper adjustment point.
  - Enter the value of the reference pressure in the “Upper adjustment point” field.
  - Click on “Transmit”.
  - In the “Corrected non-linearized pressure value” field, you can view the effect of the adjustment. In the “Upper adjustment point” field, you can see whether or not the new adjustment point has been transferred.

After you have adjusted both points, the quality of the measured value should be “Good”. If “Quality bad, configuration error” is displayed, then you have fallen below the lowest adjustment range. You must increase the distance between the adjustment points, by moving one of the two points.

5.2.13 Positional error adjustment

Outside influences such as installation location, ambient temperature or installation-dependent admission pressures (e.g. hydraulic column in the pressure pipe to the transmitter) can move the original zero point. You can correct this inconsistency here within the following limits.

- Differential pressure: -100 % to +100 % of the nominal measuring range
- Pressure: -100 % (not more than –1 bar, however) up to +100 % of the nominal measuring range
- Absolute pressure:Positional error adjustment not possible;
- You carry out a positional error adjustment as follows:
  - Call up the “Positional error adjustment” dialog
  - Create a pressure adjustment
  - Click on “Transmit”

5.2.14 Resetting

5.2.14.1 Resetting to delivery status

If the SITRANS P, Series DS III PA, has been adjusted to such an extent that it can no longer fulfil its measuring tasks, you can recreate the delivery status with this function. It resets all parameters to the factory settings, with the exception of the PROFIBUS address (see chapter 5.2.14.3, pg. 77), the device operating mode (see chapter 4.2.9, pg. 54), the static inspection number in Transducer Block 1, in the analog input and counter function block.

Resetting is displayed by the diagnostic message “Cold starting in progress”. As long as there is no measured value result, the automation or control system records the status “Uncertain, initial value, value constant”.

5.2.14.2 Restart (warm start)

For a warm start you will need to turn off the SITRANS P, Series DS III PA, and restart it. Communication is interrupted and re-established.

You will need this function if, for example, during communication with a cyclic Master, the PROFIBUS address has been changed.

This restart is displayed by the diagnostic message "New start-up (warm startup) carried out". As long as there is no measured value result, the automation or control system records the status “Uncertain, intial value, value constant”.

5.2.14.3 Resetting the PROFIBUS address to 126

If no other device in your system has the preset address 126, you can extend the PROFIBUS-PA channel during operation of the automation or control system with your SITRANS P, Series DS III PA. You then have to change the address of the newly integrated device to another value.

If you remove a SITRANS P, Series DS III PA from the PROFIBUS channel, you should use this function to reset its address to 126 so that, if required, it can be re-integrated into another system.

5.2.15 Operator input inhibits

You can set operator input inhibits according to the following table.

Operator input inhibit	Effect	Turn on/off	Digital display
Keylock and function disable	Parameter changes using SIMATIC PDM and settings via local operation are disabled. Independent of the other operator input inhibits.	Keyboard Mode 10	L
Write protection	Password protection for changing parameters via the bus. Local operation is possible.	SIMATIC PDM	LC
Enable local operation	If local operation is not enabled, no access is possible using the keyboard. Independently of this parameter, local operation is automatically enabled 30 s after a communiation failure. Once communication has been re-stablished, the parameter “Enable local operation" in the device is reset to the original setting.	SIMATIC PDM	LA
Combination of write-protection and local operation not being enabled	Has the same effect as an active keylock. Parameters (except operator input inhibits) cannot be changed via local operation or using SIMATIC PDM.	SIMATIC PDM	LL

Table 32 Operator input inhibits

You can also combine the operator input inhibits:

Key lock and function disable	Write-protection for changing parameters via the bus	Enable local operation using SIMATIC PDM	Digital display
On	On or off	enabled or disabled	L
Off	Off	disabled	LA
Off	Off	enabled	
Off	On	disabled	LL
Off	On	enabled	LC

Table 33 Combined operator input inhibits

Modular design

6

WARNING

This device has a modular design. This gives you the opportunity to replace various components with original spares. When replacing a component, please ensure that you always observe the instructions enclosed with the component to be replaced.

This applies particularly to devices used in areas with a risk of explosion.

Summary

The two individual components *measuring cell* and *electronics* both have a non-volatile memory (EEPROM). Each contains a data structure which is permanently assigned to the measuring cell or the electronics. Measuring cell data (e. g.: measuring range, measuring cell material, oil filling etc.) is stored in the measuring cell's EEPROM. Data for the electronics (e.g.: turn-down, additional electric damping etc.) are in the electronics' EEPROM. This ensures that the data relevant to the remaining component are retained when one component is exchanged.

Before replacing components you can set, via PROFIBUS, whether the common measuring range settings are to be taken from the measuring cell or the electronics after the exchange or whether standard parameters should be set. The measuring accuracy within the specified measuring limits (with gear reduction 1:1) may be reduced by the temperature error under unfavorable conditions.

In the course of further technical development, extended functions may be implemented in the measuring cell or electronics. This is identified by a changed firmware version (FW). The firmware version has no influence on the exchangeability. However, the scope of functions is restricted to the function of the respective older component.

If a particular combination of the firmware statuses of the measuring cell and electronics is not possible for technical reasons, the device detects this and displays the status “Fault current”. This information is also provided via the PROFIBUS interface.

Installation 7

The installation types described below should be seen as typical examples. Depending on the system configuration, installation types differing from these may also be possible.

WARNING

Protection against incorrect user of the measuring device:
It must be particularly ensured that the selected materials of the process-wetted parts of the measuring device are suitable for the process media used. Failure to observe this precaution could endanger life and limb and the environment.

CAUTION

At surface temperatures > 70 °C a touch protection should be provided. The touch protection must be designed so that the max. permissible ambient temperature of the device is of exceeded.

CAUTION

The device may only be used within the medium pressure limits and voltage limits specified on the rating plate depending on the explosion protection type with which the device is operated.

NOTICE

External loads may not be applied to the transmitter.

WARNING

Explosion proof devices may only be opened when the power is off.

Notes on operation of the intrinsically-safe version in hazardous areas:

Operation is only permitted on circuits which are certified as intrinsically safe. The transmitter is compliant with Category 1 / 2 and may be installed at zone 0.

The EU type examination certificate applies for installation in the walls of containers and pipes which may contain explosive gas/air or vapor/air mixtures only under atmospheric conditions (pressure 0.8 bar to 1.1 bar, temperature -20 °C to +60 °C). The permissible ambient temperature range is -40 °C to +85 °C, in explosion hazard areas -40 °C to maximum +85 °C (T4).

The user max also apply the device in non-atmospheric conditions outside the limits set in the EC-Type Examination Certificate (or the valid test certificate for its country), according to the conditions for use (explosive mixture) and if the required additional security measures have been met. The limit values stated in the general technical data must be observed in any cases.

Additional requirements are necessitated in the case of instalation at zone 0:

The installation must be adequately sealed (IP 67 to DIN EN 60 529). An industrial standard (e.g. DIN, NPT) threaded joint is suitable for example.

When operating with intrinsically safe power supply units of the "ia" category, the explosion protection does not depend on the chemical resistance of the seal diaphragm.

When operation with intrinsically safe power supply units of the "ib" category or for units with explosion proof type of protection "Ex d" and simultaneous use at zone 0, the explision protection of the transmitter depends on tightness of the diaphragm. Under these operating conditions, the transmitter max only be used for those imflammable gases and liquids to which the diaphragms are adequately chemically resistant to avoid corrosion.

7.1 Installation (except filling level)

The transmitter can be arranged above or below the pressure tapping point.

When measuring gases we recommend installing the transmitter **above** the pressure tapping point and laying the pressure line with a constant downward gradient to the pressure tapping point so that condensation which forms can drain into the main line and the measured value is not falsified (for recommended installation see chapter 8.1.1, pg. 97).

When measuring vapors and liquids the transmitter should be installed **below** the pressure tapping point and the pressure line should have a constant upward gradient so that gas entrapped in the main line can escape (for recommended installation see chapter 8.1.2, pg. 98).

The installation point should have good access, if possible in the vicinity of the measuring point and should not be exposed to strong vibration. The permissible ambient temperature limits (see chapter 9, pg. 103 for further information) may not be exceeded. Protect the transmitter from direct heat radiation.

The operating data must be compared with the values specified on the rating plate before assembly.

The housing may only be opened for maintenance, local operation or electrical installation.

Suitable tools must be used for connecting the transmitter on the pressure side. Do not rotate the housing, to install the process terminal.

Observe the installation instructions on the housing!

7.1.1 Mounting without mounting bracket

The transmitter may be mounted directly at the process connection.

7.1.2 Mounting with mounting bracket

The mounting bracket is fastened

- to a wall or a mounting rack with two screws
  or
- with a pipe bracket to a horizontal or vertical mounting pipe (∅ 50 to 60 mm)

The transmitter is fixed to the mounting bracket with two screws (enclosed).

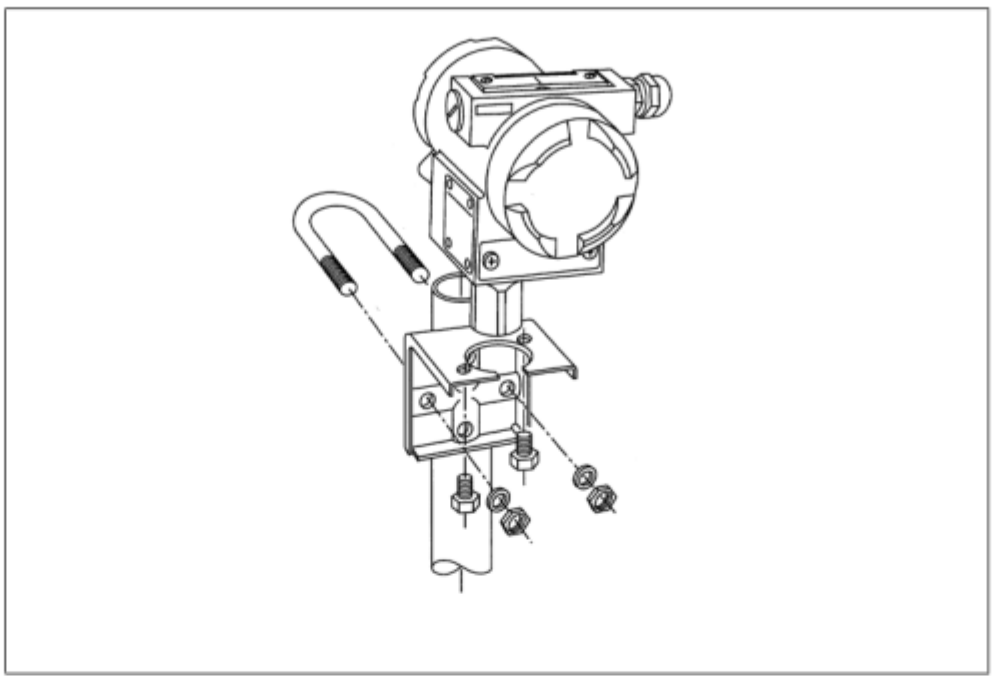


Figure 27 Mounting the SITRANS P, Series DS III PA transmitter, with mounting bracket

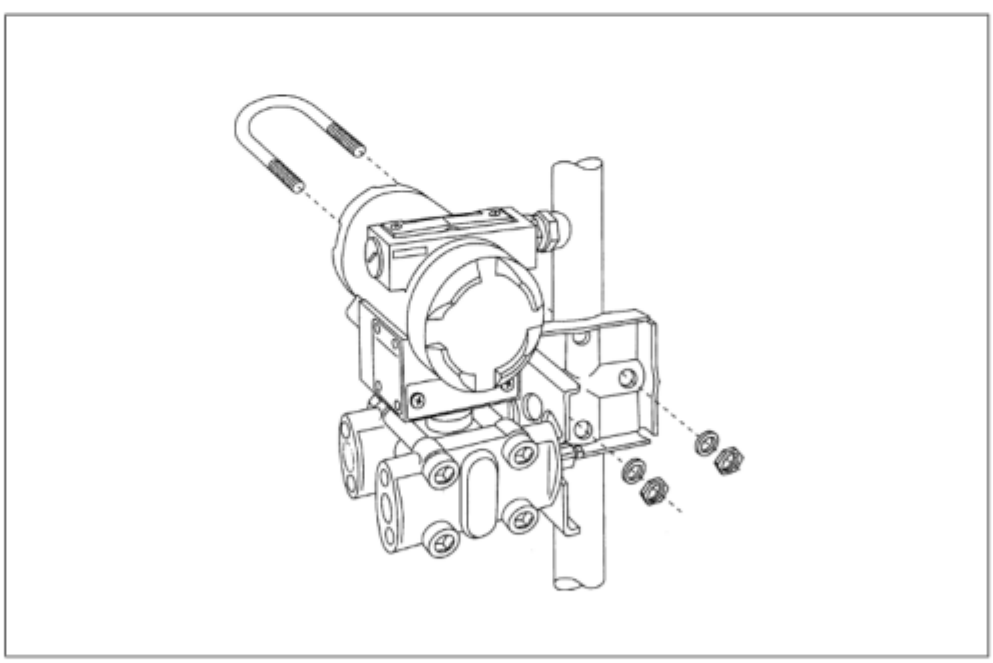


Figure 28 Mounting the SITRANS P, Series DS III PA transmitter, with mounting bracket (example differential pressure, horizontal active pressure lines)

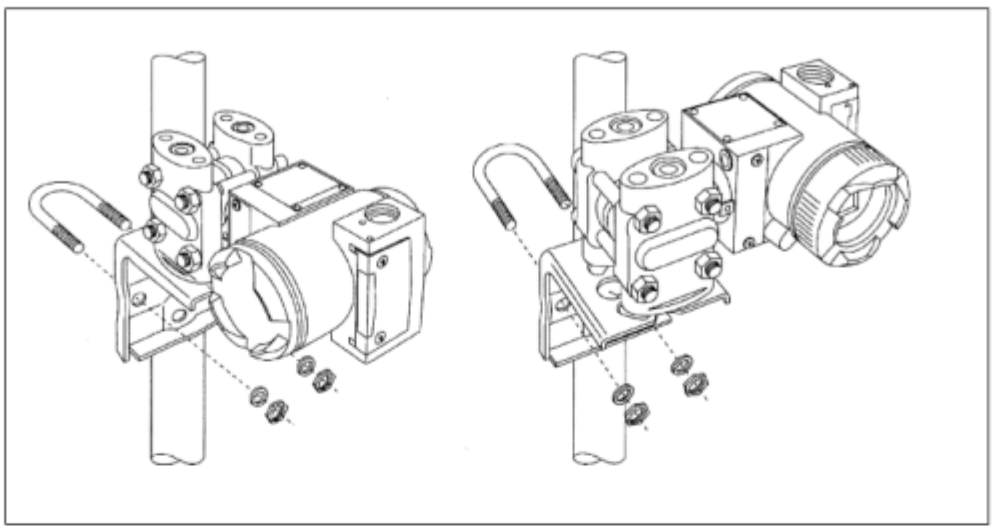


Figure 29 Mounting the SITRANS P, Series DS III PA transmitter, with mounting bracket (example differential pressure, vertical active pressure lines)

7.2 Mounting “filling level”

7.2.1 Installation

Before installing, check whether the transmitter satisfies the operating conditions (material, sensor length, measuring span)

The installation location must be easily accessible and free from vibration. The permissible ambient temperatures may not be exceeded. Protect the transmitter from heat radiation, rapid temperature fluctuations, heavy soiling and mechanical damage.

The height of the container flange for mounting the transmitter (measuring point) must be chosen so that the lowest liquid level to be measured is always above the flange or at its top edge.

1. Screw the flange of the transmitter (for dimensions see Figure 44, pg. 110) after fitting a seal (e.g. flat sealing ring DIN EN 1514-1) to the counterflange of the container (seal and screws are not included in the delivery). The seal must be central and must not restrict the mobility of the flange’s seal diaphragm at any point.
2. Observe the installation position!

7.2.2 Connecting the low pressure line

No line is necessary when measuring on the open container (Figure 30, page 85) because the low pressure chamber is connected to the atmosphere. The open connecting pipe should point downwards to prevent dirt getting in.

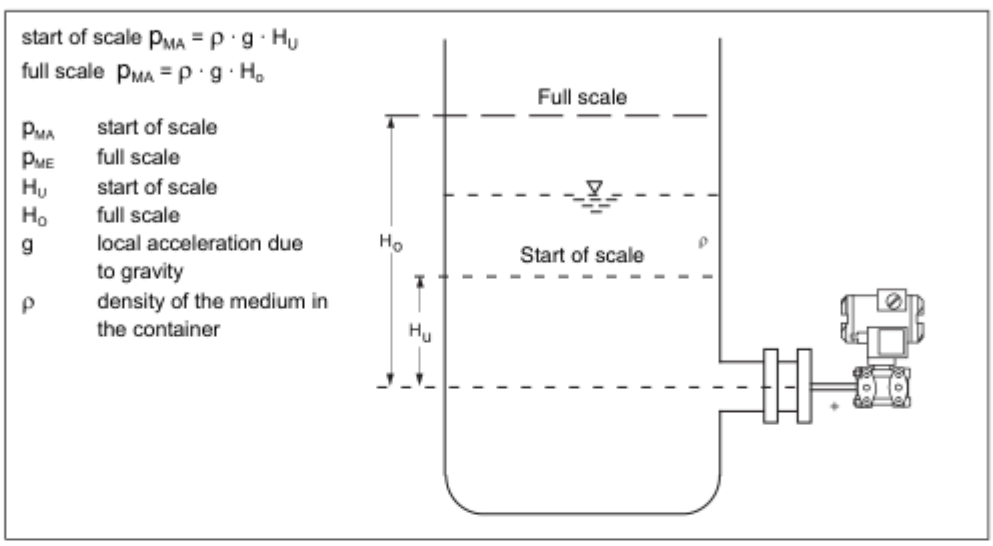


Figure 30 Measuring setup on the open container

When measuring on the closed container without or with only slight condensation (Figure 31, page 86) the low pressure line remains unfilled. The line must be laid so that no condensate sacks can form, you may have to install a condensation vessel.

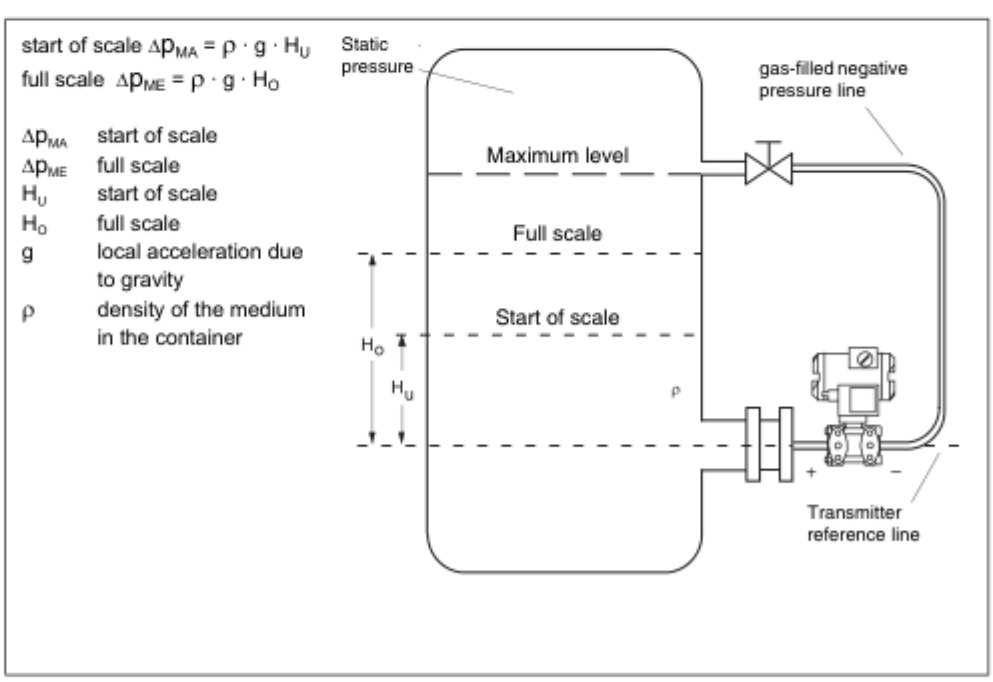


Figure 31 Measuring set up on the closed container (no or only slight condensation escape)

When measuring on the closed container with strong condensation formation (Figure 32, page 87), the low pressure line must be filled (usually with medium condensate) and a calibration vessel must be installed. The device can be shut off, for example using a double valve manifold 7MF9001-2.

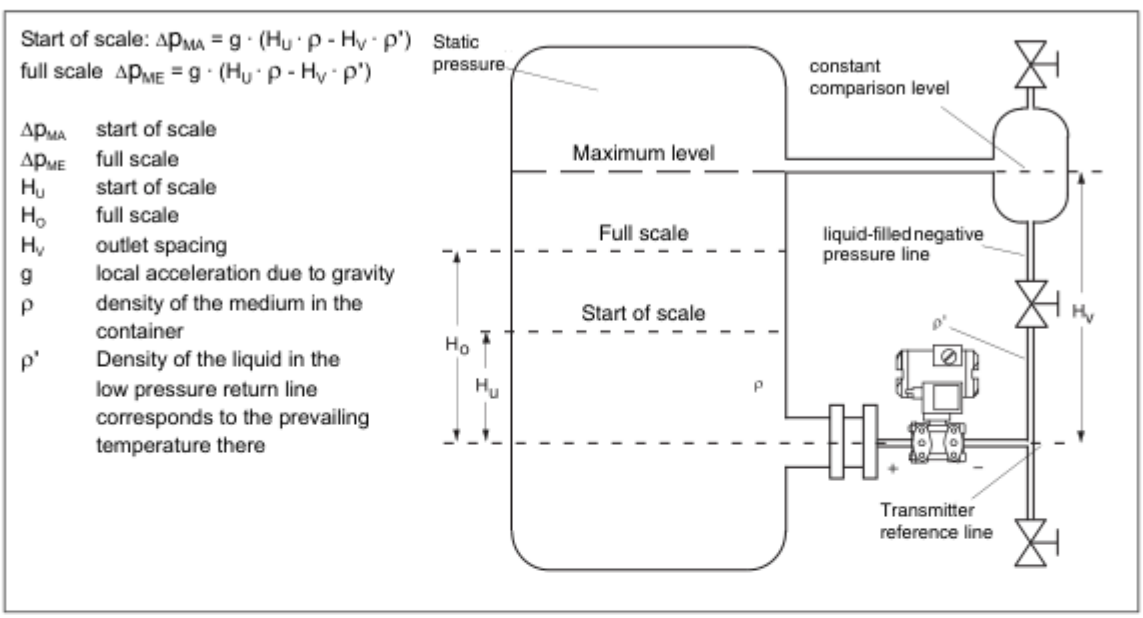


Figure 32 Measuring setup on the closed container (strong condensation formation)

The process connection on the low pressure side is a female thread $^1/_4$-18 NPT or an oval flange.

The line for the low pressure must be made e.g. of 12 mm x 1.5 mm seamless steel pipe. See Figure 28, page 84 and Figure 32 for shutoff valves.

7.3 Rotating the measuring cell in relation to the housing

If necessary, you can rotate the electronics housing in relation to the measuring cell in the SITRANS P, Series DS III PA transmitter so that the digital display (in housing covers with a window) is visible and access to the input keys and the current connection for an external measuring instrument is possible.

Only limited rotation is permitted! The range of rotation (1, Figure 33, page 88) is marked at the base of the electronics housing, there is an orientation mark (3) on the neck of the measuring cell which must stay within the marked area when rotating.

1. Loosen the locking screw ((2), hexagon socket head 2.5 mm).
2. Rotate the electronics housing in relation to the measuring cell (only within the marked area)
3. Tighten the locking screw (torque 3.4 to 3.6 Nm).

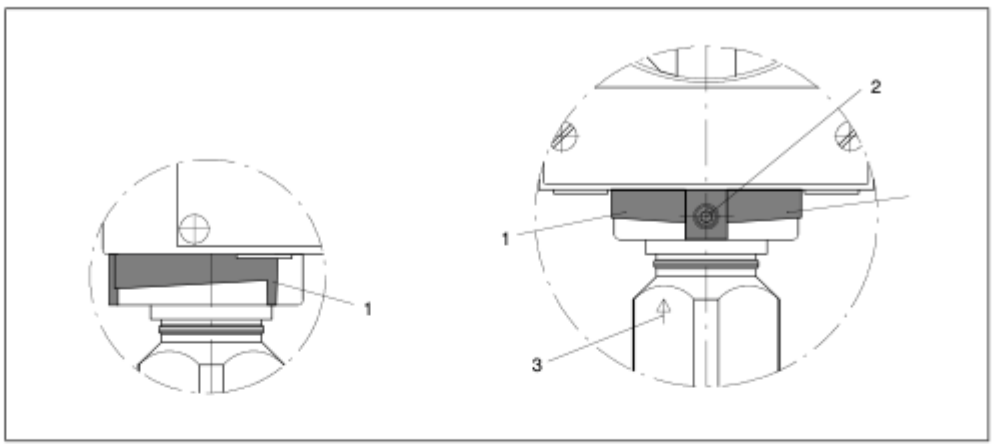


Figure 33 Range of rotation of the measuring cell (in pressure and absolute pressure transmitters of the pressure series)

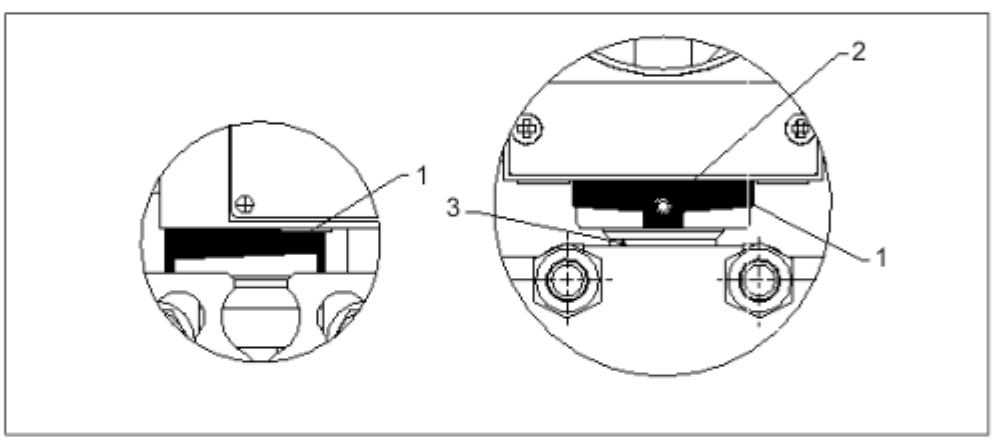


Figure 34 Range of rotation of the measuring cell (in differential pressure and flow and absolute pressure transmitters from the differential pressure and filling level series

CAUTION

The range of rotation must be observed otherwise destruction of the electrical connections of the measuring cell cannot be ruled out.

7.4 Electrical Connection

WARNING

The specifications of the examination certificate valid in your country must be observed.

Laws and regulations valid in your country must be observed for the electrical installation in explosion hazardous areas. In Germany these are for example:

- Working reliability regulations
- Regulations for installing electrical equipment in hazardous areas DIN EN 60079-14.

It should be checked whether the available power supply is compliant with the power supply specified on the type plate and specified in the examination certificate valid in your country. Dust-proof protection caps in the cable inlets must be replaced by suitable screwtype glands or dummy plugs which must be appropriately certified for transmitters with explosion-proof type of protection!

NOTE

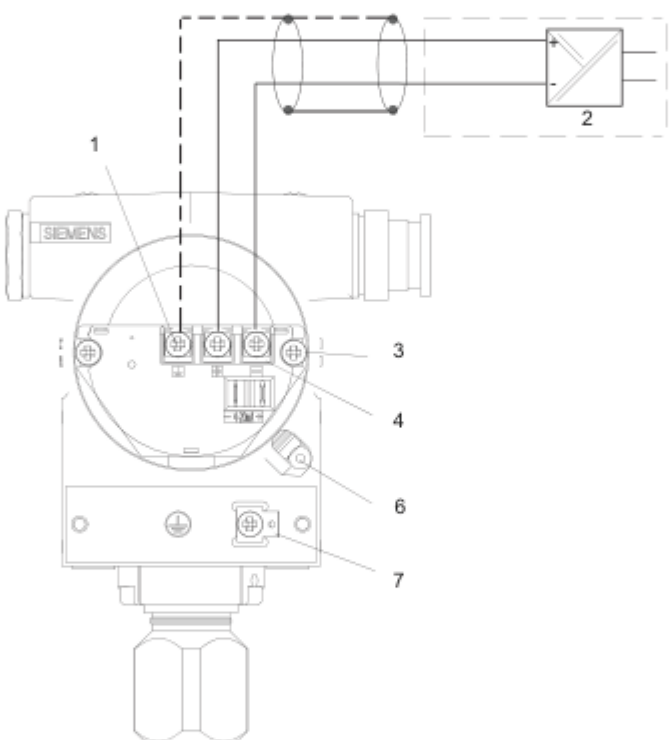
To improve interference it is recommended to:

- lay signal cables separately from cables with voltages >60 V.
- use cables with twisted wires.
- avoid the vicinity of large electrical installations or use shielded cables.
- use shielded cables to guarantee the full specification according to HART.
- use a load of at least 230 ohms in the signal circuit to guarantee error-free communication. When using feed separators for SMART transmitters, e.g. Siemens 7NG4021, a load is already built into the device.
- Only use cables with a diameter of 6 to 12 mm in the standard screwed glands M20x1.5 and ½-14" NPT for reasons of tightness (IP degree of protection).
- In devices with "n" type of protection (Zone 2) only use cables with a diameter of 8 to 12 mm or a suitable screwed gland for a smaller diameter for reasons of tensile strength.

7.4.1 Connection to screw terminals

Make the electrical connection as follows:

1. Unscrew the cover of the connection box (marked “FIELD TERMINALS” on the housing).
2. Insert the connecting cable through the cable gland.
3. Connect the wires to the “+” and “-” terminals (Figure 35, page 90). Despite the markings, the polarity is not important.
4. Connect the screen to the screen screw if necessary. This is connected to the outer earth terminal. The polarity is unimportant although it is indicated.
5. Screw on the housing cover.



1 Screen plate
2 Power supply
3 Screws for fastening the terminal strip
4 Terminals
5 Test plug for DC ammeter or connection facility for external display
6 Cover catchr
7 PE conductor connection/Equipotential terminal

Figure 35 Electrical connection, schematic diagram

WARNING

In explosion-proof transmitters the housing cover must be screwed on tightly and secured with the cover catch.

7.4.2 Connection with plug M12

For devices on which a plug is already installed on the housing of the SITRANS P, DS III PA series, the bus connection to the PROFIBUS PA is created with a mating connector.

1. Thread the pressure screw, clamping cage, seal, screening ring and coupling sleeve onto the field bus cable, see Figure 37, page 92
2. Strip the insulation from the bus cable according to Figure 36, page 91.
3. Pull insulated tubing over the screen * or solder the screen to insulated wire** (0.25 mm^2)
4. Pull a shrink-on sleeve over the cable, wires and screen in the insulated tubing or pull the wire

CAUTION

There should not be a conductive connection between the screen and the connector housing !

5. Screw the cable ends and the screen (in the insulated tubing) tightly in the pin insert
6. Pull the coupling sleeve up to the shrink-on sleeve to screw it tightly in the inside thread of the pin insert.
7. Push the screening ring with seal into the coupling sleeve.
8. Push the seal, clamp cage and pressure screw up to the screening ring and tighten the pressure screw by hand

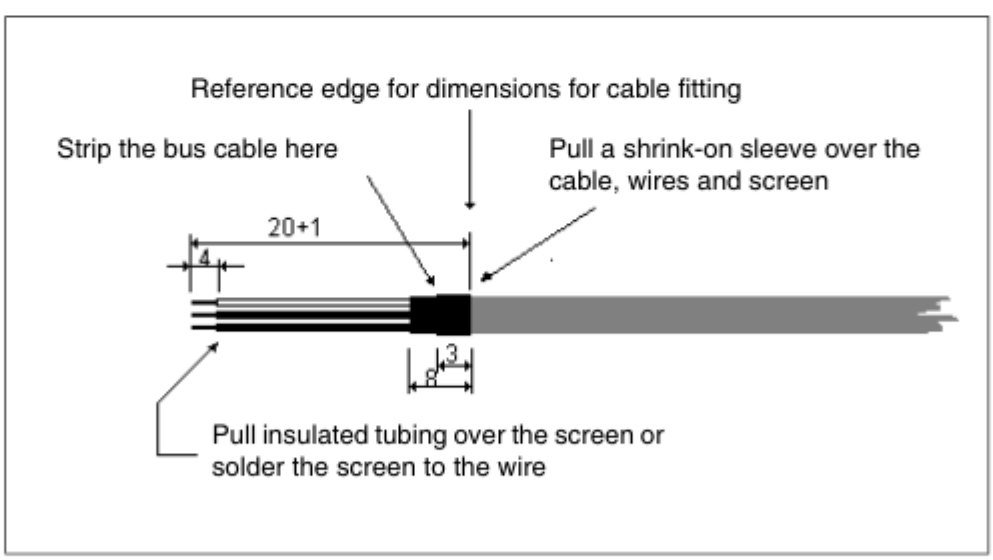
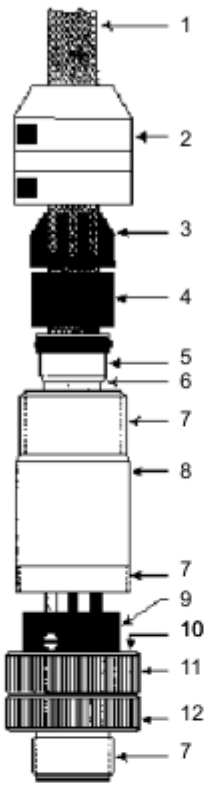


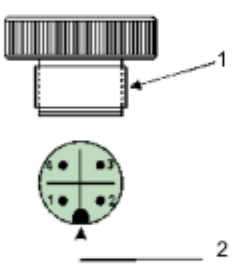
Figure 36 Preparing the cable

* twist shield and pull through the insulated tubing
** Twist and shorten screen and solder it to the wire



1 Double pole field bus cable with screen
2 Pressure screw
3 Clamp cage
4 Seal
5 Screening ring with seal
6 Reference edge for dimensions for cable assembly
7 Thread
8 Coupling sleeve
9 Pin insert for screw terminal connection
10 Inside thread
11 Fixed knurl
12 Rotating knurled screw

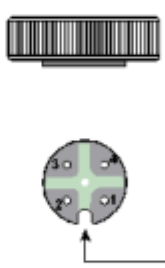
Figure 37 Components of the M12 bus connection



Front view of pin insert and pins

1 Thread M12 x 1
2 Positioning lug

PIN	PROFIBUS PA
1	PA+
2	Not connected
3	PA-
4	Screen



Front view of sleeve insert and sleeves

1 Positioning nut

PIN	PROFIBUS PA
1	PA+
2	Not connected
3	PA-
4	Screen

Middle contact tube is not fitted

Figure 38 Pin assignment

7.5 Turn digital display

If the device cannot be operated in a vertical position you can turn the digital display to make it easier to read. To do this, proceed as follows:

1. Unscrew the cover from the electronics housing.
2. Unscrew the digital display. Depending on the position of the transmitter you can screw it back in four different positions (rotated by ±90° or ±180° possible).
3. Screw on the housing cover.

WARNING

Explosion-proof devices may only be opened with the power off.

Commissioning

8

The operating data must match the values specified on the rating plate. The transmitter is in operation when the power supply is switched on.

WARNING

In areas with a potential explosion hazard, the housing cover of transmitters with the ignition category "Pressure-proof encapsulation" may only be unscrewed when the device is not energized. If transmitters are to be used as category 1/2 equipment, please observe the examination certificates (enclosed as loose sheets).

The following applies for devices with the common admission "intrinsic safety" and "explosion-proof" type of protection (EEx ia + EEx d). The inapplicable type of protection must be permanently erased from the rating plate before putting into operation.

"Intrinsic safety" type of protection is no longer guaranteed in case of an improper power supply.

The following commissioning cases should be seen as typical examples. Depending on the system configuration, arrangements differing from these may make sense.

8.1 Pressure, absolute pressure from the differential pressure series and absolute pressure from the pressure series

WARNING

Incorrect or improper operation of the shutoff fittings (Figure 39, pg. 97) may result in serious injury or considerable material damage.

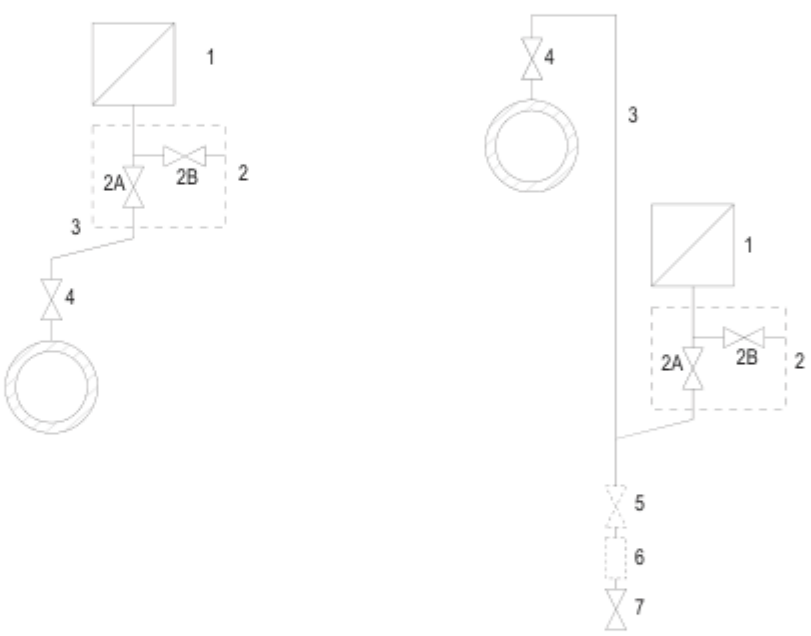
When using toxic media, the measuring transducer may not be vented.

8.1.1 Measuring gases

Operate the shutoff fittings in the following order:

Initial position: all valves closed

1. Open the shutoff valve (2B, Figure 39, pg. 97).
2. Apply pressure corresponding to the start of scale through the test connection of the shutoff fitting (2) to the transmitter.
3. Check the start of scale and correct it if necessary.
4. Close the shutoff valve (2B).
5. Open the shutoff valve (4) on the pressure tap.
6. Open the shutoff valve (2A).



Transmitter **above** the pressure tap (normal arrangement)

Transmitter **below** the pressure tap (exception)

1 Transmitter
2 Shutoff fitting
  A shutoff valve for the process
  B shutoff valve for test connection or venting screw
3 Pressure pipe
4 Shutoff valve
5 Shutoff valve (optional)
6 Condensation vessel (optional)
7 Drain valve

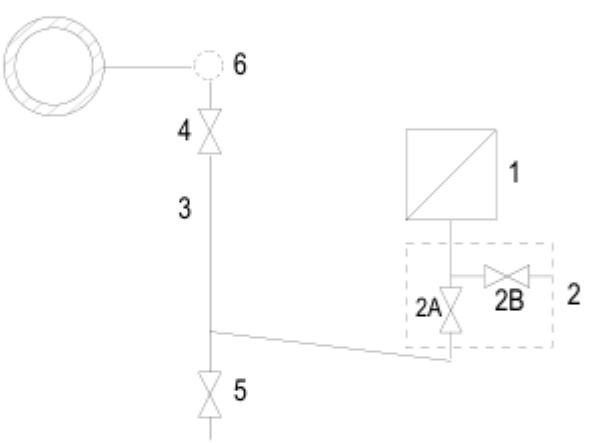
Figure 39 Measuring gases

8.1.2 Measuring vapor and liquid

Operate the shutoff fittings in the following order:

Initial position: all valves closed

1. Open the shutoff valve (2B, Figure 40, pg. 98).
2. Apply pressure corresponding to the start of scale through the test connection of the shutoff fitting (2) to the transmitter,
3. Check the start of scale and correct it if necessary.
4. Close the shutoff valve (2B).
5. Open the shutoff valve (4) on the pressure tap.
6. Open the shutoff valve (2A).



1 Transmitter
2 Shutoff fitting
A shutoff valve for the process
B shutoff valve for test connection or venting screw
3 Pressure pipe
4 Shutoff valve
5 Drain valve
6 Compensation vessel (for vapor only)

Figure 40 Measuring vapor

8.2 Differential pressure and flow

WARNING

– If the vent valve and/or the sealing screw are missing or are not tight enough

and/or

– if the valves are operated incorrectly or improperly,

serious injury or considerable material damage may result.

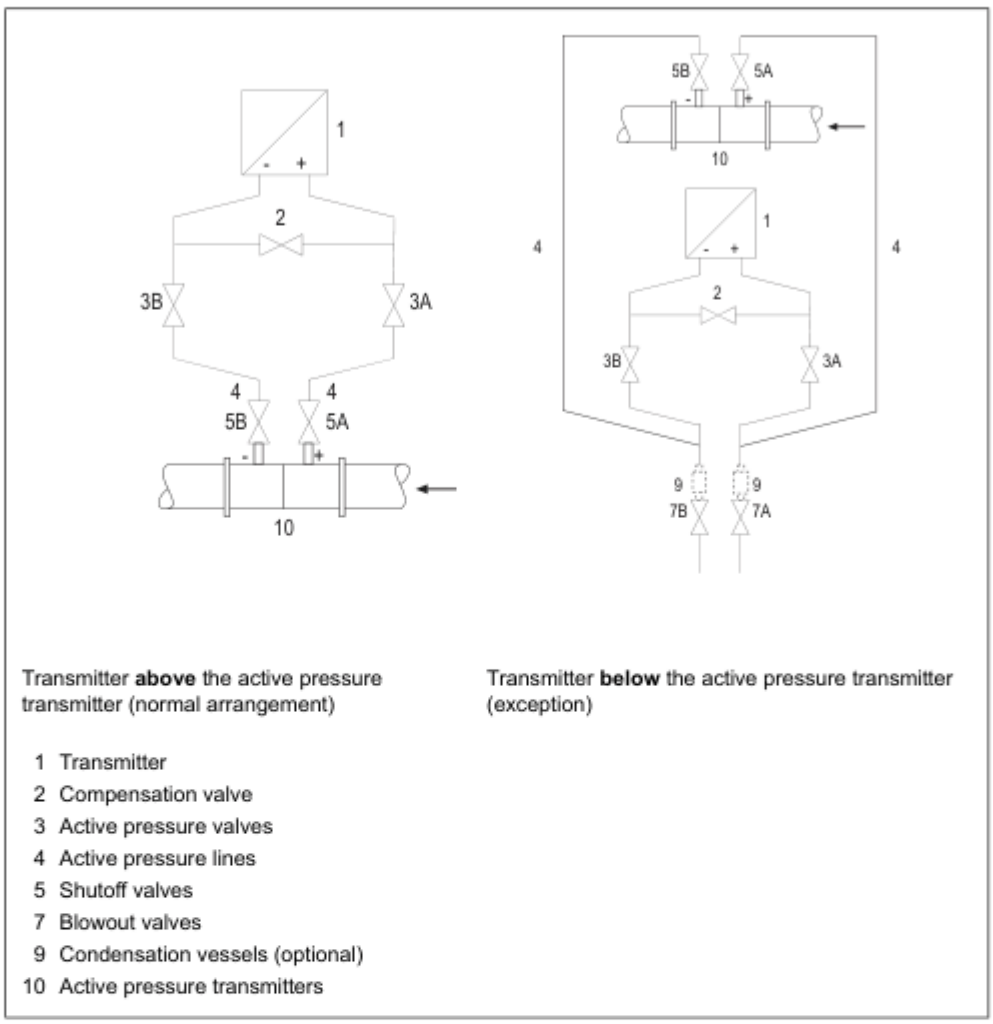
In the case of hot media the individual operating steps must be performed in rapid succession. Otherwise the valves and the transmitter may be heated up beyond the permissible limit, leading to damage.

8.2.1 Measuring gases

Operate the shutoff fittings in the following order:

Initial position: all shutoff valves closed

1. Open both shutoff valves (5, Figure 41, pg. 100) at the pressure taps
2. Open the compensation valve (2).
3. Open the active pressure valve (3A or 3B).
4. Check and correct zero point, if necessary, at start of scale 0 mbar.
5. Close the compensation valve (2).
6. Open the other active pressure valve (3B or 3A).



Transmitter **above** the active pressure transmitter (normal arrangement)

Transmitter **below** the active pressure transmitter (exception)

1 Transmitter
2 Compensation valve
3 Active pressure valves
4 Active pressure lines
5 Shutoff valves
7 Blowout valves
9 Condensation vessels (optional)
10 Active pressure transmitters

Figure 41 Measuring gases

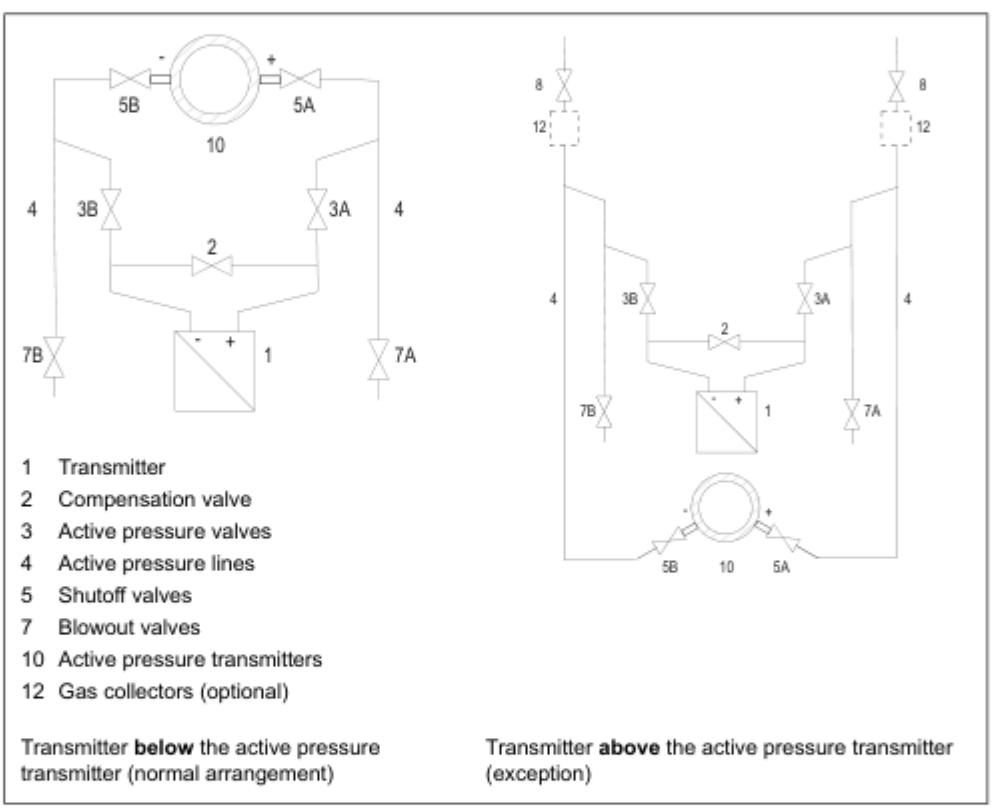
8.2.2 Measuring liquids

Operate the shutoff fittings in the following order:

Initial position: all valves closed

1. Open both shutoff valves (5, Figure 42, pg. 101) at the pressure taps
2. Open the compensation valve (2).
3. With the **transmitter below the active pressure transmitter** open both blowout valves (7) one after the other, with the **transmitter above the active pressure transmitter** open both vent valves (8) slightly until air-free liquid emerges.
4. Close both blowout valves (7) or vent valves (8).
5. Open the active pressure valve (3A) and the vent valve at the high pressure chamber of the transmitter (1) slightly, until air-free liquid emerges.
6. Close the vent valve.

7. Open the vent valve at the low pressure chamber of the transmitter (1) slightly until air-free liquid emerges.
8. Close the active pressure valve (3A).
9. Open the active pressure valve (3B) slightly until air-free liquid emerges, then close it.
10. Close the vent valve at the low pressure chamber of the transmitter (1).
11. Open the active pressure valve (3A) by $^1/_2$ turn
12. Check and correct zero point, if necessary, at start of scale 0 bar.
13. Close the compensation valve (2).
14. Open the active pressure valves (3A or 3B) fully.



1 Transmitter
2 Compensation valve
3 Active pressure valves
4 Active pressure lines
5 Shutoff valves
7 Blowout valves
10 Active pressure transmitters
12 Gas collectors (optional)

Transmitter **below** the active pressure transmitter (normal arrangement)

Transmitter **above** the active pressure transmitter (exception)

Figure 42 Measuring liquids

WARNING

When using toxic media, the measuring transducer may not be vented.

8.2.3 Measuring vapor

Operate the shutoff fittings in the following order:

Initial position: all valves closed

1. Open both shutoff valves (5, Figure 43, pg. 102) at the pressure taps
2. Open the compensation valve (2).
3. Wait until the vapor in the active pressure lines (4) and in the compensation vessels (13) has condensed.
4. Open the active pressure valve (3A) and the vent valve at the high pressure chamber of the transmitter (1) slightly until air-free condensate emerges.
5. Close the vent valve.
6. Open the vent valve at the low pressure chamber of the transmitter (1) slightly until air-free condensate emerges.
7. Close the active pressure valve (3A).
8. Open the active pressure valve (3B) slightly until air-free condensate emerges, then close it.
9. Close the vent valve at the low pressure chamber of the transmitter (1).
10. Open the active pressure valve (3A) by half a turn
11. Check and correct zero point, if necessary, at start of scale 0 bar.
12. Close the compensation valve (2).
13. Open the active pressure valves (3A or 3B) fully.

1 Transmitter
2 Compensation valve
3 Active pressure valves
4 Active pressure lines
5 Shutoff valves
7 Blowout valves
10 Active pressure transmitters
13 Compensation vessels
14 Insulation

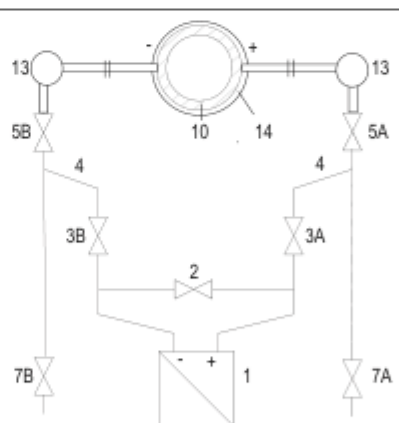


Figure 43 Measuring vapor

CAUTION

The measuring result is only error-free if the active pressure lines (4) contain equally high condensate columns of equal temperature. Zero adjustment must be repeated when these conditions are satisfied.

If the compensation valve (2) is opened when the shutoff valves (5) and active pressure valves (3) are open simultaneously, the transmitter (1) may be damaged by flowing vapors!

Technical data

9

SITRANS P, DS III PA series, for	Pressure 7MF4034	Absolute pressure		Differential pressure and flow 7MF4434/ 7MF4534	Level 7MF4634
		Pressure transmitter series 7MF4234	Diff. pressure transm. series 7MF4334		
Application	See page 11				
Mode of operation Measuring principle	See page 13 Piezo-resistive				
Input Measured variable	Pressure	Absolute pressure		Differential pressure and flow	Level
Nominal measuring range	1 to 400 bar (14.5 to 5802 psi)	250 mbar to 30 bar (3.63 to 435 psi)	250 mbar to 160 bar (3.63 to 2320 psi)		250 mbar to 5 bar (3.63 to 72.5 psi)
• Nominal pressure PN 32 (MWP 464 psi)				20 mbar (0.29 psi)	
• Nominal pressure PN 160 (MWP 2320 psi)				60 mbar to 30 bar (0.87 to 435 psi)	
• Nominal pressure PN 420 (MWP 6092 psi)				250 mbar to 30 bar (3.63 to 435 psi)	
• Lower measuring limit					
- Measuring cell with silicone oil filling	30 mbar (0.435 psi) (absolute)	0 mbar (0 psi) (absolute)		-100% of nominal measuring range [1] or 30 mbar (0.435 psi) (absolute)	-100% of nominal measuring range or 30 mbar (0.435 psi) (abs.) depending on mounting flange
- Measuring cell with inert filling liquid					
For process temperature -20 °C < ϑ ≤ 60 °C (-4 °F < ϑ ≤ +140 °F)	30 mbar (0.435 psi) (absolute)			-100% of nominal measuring range [1] or 30 mbar (0.435 psi) (absolute)	
For process temperature +60 °C < ϑ ≤ 100 °C (max. +85 °C for 30-bar nominal meas. range) 140 °F < ϑ ≤ 212 °C (max. +185 °F for 435 psi nominal meas. range)	30 mbar (abs.) + 20 mbar (abs.) · (ϑ - 60 °C)/°C 0.435 psi (abs.) + 0.29 psi (abs.) · (ϑ - 108 °F)/°F			-100% of nominal measuring range [1] or 30 mbar (0.435 psi) (absolute)	
• Upper measuring limit	100% of nominal measuring range (max. 160 bar (2320 psi) with oxygen measurement and inert filling liquid)				100% of nominal measuring range
Output	Digital PROFIBUS-PA signal				
Physical bus	IEC 61158-2				
Independent of polarity	Yes				

[1] -33% with nominal measuring range 30 bar (435 psi).

SITRANS P, DS III PA series, for	Pressure 7MF4034	Absolute pressure		Differential pressure and flow 7MF4434/ 7MF4534	Level 7MF4634
		Pressure transmitter series 7MF4234	Diff. pressure transm. series 7MF4334		
Accuracy					
Reference conditions	Increasing characteristic, start-of-scale value 0 bar, stainless steel seal diaphragm (with level: mounting flange without tube), silicone oil filling and room temperature (25 °C (77 °F))				
Error in measurement (including hysteresis and repeatability)					
- Linear characteristic	≤ 0.1%				≤ 0.15%
- Square-root characteristic					
Flow > 50%				≤ 0.1%	
Flow 25 to 50%				≤ 0.2%	
• Repeatability and hysteresis	Included in error in measurement				
Response time (T_{63}, without electric damping)	Approx. 0.2 s	Approx. 0.2 s		Approx. 0.2 s; approx. 0.3 s with 20- and 60-mbar (0.29 and 0.87 psi) nom. meas. range	Approx. 0.2 s
Long-term drift (change in temperature ±30 °C (±54 °F)	≤ 0.25% per 5 years	≤ 0.2% per year		≤ 0.25% per 5 years, max. static pressure 70 bar (1015 psi)	
- 20-mbar (0.29 psi) nom. meas. range				≤ 0.2% per year	
Ambient temperature effect					
• At -10 to +60 °C (14 to 140 °F)	≤ 0.3%[1]				
- 250-mbar (3.63 psi) nom. meas. range					≤ 0.7%
- 600-mbar (8.7 psi) nom. meas. range					≤ 0.5%
- 1,600- and 5,000-mbar (23.2 to 72.5 psi) nominal measuring range					≤ 0.45%
• At -40 to -10 °C and +60 to +85 °C (-40 to +14 °F and 140 to 185 °F)	≤ 0.25% / 10 K[1] ≤ 0.25% / 18 °F[1]				
- 250-mbar (3.63 psi) nom. meas. range					≤ 0.4%/10 K (18 °F)
- 600-mbar (8.7 psi) nom. meas. range					≤ 0.3%/10 K (18 °F)
- 1,600- and 5,000-mbar (23.2 to 72.5 psi) nominal measuring range					≤ 0.27%/ 10 K (18 °F)
Influence of static pressure					
• On start-of-scale				≤ 0.15% per 100 bar (1450 psi)	
- 20-mbar (0.29 psi) nominal measuring range				≤ 0.15% per 32 bar (464 psi)	
- 250-mbar (3.63 psi) nominal measuring range					≤ 0.3% per nom. pressure (PN)
- 600-mbar (8.7 psi) nominal measuring range					≤ 0.15% per nom. pressure (PN)
- 1,600- and 5,000-mbar (23.2 to 72.5 psi) nominal measuring range					≤ 0.1% per nom. pressure (PN)
• On span				≤ 0.2% per 100 bar (1450 psi)	≤ 0.1% per nom. pressure (PN)
- 20-mbar (0.29 psi) nominal measuring range				≤ 0.2% per 32 bar (464 psi)	
Influence of mounting position	≤0.05 mbar (≤0.000725 psi) per 10° inclination (can be corrected using zero correction)		≤0.7 mbar (≤0.001015 psi) per 10° inclination (can be corrected using zero correction)		Dependent on filling liquid in mounting flange
Resolution	$3 \cdot 10^{-5}$ of nominal measuring range				
Rated operating conditions					
Installation conditions					
• Installation instructions	Process conn. pointing vert. downwards		Any mounting position		Defined by flange
Ambient conditions					
• Ambient temp. (observe temperature class in potentially expl. atmospheres)					
- Measuring cell with silicone oil filling	-40 to +85 °C (-40 to +185 °F)				
30-bar (435 psi) nominal measuring range			-40 to +85 °C (-40 to +185 °F) (-20 to +85 °C (-4 to +185 °F) with 7MF4534)		
- Measuring cell with inert filling liquid	-20 to +85 °C (-4 to +185 °F)				
- Digital display	-30 to +85 °C (-22 to +185 °F)				
• Ambient temperature limits	See ambient temperature				
• Storage temperature	-50 to +85 °C (-58 to +185 °F)				

SITRANS P, DS III PA series, for	Pressure 7MF4034	Absolute pressure		Differential pressure and flow 7MF4434/ 7MF4534	Level 7MF4634
		Pressure transmitter series 7MF4234	Diff. pressure transm. series 7MF4334		
• Climate class					
- Condensation	Permissible				
• Degree of protection (to EN 60 529)	IP 65				
• Electromagnetic compatibility					
- Emitted interference	To EN 50 081-1				
- Noise immunity	To EN 61 326 and NAMUR NE 21				
Medium conditions					
• Process temperature					
- Measuring cell with silicone oil filling	-40 to +100 °C (-40 to +212 °F)				High-press. side: see mounting flange Low-press. side: -40 to +100 °C (-40 to +212 °F)
30-bar (435 psi) nom. meas. range			-40 to +85 °C (-40 to +185 °F) (-20 to +85 °C (-4 to +185 °F) for 7MF4534)		
- Measuring cell with inert filling liquid	-20 to +100 °C (-4 to +185 °F)				
30-bar (435 psi) nom. meas. range			-20 to +85 °C (-4 to +185 °F)		
• Process temperature limits	See process temperature				
• Maximum working pressure	See page 110			Nominal pressure (PN)	
Design					
Weight (without options)	Approx. 1.5 kg (3.3 lb)		Approx. 4.5 kg (9.9 lb)		
• To DIN (transmitter with mounting flange, without tube)					Approx. 11 to 13 kg (24.2 to 28.7 lb)
• To ANSI (transmitter with mounting flange, without tube)					Approx. 11 to 18 kg (24.2 to 39.2 lb)
Dimensions	See Fig. 44		See Fig. 45	See Fig. 46	See Fig. 47
Material					
• Wetted parts materials					
- Connection shank	Stainless steel, mat. No. 1.4404/316L or Hastelloy C4, mat. No. 2.4610				
- Oval flange	Stainless steel, mat. No. 1.4404/316L				
- Seal diaphragm	Stainless steel, mat. No. 1.4404/316L or Hastelloy C276, mat. No. 2.4819		Stainless steel, mat. No. 1.4404/316L, Hastelloy C276, mat. No. 2.4819, Monel, mat. No. 2.4360, tantalum or gold		
- Process flanges and sealing screw			St. steel, mat. No. 1.4408 up to PN 160 (MWP 2320 psi), mat. No. 1.4571/316Ti for PN 420 (MWP 6092 psi), Hastelloy C4, mat. No. 2.4610 or Monel, mat. No. 2.4360		
- O-ring			FPM (Viton) or as option: PTFE, FEP, FEPM and NBR		
- High-pressure side					
Seal diaphragm of mounting flange					Stainless steel, mat. No. 1.4571/ 316Ti, Monel 400, mat. No. 2.4360, Hastelloy B2, mat. No. 2.4617, Hastelloy C276, mat. No. 2.4819, Hastelloy C4, mat. No. 2.4610, tantalum, PTFE, ECTFE
Sealing face					Smooth to DIN 2526 form D or ANSI B16.5 RF for stainless steel, mat. No. 1.4571/316Ti, DIN 2526 form E or ANSI B16.5 RFSF for other materials
- Sealing material in the process flanges					
For standard applications					Viton
For vacuum application of mounting flange					Copper

SITRANS P, DS III PA series, for	Pressure 7MF4034	Absolute pressure		Differential pressure and flow 7MF4434/ 7MF4534	Level 7MF4634
		Pressure transmitter series 7MF4234	Diff. pressure transm. series 7MF4334		
- Low-pressure side					
Seal diaphragm					Stainless steel, 1.4404/316L
Process flanges and sealing screw					Stainless steel, mat. No. 1.4408
O-ring					FPM (Viton)
• Non-wetted parts materials					
- Electronics housing	Die-cast aluminium, low in copper, GD-ALSi 12, or stainless steel precision casting, polyester-based lacquer, stainless steel rating plate				
- Process flange screws			Steel, galvanized and yellow-passivized, or stainless steel		
- Mounting bracket (option)	Steel, galvanized and yellow-passivized, or stainless steel				
Measuring cell filling	Silicone oil or inert filling liquid (max. 160 bar (2320 psi) with oxygen measurement)				Silicone oil
• Filling liquid of mounting flange					Silicone oil or other material
Process connection	Connection shank G½A to DIN EN 837, female thread ½ - 14 NPT or oval flange (PN 160 (MWP 2320 psi)) to DIN 19 213 with mounting thread M10 or 7/16-20 UNF		Female thread ¼ - 18 NPT and flange connection to DIN 19 213 with mounting thread M10 (M12 for PN 420 (MWP 6092 psi)) or 7/16-20 UNF		
• High-pressure side					Flange to DIN and ANSI
• Low-pressure side					Female thread ¼ - 18 NPT and flange connection to DIN 19 213 with mounting thread M10 or 7/16-20 UNF
Electrical connection	Screw terminals, cable inlet via screwed gland M20 x 1.5 or ½ - 14 NPT, or PROFIBUS plug M12				
Displays and controls					
Input keys	3 for local programming directly on transmitter				
Digital display	Built-in, cover with window (option)				
Power supply (U_H)	Supplied via bus				
Separate 24 V power supply necessary	No				
Bus voltage					
• Not Ex	9 to 32 V				
• With intrinsically-safe operation	9 to 24 V				
Current consumption					
• Basic current (max.)	12.5 mA				
• Starting current ≤ basic current	Yes				
• Max. current in event of fault	15.5 mA				
Fault disconnection electronics (FDE) present	Yes				
Certificates and approvals					
Classification according to pressure equipment directive (DGRL 97/23/EC):	**7MF4034, 7MF4234, 7MF4334, 7MF4434, 7MF4634** For gases of fluid group 1 and liquids of fluid 1; complies with requirements of article 3, paragraph 3 (sound engineering practice) **7MF4534** For gases of fluid group 1 and liquids of fluid group 1; complies with basic safety requirements of article 3, paragraph 1 (appendix 1); assigned to category III, conformity evaluation module H by the TUV Nord				
Explosion protection					
• Intrinsic safety "i"	PTB 98 ATEX 2122				
- Identification	⟨Ex⟩ II 1/2 G EEx ia IIC T6				
- Permissible ambient temperature	-40 °C to +85 °C (-40 to +185 °F) temperature class T4, +60 °C (+140 °F) temperature class T6				
- Connection	FISCO supply unit or U_i ≤ 24 V linear				
- Effective internal inductance/capacitance	L_i ≤ 10 µH / C_i ≤ 5 nF				
• Explosion-proof "d"	PTB 99 ATEX 1160				
- Identification	⟨Ex⟩ II 1/2 G EEx d IIC T4 / T6				
- Permissible ambient temperature	-40 °C to +85 °C (-40 to +185 °F) temperature class T4, +60 °C (+140 °F) temperature class T6				
• Type of protection "n" (zone 2)	Planned				
- Identification					
- Permissible ambient temperature					
- Connection					

SITRANS P, DS III PA series, for	Pressure 7MF4034	Absolute pressure		Differential pressure and flow 7MF4434/ 7MF4534	Level 7MF4634
		Pressure transmitter series 7MF4234	Diff. pressure transm. series 7MF4334		
Certificates and approvals (continued)					
• Explosion protection to FM					
- Identification (XP/DIP) or (IS); (NI)	CL I, DIV 1, GP ABCD T4...T6; CL II, DIV 1, GP EFG; CL III; CL I, ZN 0/1 AEx ia IIC T4...T6; CL I, DIV 2, GP ABCD T4...T6; CL II, DIV 2, GP FG; CL III				
- Permissible ambient temperature	Ta = T4: -40 to 85 °C (-40 to +185 °F); T5: -40 to 70 °F (-40 to 158 °F); T6: -40 to 60 °C (-40 to 140 °F)				
- Entity parameters	According to control drawing A5E00118127A: U_i = 30 V, I_i = 100 mA, P_i = 750 mW, R_i = 300 Ω, L_i = 0.4 mH, C_i = 6 nF				
• Explosion protection to CSA	Planned				
- Identification (XP/DIP) or (IS)					
- Permissible ambient temperature					
- Entity parameters					
Communication					
Simultaneous communication with master class 2 (max.)	4				
Address setting possible using	Configuration tool or local operation (Standard setting: address 126)				
Cyclic useful data					
• Output bytes	5 (one measured value) or 10 (two measured values)				
• Input bytes	0, 1 or 2 (totalizer mode and reset function for dosing)				
Internal preprocessing					
Device profile	PROFIBUS-PA profile for process control devices version 3.0, class B				
Function blocks	2				
• Analog input					
- Adaptation to application-specific process variable	Yes, linear rising or falling characteristic				
- Electric damping T_{63} adjustable	0 to 100 s				
- Simulation function	Output/input				
- Failure response	Parameterizable (last correct value, default value, faulty value)				
- Limit monitoring	Yes, upper and lower warning limits, upper and lower alarm limits				
• Totalizer	Can be reset and preset				
	Selectable counting direction				
	Simulation function of totalizer output				
- Failure response	Parameterizable (adding with last correct value, stop adding, adding with faulty value)				
- Limit monitoring	Upper and lower warning limits, upper and lower alarm limits				
• Physical block	1				
Transducer blocks	2				
• Pressure transducer block					
- Calibration by application of two pressures	Yes				
- Monitoring of sensor limits	Yes				
- Definition of vessel characteristic	Using max. 30 interpolation points				
- Square-root characteristic for flow measurement	Yes				
- Low-flow cutoff and application point of square-rooting	Parameterizable				
- Simulation function					
Pressure value	Constant value or using parameterizable ramp function				
Sensor temperature	Constant value or using parameterizable ramp function				

9.1 Nominal measuring ranges and overload limits

9.1.1 Pressure

Nominal measuring range					max. perm. operating pressure p_s*)	max. perm. test pressure **)
1	bar	=	100.0	kPa	4 bar	6 bar
4	bar	=	400.0	kPa	7 bar	10 bar
16	bar	=	1.6	MPa	21 bar	32 bar
63	bar	=	6.3	MPa	67 bar	100 bar
160	bar	=	16.0	MPa	167 bar[1)]	250 bar[1)]
400	bar[1)]	=	40.0	MPa[1)]	400 bar[1)]	600 bar[1)]

[1)] for oxygen measurement max. 160 bar
*) according to 97/23/EG pressure transmitter regulation
**) according to DIN 16086

9.1.2 Differential pressure and flow

Nominal pressure	Nominal measuring range			
PN 32[3)]	20	mbar	=	2 kPa
PN 160	60	mbar	=	6 kPa
PN 160	250	mbar	=	25 kPa
or	600	mbar	=	60 kPa
PN 420[1)2)]	1600	mbar	=	160 kPa
	5000	mbar	=	500 kPa
	30000	mbar	=	3000 kPa

[1)] for oxygen measurement max. 160 bar
[2)] measuring cell filling only silicone oil
[3)] not suitable for remote seal mounting

9.1.3 Absolute pressure from the pressure series

Nominal measuring range				max. perm. operating pressure p_S*)	max. perm. test pressure **)
250 mbar	=	25.0 kPa		1.5 bar	6 bar
1,300 mbar	=	130.0 kPa		2.6 bar	10 bar
5,000 mbar	=	500.0 kPa		10 bar	30 bar
30,000 mbar	=	3,000.0 kPa		45 bar	100 bar

*) according to 97/23/EC pressure transmitter regulation
**) according to DIN 16086

NOTE on 250 mbar cell

See above...

9.1.4 Absolute pressure from the differential pressure series

Nominal measuring range				Overload limits
250 mbar	=	25.0 kPa		32 bar
1,300 mbar	=	160.0 kPa		32 bar
5,000 mbar	=	500.0 kPa		32 bar
30,000 mbar	=	3,000.0 kPa		160 bar
100,000 mbar	=	10,000.0 kPa		160 bar

NOTE on 250 mbar cell

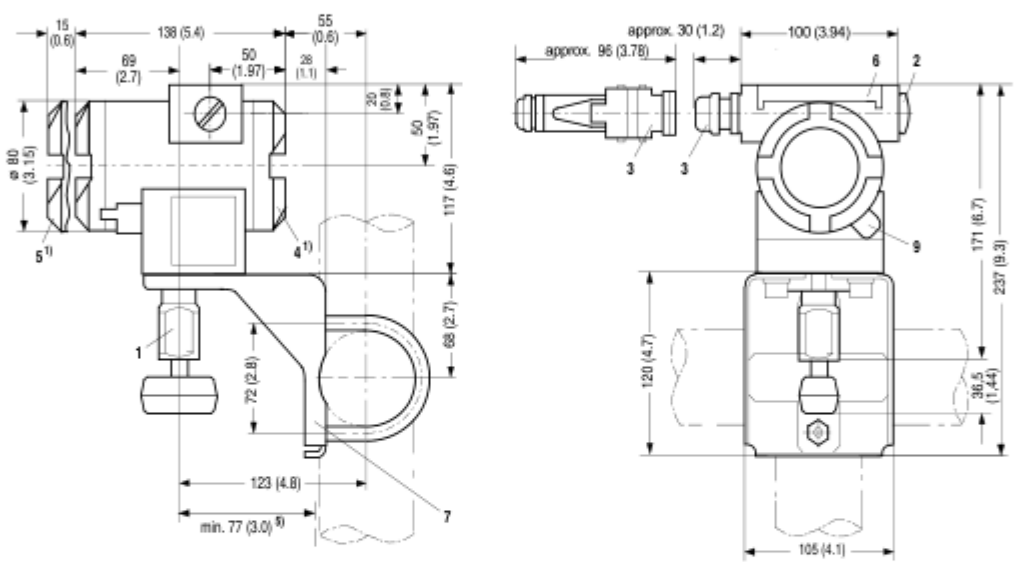
This measuring cell is designed for operation within the measuring limits 0 mbar (absolute) to 250 mbar (absolute). When stored under normal ambient pressure of around 1000 mbar (absolute) the measuring cell is in the overload state. An overload error may occur as a result. The overload error disappears in operation within the measuring limits. The transmitter then operates to its specification again, although the start of scale may have to be readjusted.

In pressure measurements with repeated exceeding of the measuring limits (e.g. batch processes with transitions between vacuum and ventilation) a measuring cell with a maximum range of 1300 mbar should be selected to avoid overloading.

9.1.5 Filling level

Nominal measuring range					Nominal pressure
250	mbar	=	25.0	kPa	PN 16 or PN 40
600	mbar	=	60.0	kPa	
1600	mbar	=	160.0	kPa	
5000	mbar	=	500.0	kPa	

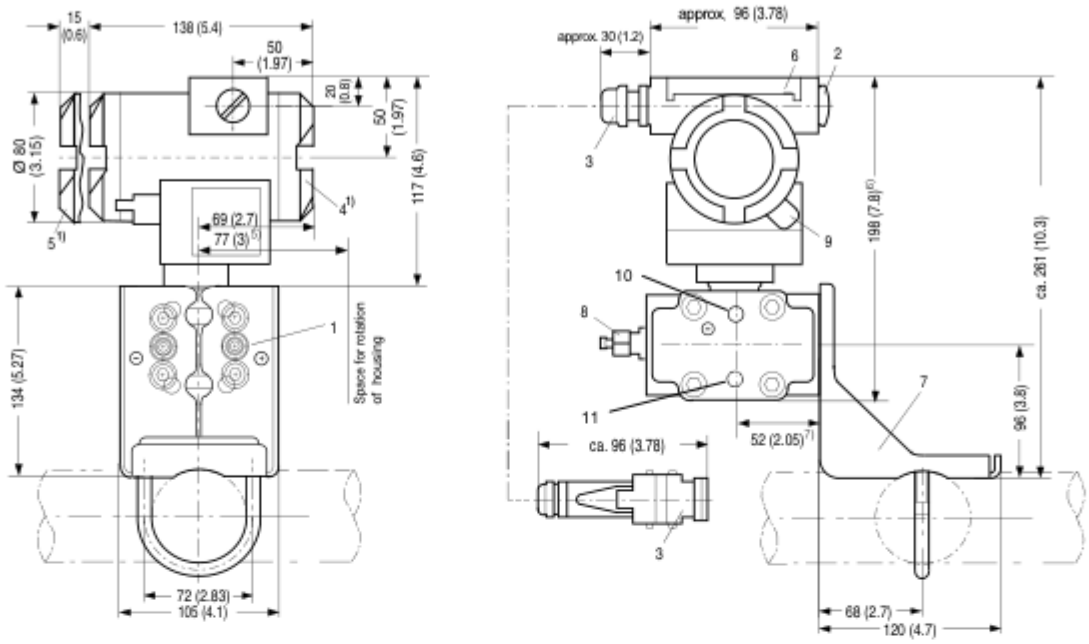
9.2 Dimensions



1 Process connection:
½ – 14 NPT (63 bar (914 psi) and above, wrench size 36)
connection shank G½A or
oval flange
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5,
screwed gland ½ – 14 NPT or
PROFIBUS plug M12 2) 3)
4 Terminal side
5 Electronics side, digital display (longer overall length for cover with window)
6 Protective cover over keys
7 Mounting bracket (option)
9 Screw cover safety bracket (only for explosion-proof enclosure, not shown in the drawing)

1) Allow approx. 20 mm (0.79 inch) "FM + CSA [is + xp]"
2) Not with type of protection "Explosion proof enclosure"
3) Not with type of protection "FM + CSA [is + xp]"
4) Approx. 45 mm (1.77 inch) (for Pg 13.5 with adapter)
5) Minimum distance for rotating

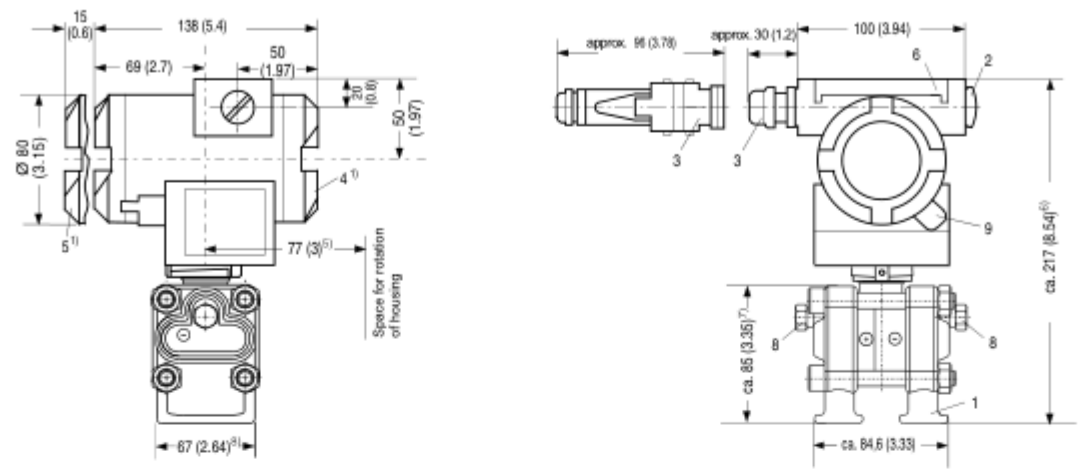
Figure 44 Dimensions of DS III PA series for pressure and absolute pressure from pressure transmitters series, dimensions in mm (inches)



1 Process connection ¼-18 NPT (DIN 19 213)
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5
screwed gland ½ - 14 NPT or
PROFIBUS plug M12 2) 3)
4 Terminal side
5 Electronics side, digital display (longer overall length for cover with window)
6 Protective cover over keys
7 Mounting bracket (option)
8 Sealing screw with valve (option)
9 Screw cover safety bracket (only for explosion-proof enclosure, not shown in the drawing)
10 Side ventilation for liquid measurement
11 Side ventilation for gas measurement (additive H02)

1) Allow approx. 20 mm (0.79 inch) thread length in addition
2) Not with type of protection "Explosion proof enclosure"
3) Not with type of protection "FM + CSA [is + xp]"
4) 92 mm (3.62 inch) for minimum distance to permit rotation without indicator
5) 201.5 mm (79.3 inch) for PN ≥ 420 (MWP ≥ 6092 psi)
6) 54 mm (2.12 inch) for PN ≥ 420 (MWP ≥ 6092 psi)
7) Approx. 45 mm (1.77 inch) for Pg 13.5 with adapter

Figure 45 Dimensions of DS III PA series for differential pressure and flow as well as absolute pressure from differential pressure transmitter series, dimensions in mm (inches)

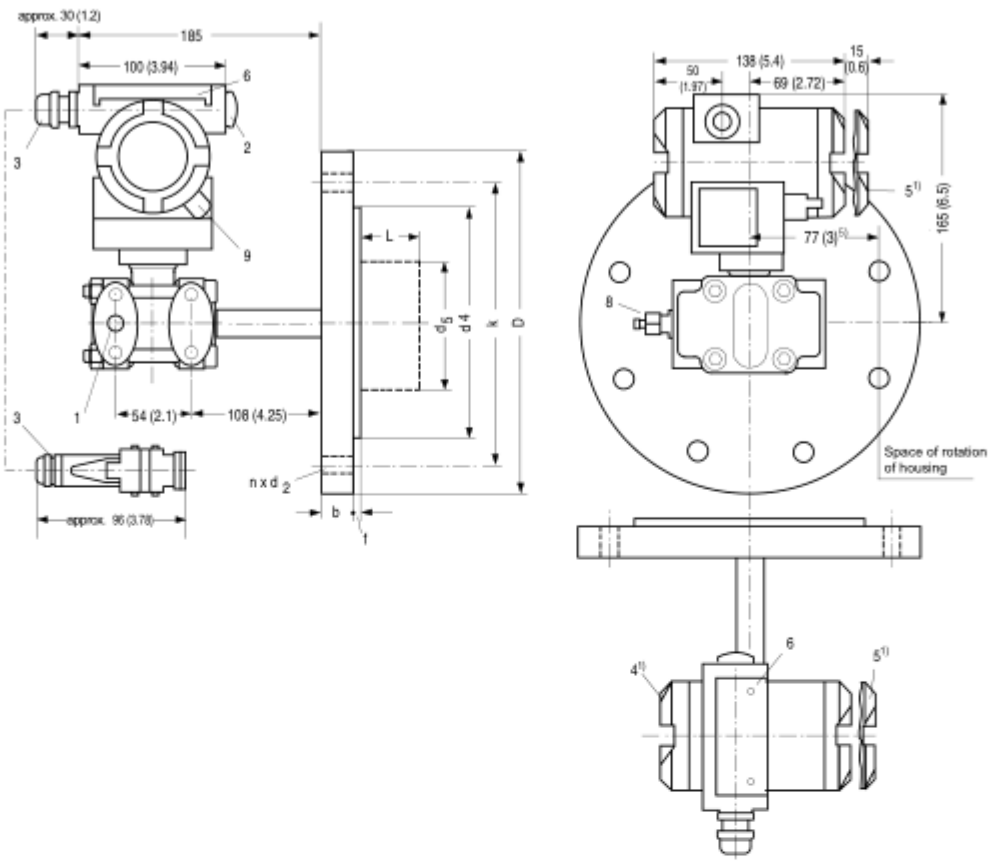


1 Process connection ¼-18 NPT (DIN 19213)
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5 or
screwed gland ½ - 14 NPT or
PROFIBUS plug M12 2) 3)
4 Terminal side
5 Electronics side, digital display (longer overall length for cover with window)
6 Protective cover over keys
7 Mounting bracket (option)
8 Sealing screw with valve (option)
9 Screw cover safety bracket (only for explosion-proof enclosure, not shown in the drawing)

1) Allow approx. 20 mm (0.79 inch) thread length in addition
2) Not with type of protection "Explosion proof enclosure"
3) Not with type of protection "FM + CSA [is + xp]"
4) 92 mm (3.62 inch) for minimum distance to permit rotation without indicator
5) 74 mm (2.9 inch) for PN ≥ 420 (MWP ≥ 6092 psi)
6) 91 mm (3.6 inch) for PN ≥ 420 (MWP ≥ 6092 psi)4)
7) 219 mm (8.62 inch) for PN ≥ 420 (MWP ≥ 6092 psi)
8) Approx. 45 mm (1.77 inch) for Pg 13.5 with adapter

Figure 46 Dimensions of DS III PA series for differential pressure and flow as well as process covers for vertical differential pressure lines (order using Order code "H03"), dimensions in mm (inches)

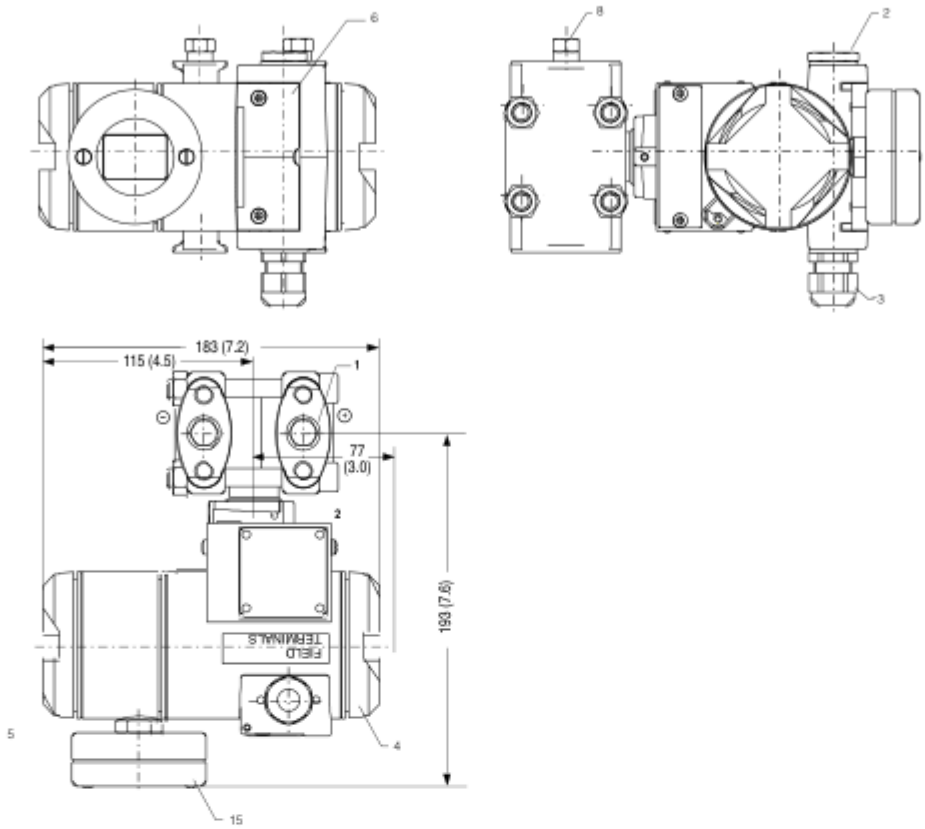
A special half flange is available for better reading of the SITRANS P, Series DS III PA transmitter's digital display. It is a particular advantage when mounting the transmitter on a valve manifold with vertical active pressure lines.



1 Process connection ¼-18 NPT (DIN 19213)
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5 or
screwed gland ½ - 14 NPT or
PROFIBUS plug M12
4 Terminal side
5 Electronics side, digital display (longer overall length for cover with window)
6 Protective cover over keys
8 Sealing screw with valve (option)
9 Screw cover safety bracket (only for explosion-proof enclosure, not shown in the drawing)

1) Allow approx. 20 mm (0.79 inch) thread length in addition
2) Not with type of protection "Explosion proof enclosure"
3) Not with type of protection "FM + CSA [is + xp]"
4) 92 mm (3.62 inch) for minimum distance to permit rotation without indicator
5) Approx. 45 mm (1.77 inch) for Pg 13.5 with adapter

Figure 47 Dimensions of DS III PA series for level (transmitter including mounting flange), dimensions in mm (inches)



1 Process connection ¼-18 NPT (DIN 19213)
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5 or
screwed gland ½ - 14 NPT or
PROFIBUS plug M12
4 Terminal side
5 Electronics side, digital display (longer overall length for cover with window)
6 Protective cover over keys
8 Sealing screw with valve (option)
15 External digital indicator (option)

2) Not with type of protection "Explosion proof enclosure"
3) Not with type of protection "FM + CSA [is + xp]"

Figure 48 Dimensions of DS III PA series for differential pressure and flow as well as digital display beside input keys (order using Order code "D27"), dimensions in mm (inches)

Care and maintenance

10

The device's zero point should be checked from time to time.

In the event of a fault decide:

- whether the internal self-test has detected an error,
  e. g. sensor breakdown
  Displays:
  digital display: Display “ERROR”
  - PROFIBUS: B_016: Sensor error
    Diagnosis: Measured value recording error
- serious hardware error the processor is not working
  Displays:
  digital display: no defined display
  - PROFIBUS: Slave not available

In the event of a fault you can exchange the electronics as described in chapter 6, pg. 79 under consideration of the warnings.

PROFIBUS 11

The PROFIBUS-PA(PA = **P**rocess **A**utomation) is a variant of the PROFIBUS DP (DP = **D**ecentral **P**eripheral) which is widely used in manufacturing engineering.

The PROFIBUS (**Pro**cess **Fi**eld **Bus**) is an open communication system for automation engineering and thousands are used all over the world. It is specified in the European standard EN 50170.

11.1 Transmission method

The PROFIBUS PA has a special transmission method and therefore satisfies the requirements of process automation and manufacturing engineering. This transmission method is defined in the international standard IEC 61158-2. The low transmission speed reduces the power loss compared to the PROFIBUS-DP and therefore enables an intrinsically safe technique for use in hazardous areas.

11.2 Topology

The bus topology can, to a large extent, be freely selected so that line, star and tree structures are possible, as well as mixtures of these. All kinds of field devices such as transformers, actuators, analyzers, etc. can be connected to the PROFIBUS PA.

The main advantage is in:

- the saving of installation costs
- the possibility of more extensive diagnostics with an increase in the availability of system parts
- the possibility of automatic tracing of system documentation
- the possibility of system optimization in operation

In an automation system, several PROFIBUS PA channels are usually connected to the fast PROFIBUS-DP with coupling units. The process control system is also linked to this.

Both bus systems use a uniform protocol layer. This makes the PROFIBUS PA a communication-compatible extension of the PROFIBUS DP into the field.

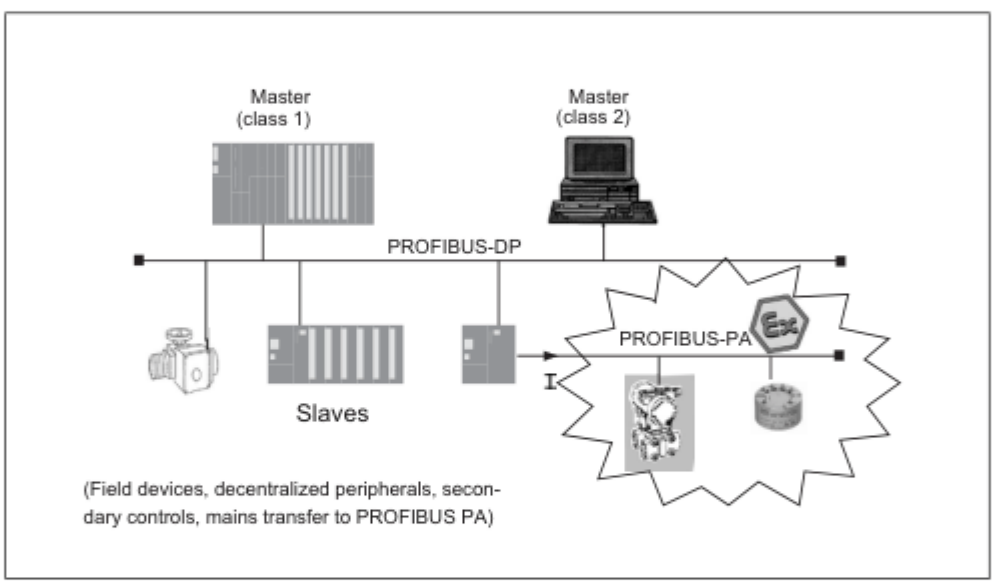


Figure 48 Typical PROFIBUS automation system

Figure 48 shows the section of a typical PROFIBUS automation system. The control system consists of two masters with distributed tasks.

The class 1 master looks after the control and regulation functions, while the class 2 master enables operating and monitoring functions. A cyclic exchange of measuring and setting data takes place between master 1 and the field devices. Parallel to this data, the status data of the field devices is transmitted to and evaluated in the class 1master. No field device parameters are set or other device information read during cyclic operation.

The information necessary for establishing communication is available to the control system from the stored, device-specific device master data (GSD) files (available on the Internet at http://www.ad.siemens.de/csi_e/gsd).

One or more class 2 masters can access the field devices acyclically in addition to the cyclic mode. With this communication type further information can be fetched from the devices or settings made in the devices.

11.3 Properties of the PROFIBUS PA

The PROFIBUS PA enables bi-directional communication between a bus master and the field devices via a shielded two-wire line. At the same time the power is supplied to the two-wire field devices on the same lines.

11.3.1 Profile

Supplementary to the EN standard 50170, the PNO (**P**ROFIBUS**U**ser**o**rganisation) has defined the functionality of the individual field device types in a so-called profile description. This profile defines minimum functional requirements and optional extensions. The device-internal “Device Management“ supplies all the basic information necessary for finding the profile parameters to the control system configuration tool. With this, a parametering tool can operate all profile-conforming devices regardless of type and manufacturer.

Depending on the size of the system and thus the number of field devices and the required timing, the system must be implemented with one or more PROFIBUS-PA channels. A PROFIBUS PA channel consists of the components shown in Figure 49.

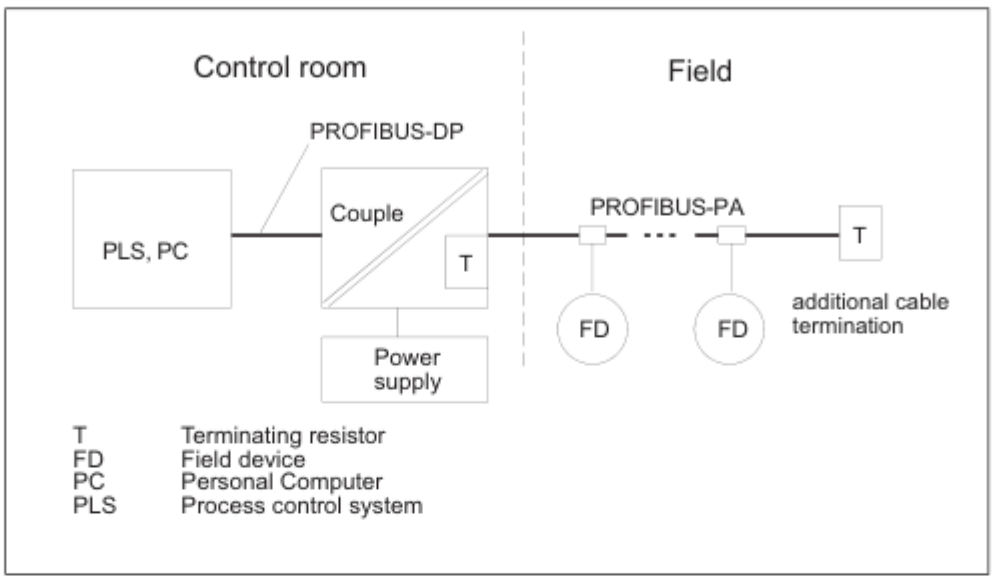


Figure 49 PROFIBUS-PA architecture

11.3.2 Interfacing

The central process control system PLS or, in the case of low requirements, a PC, is responsible for the control.

As a rule the signal conversion DP/PA, bus feeding and bus termination functions are combined in a coupling module. Depending on the number of PROFIBUS-PA field devices to be operated in the automation system and the required timing, a DP/PA coupler or, in the case of higher requirements, a more powerful DP/PA link is used.

An additional terminating resistor T must be fitted at the far end of the bus for transmission-technical reasons. When using the recommended bus cable, the theoretically possible line length (sum of all line sections) is a maximum of 1900 mm. In addition, the voltage drop over the lines supplying the field devices must be taken into account in the planning.

However, the current requirements of the individual users and voltage drop on the cable must also be taken into account in the planning. The individual field devices FG can be connected almost anywhere in the bus system. Further information can be found in the “PROFIBUS PPNO Guide A” (see chapter 13.1, pg. 137 /1/).

DP/PA-coupler or DP/PA-Link are supplied by a power supply unit with SELV (**S**afety **E**xtra**L**ow **V**oltage). This power supply must have adequate reserves for bridging brief power failures.

The maximum number of devices that can be connected to a bus channel depends on their current consumption and the respective conditions of use. When operating in a safe area, the couplers/links can feed up to 400 mA into the bus.

For operation in areas at risk of explosion, inherent safety is only guaranteed if all devices, components etc. (e.g. bus terminal) connected to the bus are certified as inherently safe equipment and meet the requirements forming the basis of the FISCO model (Field bus Intrinsic Safety Concept). In particular, supply devices (bus couplers) must be certified as so-called FISCO supply devices. The safety regulations on maximum values and other specifications in the EU type test certificate must be observed in every case.

Supply devices (bus couplers), which are not explosion-proof and certified, must be connected to inserted EX-certified Zener barriers. The specifications in the EU type test certificate must be observed.

WARNING

Only supply devices (DP/PA couplers or DP/PA links) certified according to the FISCO model may be used to supply inherently safe PROFIBUSes. With non EX-proof supply devices, Zener barriers must be inserted. The requirements can be found in the EU type test certificate PTB 99 ATEX 2122, 2nd supplement (see chapter 13.3, pg. 142).

The number of devices which can be connected to a bus channel can be determined from the maximum current consumption of the devices connected (according to standards -10 mA per device) and the available current. A current reserve should be planned for safety reasons, otherwise there is a risk that a defective device could overload the bus with its increased current consumption and the power supply and communication with all unaffected users could collapse. The power reserve quantity depends on the current increase in the event of an error specified by the manufacturer.

Every device has its own address to distinguish between the connected process devices. Address setting is described in chapter 4.2.8, pg. 54.

Further information about components, design guidelines and planning can be found in the System Description, Field Technology (see chapter 13.1, pg. 137, /2/).

Ordering Data

12

see following page

12.1 Ordering data for basic device

Ordering data	Order No.
SITRANS P transmitter for pressure, DS III PA series	**7MF4034-** ■■■■■-■■■■
Meas. cell filling / Meas. cell cleaning	
Silicone oil / Normal	1
Inert liquid / Grease-free	3
Nominal measuring range	
1 bar (14.5 psi)	B
4 bar (58 psi)	C
16 bar (232 psi)	D
63 bar (914 psi)	E
160 bar (2320 psi)	F
400 bar (5802 psi)	G
Wetted parts materials	
Seal diaphragm / Process connection	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Hastelloy / Hastelloy	C
Version for remote seal	Y 0
Process connection	
• Connection shank G½A	0
• Female thread ½ - 14 NPT	1
• Oval flange made of stainless steel, max. span 160 bar - Mounting thread $^{7}/_{16}$- 20 UNF - Mounting thread M10	2 3
Non-wetted parts materials	
• Housing made of die-cast aluminium	0
• Housing stainl. steel precision casting	3
Design	
• Standard version	1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD	2
Explosion protection	
• Without explosion protection	A
• With explosion protection (CENELEC) Type of protection: - "Intrinsic safety" (EEx ia) - "Explosion-proof" (EEx d) [1]) - "Intrinsic safety and explosion-proof" (EEx ia and EEx d) [1]) (planned) - "n" (zone 2) (planned)	 B D P E
• With explosion protection (FM + CSA) - intrinsic safe and explosion-proof (is + xp) [1]) (planned)	N C
Electrical connection/cable inlet	
• Screwed gland M20 x 1.5	B
• Screwed gland ½ - 14 NPT	C
• PROFIBUS plug M12 [2])	F
Indicator	
• Without indicator (digital display hidden)	1
• With indicator (digital display visible)	6
• With indicator (digital display visible, setting as specified, Order code Y21 required)	7

Ordering data	Order code
Further designs	
Please add **"Z"** to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	**A01**
• Stainless steel	**A02**
Rating plate inscription (instead of German)	
• English	**B11**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
English rating plate, pressure units in inH_2O or psi	**B21**
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 8402	**C11**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Factory certificate to EN 10 204-2.2	**C14**
Acid gas version to NACE (only together with seal diaphragm made of Hastelloy)	**D07**
IP 68 (not together with PROFIBUS plug M12)	**D12**
Digital indicator beside control keys (only with transmitter 7MF4034-■■■■0-■A■6 or 7MF4034-■■■■0-■A■7-Z, Y21)	**D27**
Use in or on zone 1D/2D (only together with basic device with type of protection "Intrinsically-safe")	**E01**
Use in zone 0 (basic unit EEx ia)	**E02**
Oxygen application (max. 160 bar (2320 psi) with oxygen measurement and inert filling liquid)	**E10**
Additional information	
Please add **"Z"** to Order No. and specify Order code(s) and plain text.	
Measuring-point number/identification (max. 16 characters), specify in plain text:	
Y15:	**Y15**
Measuring-point text (max. 27 characters), specify in plain text:	
Y16:	**Y16**
Setting for digital display, specify in plain text (standard setting: mbar):	
Y21: mbar, bar, kPa, MPa, psi, ...	**Y21**
Note: only pressure dimensions (see page 51) can be selected.	
Preset bus address, specify in plain text (standard setting: 126):	
Y25:	**Y25**

Only the setting for "Y21" and "Y25" can be made in the factory.

Example for ordering:
Item line: 7MF4034-1EA00-1AA7-Z
B line: A01 + Y21
C line: Y21: .... m

Scope of delivery: Transmitter as ordered (Instruction Manual is extra ordering item (see accessories on page 135)).

Ordering data	Order No.
SITRANS P transmitter for absolute pressure, from pressure transmitter series, DS III PA series	7MF4234- ■■■■■-■■■■
Meas. cell filling / Meas. cell cleaning	
Silicone oil / Normal	1
Inert liquid / Grease-free	3
Nominal measuring range	
250 mbar (3.63 psi)	D
1,300 mbar (18.9 psi)	F
5,000 mbar (72.5 psi)	G
30,000 mbar (435 psi)	H
Wetted parts materials	
Seal diaphragm / Process connection	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Hastelloy / Hastelloy	C
Version for remote seal [1]	Y 0
Process connection	
• Connection shank G½A	0
• Female thread ½ - 14 NPT	1
• Oval flange made of stainless steel, max. span 160 bar (2320 psi) - Mounting thread $^{7}/_{16}$ - 20 UNF	2
- Mounting thread M10	3
Non-wetted parts materials	
• Housing made of die-cast aluminium	0
• Housing stainl. steel precision casting	3
Design	
• Standard version	1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD	2
Explosion protection	
• Without explosion protection	A
• With explosion protection (CENELEC) Type of protection: - "Intrinsic safety" (EEx ia)	B
- "Explosion-proof" (EEx d) [2]	D
- "Intrinsic safety and explosion-proof" (EEx ia and EEx d) [2] (planned)	P
- "n" (zone 2) (planned)	E
• With explosion protection (FM + CSA) - intrinsic safe and explosion-proof (is + xp) [2] (planned)	N C
Electrical connection/cable inlet	
• Screwed gland M20 x 1.5	B
• Screwed gland ½ - 14 NPT	C
• PROFIBUS plug M12 [3]	F
Indicator	
• Without indicator (digital display hidden)	1
• With indicator (digital display visible)	6
• With indicator (digital display visible, setting as specified, Order code Y21 required)	7

Ordering data	Order code
Further designs	
Please add **"Z"** to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	**A01**
• Stainless steel	**A02**
Rating plate inscription (instead of German)	
• English	**B11**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
English rating plate, pressure units in inH_2O or psi	**B21**
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 8402	**C11**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Factory certificate to EN 10 204-2.2	**C14**
Acid gas version to NACE (only together with seal diaphragm made of Hastelloy)	**D07**
IP 68 (not together with PROFIBUS plug M12)	**D12**
Digital indicator beside control keys (only with transmitter 7MF4234-■■■■0-■A■6 or 7MF4234-■■■■0-■A■7-Z, Y21)	**D27**
Use in or on zone 1D/2D (only together with basic device with type of protection "Intrinsically-safe")	**E01**
Use in zone 0 (basic unit EEx ia)	**E02**
Oxygen application (max. 160 bar (435 psi) with oxygen measurement and inert filling liquid)	**E10**
Additional information	
Please add **"Z"** to Order No. and specify Order code(s) and plain text.	
Measuring-point number/identification (max. 16 characters), specify in plain text:	
Y15:	**Y15**
Measuring-point text (max. 27 characters), specify in plain text:	
Y16:	**Y16**
Setting for digital display, specify in plain text (standard setting: mbar):	
Y21: mbar, bar, kPa, MPa, ...	**Y21**
Note: only pressure dimensions (see page 51) can be selected.	
Preset bus address, specify in plain text (standard setting: 126):	
Y25:	**Y25**

Only the setting for "Y21" and "Y25" can be made in the factory.

Example for ordering: see page 126

Scope of delivery: Transmitter as ordered (Instruction Manual is extra ordering item (see accessories on page 135)).

[1] Version 7MF4234-1DY... only up to max. span 200 mbar (2.9 psi).

[2] Without cable gland or PROFIBUS plug M12.

[3] Not together with type of protection "Explosion-proof" or FM+CSA (is+xp)

Ordering data	Order No.
SITRANS P transmitter for absolute pressure, from differential pressure transmitter series, DS III PA series	7MF4334- ■■■■■ - ■■■■
Meas. cell filling / Meas. cell cleaning	
Silicone oil / Normal	1
Inert liquid / Grease-free	3
Nominal measuring range	
250 mbar (3.63 psi)	D
1,300 mbar (18.9 psi)	F
5,000 mbar (72.5 psi)	G
30,000 mbar (435 psi)	H
100,000 mbar (1450 psi)	K E
Wetted parts materials	
Seal diaphragm / Parts of meas. cell	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Hastelloy / Hastelloy	C
Tantalum / Tantalum	E
Monel / Monel	H
Gold / Gold	L
Version for remote seal [1]	Y
Process connection	
Female thread ¼ - 18 NPT with flange connection to DIN 19 213	
• With sealing screw opposite process conn.	
- Mounting thread M10	0
- Mounting thread 7/16 - 20 UNF	2
• Sealing screw on side of process flanges [2]	
- Mounting thread M10	4
- Mounting thread 7/16 - 20 UNF	6
Non-wetted parts materials	
Process flange screws / Electronics housing	
Stainless steel / Die-cast aluminium	2
Stainless steel / Stain. steel prec. cast.	3
Design	
• Standard version	1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD	2
Explosion protection	
• Without explosion protection	A
• With explosion protection (CENELEC) Type of protection:	
- "Intrinsic safety" (EEx ia)	B
- "Explosion-proof" (EEx d) [3]	D
- "Intrinsic safety and explosion-proof" (EEx ia + EEx d) [3] (planned)	P
- "n" (zone 2) (planned)	E
• With explosion protection (FM + CSA)	
- intrinsic safe and explosion-proof (is + xp) [3] (planned)	N C
Electrical connection/cable inlet	
• Screwed gland M20 x 1.5	B
• Screwed gland ½ - 14 NPT	C
• PROFIBUS plug M12 [4]	F
Indicator	
• Without indicator (digital display hidden)	1
• With indicator (digital display visible)	6
• With indicator (digital display visible, setting as specified, Order code Y21 required)	7

Ordering data	Order code
Further designs	
Please add **"Z"** to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	**A01**
• Stainless steel	**A02**
Instead of FPM (Viton), process flange O-ring made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Sealing screws (¼ - 18 NPT) with valve in material of process flange	**A40**
Rating plate inscription (instead of German)	
• English	**B11**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
English rating plate, pressure units in inH_2O or psi	**B21**
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 8402	**C11**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Factory certificate to EN 10 204-2.2	**C14**
Acid gas version to NACE (only together with seal diaphragm made of Hastelloy and process screws made of stainless steel)	**D07**
IP 68 (not together with PROFIBUS plug M12)	**D12**
Digital indicator beside control keys (only with transmitter 7MF4334-■■■■2-■A■6 or 7MF4334-■■■■2-■A■7-Z, Y21)	**D27**
Use in or on zone 1D/2D (only together with basic device with type of protection "Intrinsically-safe")	**E01**
Use in zone 0 (basic unit EEx ia)	**E02**
Oxygen application (max. 160 bar (2320 psi) with oxygen measurement and inert filling liquid)	**E10**
Interchanging of process connection side	**H01**
Vent on side for gas measurements	**H02**
Process flange made of:	
• Hastelloy	**K01**
• Monel	**K02**
• Stainless steel with PVDF insert (max. PN 10 (MWP 145 psi), max. temperature of medium 90 °C (194 °F))	**K04**
Additional information	
Please add **"Z"** to Order No. and specify Order code(s) and plain text.	
Measuring-point number/identification (max. 16 characters), specify in plain text: **Y15: .....**	**Y15**
Measuring-point text (max. 27 characters), specify in plain text: **Y16: .....**	**Y16**
Setting for digital display, specify in plain text (standard setting: mbar): **Y21: mbar, bar, kPa, MPa, psi, ...** **Note:** only pressure dimensions (see page 51) can be selected.	**Y21**
Preset bus address, specify in plain text (standard setting: 126): **Y25: .....**	**Y25**

Only the setting for "Y21" and "Y25" can be made in the factory.

Example for ordering: see page 126

Scope of delivery: Transmitter as ordered (Instruction Manual is extra ordering item (see accessories on page 135)).

[1] Version 7MF4334-1DY... only up to max. span 200 mbar (2.9 psi).
[2] Not for nominal measuring range 160 bar (2320 psi).
[3] Without cable gland or PROFIBUS plug M12.
[4] Not together with type of protection "Explosion-proof" or FM+CSA (is+xp)

Ordering data	Order No.
SITRANS P transmitter for differential pressure and flow, DS III PA series, PN 32/160 (MWP 464/2320 psi)	7MF4434- ■■■■■ - ■■■■
Meas. cell filling / **Meas. cell cleaning**	
Silicone oil / Normal	1
Inert liquid / Grease-free	3
Nominal measuring range	
PN 32 (MWP 435 psi)	
20 mbar [1] (0.29 psi)	B
PN 160 (MWP 2320 psi)	
60 mbar (0.87 psi)	C
250 mbar (3.63 psi)	D
600 mbar (8.7 psi)	E
1,600 mbar (23.2 psi)	F
5,000 mbar (72.5 psi)	G
30,000 mbar (435 psi)	H
Wetted parts materials (process flange made of stainless steel)	
Seal diaphragm / Parts of meas. cell	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Hastelloy / Hastelloy	C
Tantalum [2] / Tantalum	E
Monel [2] / Monel	H
Gold [2] / Gold	L
Version for remote seal	Y
Process connection	
Female thread ¼ - 18 NPT with flange connection to DIN 19 213	
• Sealing screw opposite process conn.	
- Mounting thread M10	0
- Mounting thread $^{7}/_{16}$ - 20 UNF	2
• Sealing screw on side of process flanges	
- Mounting thread M10	4
- Mounting thread $^{7}/_{16}$ - 20 UNF	6
Non-wetted parts materials	
Process flange screws / Electronics housing	
Stainless steel / Die-cast aluminium	2
Stainless steel / Stain. steel prec. cast.	3
Design	
• Standard version	1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD	2
Explosion protection	
• Without explosion protection	A
• With explosion protection (CENELEC) Type of protection:	
- "Intrinsic safety" (EEx ia)	B
- "Explosion-proof" (EEx d) [3]	D
- "Intrinsic safety and explosion-proof" (EEx ia +EEx d) [3] (planned)	P
- "n" (zone 2) (planned)	E
• With explosion protection (FM + CSA)	
- intrinsic safe and explosion-proof (is + xp) [3] (planned)	N C
Electrical connection/cable inlet	
• Screwed gland M20 x 1.5	B
• Screwed gland ½ - 14 NPT	C
• PROFIBUS plug M12 [4]	F
Indicator	
• Without indicator (digital display hidden)	1
• With indicator (digital display visible)	6
• With indicator (digital display visible, setting as specified, Order code Y21 required)	7

Ordering data	Order code
Further designs	
Please add "**Z**" to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	**A01**
• Stainless steel	**A02**
Instead of FPM (Viton), process flange O-ring made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Sealing screws (¼ - 18 NPT) with valve in material of process flange	**A40**
Rating plate inscription (instead of German)	
• English	**B11**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
English rating plate, pressure units in inH_2O or psi	**B21**
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 8402	**C11**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Factory certificate to EN 10 204-2.2	**C14**
Acid gas version to NACE (only together with seal diaphragm made of Hastelloy and process screws made of stainless steel)	**D07**
IP 68 (not together with PROFIBUS plug M12)	**D12**
Digital indicator beside control keys (only with transmitter 7MF4434-■■■■2-■A■6 or 7MF4434-■■■■2-■A■7-Z, Y21)	**D27**
Use in or on zone 1D/2D (only together with basic device with type of protection "Intrinsically-safe")	**E01**
Use in zone 0 (basic unit EEx ia)	**E02**
Over-filling safety device for flammable and non-flammable liquids (max. PN 32 (MWP 464 psi)) (basic unit EEx ia)	**E08**
Oxygen application (max. 160 bar (2320 psi) with oxygen measurement and inert filling liquid)	**E10**
Interchanging of process connection side	**H01**
Vent on side for gas measurements	**H02**
Stainless steel process flanges for vertical differential pressure lines (not together with K01, K02 and K04) [1]	**H03**
Process flange made of Hastelloy	**K01**
Process flange made of Monel	**K02**
Stainless steel with PVDF insert (max. PN 10 (MWP 145 psi), max. temperature of medium 90 °C (194 °F))	**K04**
Additional information	
Please add "**Z**" to Order No. and specify Order code(s) and plain text.	
Measuring-point number/identification (max. 16 characters), specify in plain text: **Y15: .....**	**Y15**
Measuring-point text (max. 27 characters), specify in plain text: **Y16: .....**	**Y16**
Setting for digital display, specify in plain text (standard setting: mbar): **Y21: mbar, bar, kPa, MPa, psi ...**	**Y21**
Note: only pressure dimensions (see page 51) can be selected.	
Preset bus address, specify in plain text (standard setting: 126): **Y25: .....**	**Y25**

Only the setting for "Y21" and "Y25" can be made in the factory.

Example for ordering: see page 126

Scope of delivery: Transmitter as ordered (Instruction Manual is extra ordering item (see accessories on page 135)).

[1] Not suitable for connection of remote seal.
[2] Only together with nominal measuring range 250, 1600, 5000 and 30000 mbar (3.63, 23.21, 72.5 and 435 psi).
[3] Without cable gland or PROFIBUS plug M12.
[4] Not together with type of protection "Explosion-proof" or FM+CSA (is+xp)

Ordering data	Order No.
SITRANS P transmitter for differential pressure and flow, DS III PA series, PN 420 (MWP 6092 psi)	7MF4534- 1■■■■- ■■■■
Nominal measuring range	
250 mbar (3.63 psi)	D
600 mbar (8.7 psi)	E
1,600 mbar (23.2 psi)	F
5,000 mbar (72.5 psi)	G
30,000 mbar (435 psi)	H
Wetted parts materials (process flange made of stainless steel)	
Seal diaphragm / Parts of meas. cell	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Gold [1] / Gold	L
Process connection	
Female thread ¼ - 18 NPT and flange connection to DIN 19213	
• Sealing screw opposite process connection	
- Mounting thread M12	1
- Mounting thread $^{7}/_{16}$ - 20 UNF	3
• Sealing screw on side of process flanges	
- Mounting thread M12	5
- Mounting thread $^{7}/_{16}$ - 20 UNF	7
Non-wetted parts materials	
Process flange screws / Electronics housing	
Stainless steel / Die -cast aluminium	2
Stainless steel / Stain. steel prec. cast.	3
Design	
• Standard version	1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD	2
Explosion protection	
• Without explosion protection	A
• With explosion protection (CENELEC) Type of protection:	
- "Intrinsic safety" (EEx ia)	B
- "Explosion-proof" (EEx d) [2]	D
- "Intrinsic safety and explosion-proof" (EEx ia +EEx d) [2] (planned)	P
- "n" (zone 2) (planned)	E
• With explosion protection (FM + CSA)	
- intrinsic safe and explosion-proof (is + xp) [2] (planned)	N C
Electrical connection/cable inlet	
• Screwed gland M20 x 1.5	B
• Screwed gland ½ - 14 NPT	C
• PROFIBUS plug M12 [3]	F
Indicator	
• Without indicator (digital display hidden)	1
• With indicator (digital display visible)	6
• With indicator (digital display visible, setting as specified, Order code Y21 required)	7

Ordering data	Order code
Further designs	
Please add **"Z"** to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	**A01**
• Stainless steel	**A02**
Instead of FPM (Viton), process flange O-ring made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Sealing screw (¼ - 18 NPT) with valve in material of process flange	**A40**
Rating plate inscription (instead of German)	
• English	**B11**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
English rating plate, pressure units in inH_2O or psi	**B21**
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 8402	**C11**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Factory certificate to EN 10 204-2.2	**C14**
Acid gas version to NACE (only together with seal diaphragm made of Hastelloy and process screws made of stainless steel)	**D07**
IP 68 (not together with PROFIBUS plug M12)	**D12**
Digital indicator beside control keys (only with transmitter 7MF4534-■■■■2-■A■6 or 7MF4534-■■■■2-■A■7-Z, Y21)	**D27**
Use in or on zone 1D/2D (only together with basic device with type of protection "Intrinsically-safe")	**E01**
Use in zone 0 (basic unit EEx ia)	**E02**
Interchanging of process connection side	**H01**
Stainless steel process flanges for vertical differential pressure lines	**H03**
Additional information	
Please add **"Z"** to Order No. and specify Order code(s) and plain text.	
Measuring-point number/identification (max. 16 characters), specify in plain text:	
Y15:	**Y15**
Measuring-point text (max. 27 characters), specify in plain text:	
Y16:	**Y16**
Setting for digital display, specify in plain text (standard setting: mbar):	
Y21: mbar, bar, kPa, MPa, psi, ...	**Y21**
Note: only pressure dimensions (see page 51) can be selected.	
Preset bus address, specify in plain text (standard setting: 126):	
Y25:	**Y25**

Only the setting for "Y21" and "Y25" can be made in the factory.

Example for ordering: see page 126

Scope of delivery: Transmitter as ordered (Instruction Manual is extra ordering item (see accessories on page 135)).

[1] Only together with nominal measuring range 250, 1600, 5000 and

Ordering data	Order No.
SITRANS P transmitter for level, DS III PA series	7MF4634- 1 ■ Y ■ ■ - ■ ■ ■ ■ ■
Nominal measuring range	
250 mbar (3.63 psi)	D
600 mbar (8.7 psi)	E
1,600 mbar (23.2 psi)	F
5,000 mbar (72.5 psi)	G
Process connection of low-pressure side	
Female thread ¼ - 18 NPT and flange connection to DIN 19213 with mounting thread	
• M10	0
• $^{7}/_{16}$ - 20 UNF	2
Non-wetted parts materials	
Process flange screws / Electronics housing	
Stainless steel / Die-cast aluminium	2
Stainless steel / Stain. steel prec. cast.	3
Design	
• Standard version	1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD	2
Explosion protection	
• Without explosion protection	A
• With explosion protection (CENELEC) Type of protection:	
- "Intrinsic safety" (EEx ia)	B
- "Explosion-proof" (EEx d) [1]	D
- "Intrinsic safety and explosion-proof" (EEx ia +EEx d) [1] (planned)	P
- "n" (zone 2) (planned)	E
Electrical connection/cable inlet	
• Screwed gland M20 x 1.5	B
• Screwed gland ½ - 14 NPT	C
• PROFIBUS plug M12 [2]	F
Indicator	
• Without indicator (digital display hidden)	1
• With indicator (digital display visible)	6
• With indicator (digital display visible, setting as specified, Order code Y21 required)	7

Ordering note: 1st order item: Transmitter 7MF4634-...
2nd order item: Mounting flange 7MF4912-3...

Example for ordering:
Item line 1: 7MF4634-1EY20-1AA1
Item line 2: 7MF4912-3GE01

Ordering data	Order code
Further designs	
Please add **"Z"** to Order No. and specify Order code(s).	
Instead of FPM (Viton), process flange O-ring on low-pressure side made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Sealing screws (¼ - 18 NPT) with valve in material of process flange	**A40**
Rating plate inscription (instead of German)	
• English	**B11**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
English rating plate, pressure units in inH_2O or psi	**B21**
Manufacturer's test certificate M to DIN 55 350, Part 18 and to ISO 8402	**C11**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Factory certificate to EN 10 204-2.2	**C14**
IP 68 (not together with PROFIBUS plug M12)	**D12**
Use in or on zone 1D/2D (only together with basic device with type of protection "Intrinsically-safe")	**E01**
Use in zone 0 (basic unit EEx ia)	**E02**
Over-filling safety device for flammable and non-flammable liquids (max. PN 32 (MWP 464 psi) (basic unit EEx ia)	**E08**
Interchanging of process connection side	**H01**
Additional information	
Please add **"Z"** to Order No. and specify Order code(s) and plain text.	
Measuring-point number/identification (max. 16 characters), specify in plain text:	
Y15:	**Y15**
Measuring-point text (max. 27 characters), specify in plain text:	
Y16:	**Y16**
Setting for digital display, specify in plain text (standard setting: mbar):	
Y21: mbar, bar, kPa, MPa, psi, ...	**Y21**
Note: only pressure dimensions (see page 51) can be selected.	
Preset bus address, specify in plain text (standard setting: 126):	
Y25:	**Y25**

Only the setting for "Y21" and "Y25" can be made in the factory.

Scope of delivery: Transmitter as ordered (Instruction Manual is extra ordering item (see accessories on page 135)).

Ordering data — Order No. Order code

Mounting flange
Directly fitted onto SITRANS P transmitter for level, for

DS III PA series

Flange	Nom. diam.	Nom. press.	
Connection	DN 80	PN 40	D
to DIN 2501	DN 100	PN 16	G
		PN 40	H
Connection to	3 inch	class 150	Q
		class 300	R
ANSI B16.5	4 inch	class 150	T
		class 300	U
Other version Add Order code and plain text: Nominal diameter: ...; Nom. pressure: ...			Z J1Y

Wetted parts materials

• Stainless steel, mat. No. 1.4571/316Ti[1]	A
- Coated with PFA	D
- Coated with PTFE	E
- Coated with ECTFE	F
• Monel 400, mat. No. 2.4360	G
• Hastelloy B2, mat. No. 2.4617	H
• Hastelloy C276, mat. No. 2.4819	J
• Hastelloy C4, mat. No. 2.4610	U
• Tantalum	K
Other version Add Order code and plain text: Wetted parts materials: ...	Z K1Y
Sealing face: see "Technical data"	0

Tube length

• Without tube	0
• 50 mm (1.97 inch)	1
• 100 mm (3.94 inch)	2
• 150 mm (5.90 inch)	3
• 200 mm (7.87 inch)	4

Filling liquid

• Silicone oil M5	1
• Silicone oil M50	2
• High-temperature oil	3
• Halocarbon oil (for O_2 measurements)	4
• Vegetable oil	5
• Glycerine/water [2]	6
Other version Add Order code and plain text: Filling liquid:	9 M1Y

	Order code
Further designs Please add **"Z"** to Order No. and specify Order code(s).	
With flame flashover lock-out for mounting on zone 0 (including documentation)	**A01**
Manufacturer's test certificate M to DIN 55 350, Part 18, and to ISO 8402	**C11**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Vacuum-resistant design (for use in vacuum range)	**V04**
Calculation of span of associated transmitter (enclose filled-in questionnaire with order)	**Y05**
Note: Suffix "Y01" required with transmitter!	

[1]) For vacuum on request.
[2]) Not suitable for use in low-pressure range.

Example for ordering: see page 131

12.2 Ordering data for spare parts

Ordering data	Order No.
Spare parts	
Mounting bracket and mounting parts For pressure transmitters: MK II series (7MF4010-■■■■■-1■C■) MS series (7MF4013-■■■■■-1■C■) and DS III (PA) series (7MF403■-■■■■■-1■C■) For absolute pressure transmitters: DS III (PA) series (7MF423■-■■■■■-1■C■)	
• Made of steel	**7MF4997-1AB**
• Made of stainless steel	**7MF4997-1AH**
Mounting bracket and mounting parts For pressure transmitters: MK II series (7MF4010-■■■■■-1■A■, -1■B■ and -1■D■), MS series (7MF4013-■■■■■-1■A■, -1■B■ and -1■D■), DS III (PA) series (7MF403■-■■■■■-1■A■), -1■B■ and -1■D■), For absolute pressure transmitters: DS III (PA) series (7MF423■-■■■■■-1■A■) -1■B■ and -1■D■),	
• Made of steel	**7MF4997-1AC**
• Made of stainless steel	**7MF4997-1AJ**
Mounting bracket and mounting parts for diff. pressure transmitters with M10 flange thread (7MF43 ■■-... and 7MF44 ■■-...)	
• Made of steel	**7MF4997-1AD**
• Made of stainless steel	**7MF4997-1AK**
Mounting bracket and mounting parts for differential pressure transmitters with M12 flange thread (7MF45 ■■-...)	
• Made of steel	**7MF4997-1AE**
• Made of stainless steel	**7MF4997-1AL**
Mounting bracket and mounting parts for differential pressure and absolute pressure transmitters with flange thread $^{7}/_{16}$- 20 UNF (7MF43 ■■-..., 7MF44 ■■-..., MF45 ■■-...)	
• Made of steel	**7MF4997-1AF**
• Made of stainless steel	**7MF4997-1AM**
Cover (die-cast aluminium) without window, including gasket	
• For MK II, MS and DS III (PA) series	**7MF4997-1BB**
Cover (stainless steel) without window, including gasket, for DS III (PA) series	**7MF4997-1BC**
Cover (die-cast aluminium) with window, including gasket	
• for MK II, MS and DS III (PA) series	**7MF4997-1BE**
Cover (stainless steel) with window, including gasket for DS III (PA) series	**7MF4997-1BF**
Analog indicator, scale 0 to 100%	**7MF4997-1BN**
Analog indicator, customer-specific scale divisions as specified in plain text	**7MF4997-1BP-Z Y20:** .....
Digital display including mounting material for MS and DS III (PA) series	**7MF4997-1BR**
Measuring-point label	
• Without inscription (5 off)	**7MF4997-1CA**
• Printed (1 off), data according to Y01 or Y02, Y15 and Y16 (see Ordering data for SITRANS P transmitters)	**7MF4997-1CB-Z Y■■:** .....

Ordering data	Order No.
Spare parts (continued)	
Mounting screws For measuring-point label for MK II, MS and DS III (PA) series, earthing and connection terminals or for digital display (50 off)	**7MF4997-1CD**
Sealing screws (1 set = 2 off) for process flange	
• Stainless steel	**7MF4997-1CG**
• Hastelloy	**7MF4997-1CH**
Vent valves complete (1 set = 2 off)	
• Stainless steel	**7MF4997-1CP**
• Hastelloy	**7MF4997-1CQ**
Electronics for	
• SITRANS P, DS III series	**7MF4997-1DK**
• SITRANS P, DS III PA series	**7MF4997-1DL**
Connection board for	
• SITRANS P, DS III series	**7MF4997-1DN**
• SITRANS P, DS III PA series	**7MF4997-1DP**
O-rings, for process flanges made of:	
• FPM (Viton)	**7MF4997-2DA**
• PTFE (Teflon)	**7MF4997-2DB**
• FEP (with silicone core, approved for food)	**7MF4997-2DC**
• FFPM (Kalrez (Compound: 4079))	**7MF4997-2DD**
• NBR (Buna N)	**7MF4997-2DE**

Ordering data	Order No.
SITRANS P measuring cell for pressure for DS III and DS III PA series	**7MF4990 - ■■■■ 0**
Meas. cell filling / **Meas. cell cleaning** Silicone oil / Normal Inert filling liquid / Grease-free	1 3
Rated measuring range 1 bar (14.5 psi) 4 bar (58 psi) 16 bar (232 psi) 63 bar (914 psi) 160 bar (2320 psi) 400 bar (5802 psi)	B C D E F G
Wetted parts materials Seal diaphragm / Connection shank Stainless steel / Stainless steel Hastelloy / Stainless steel Hastelloy / Hastelloy	A B C
Process connection • Connection shank G½A • Female thread ½ - 14 NPT • Oval flange made of stainless steel, max. span 160 bar (2320 psi) - Mounting thread $^{7}/_{16}$- 20 UNF - Mounting thread M10	0 1 2 3
Further designs Please add **"Z"** to Order No. and specify Order code(s).	Order code
Acceptance test certificate B to EN 10 204-3.1 B	**C12**

Ordering data	Order No.
SITRANS P measuring cell for absolute pressure (from pressure transmitter series) for DS III and DS III PA series	**7MF4992 - ■■■■ 0**
Meas. cell filling / **Meas. cell cleaning** Silicone oil / Normal Inert filling liquid / Grease-free	1 3
Rated measuring range 250 mbar (3.63 psi) 1,300 mbar (18.9 psi) 5,000 mbar (72.5 psi) 30,000 mbar (435 psi)	D F G H
Wetted parts materials Seal diaphragm / Connection shank Stainless steel / Stainless steel Hastelloy / Stainless steel Hastelloy / Hastelloy	A B C
Process connection • Connection shank G½A • Female thread ½ - 14 NPT • Oval flange made of stainless steel, max. span 160 bar (2320 psi) - Mounting thread $^{7}/_{16}$- 20 UNF - Mounting thread M10	0 1 2 3
Further designs Please add **"Z"** to Order No. and specify Order code(s).	Order code
Acceptance test certificate B to EN 10 204-3.1 B	**C12**

Ordering data	Order No.
SITRANS P measuring cell for absolute pressure (from differential pressure transmitter series) for DS III and DS III PA series	7MF4993 - ■■■■■
Meas. cell filling / **Meas. cell cleaning**	
Silicone oil, Normal	1
Inert filling liquid, Grease-free	3
Rated measuring range	
250 mbar (3.63 psi)	D
1,300 mbar (18.9 psi)	F
5,000 mbar (72.5 psi)	G
30,000 mbar (435 psi)	H
100,000 mbar (1450 psi)	K
	E
Wetted parts materials	
Seal diaphragm / Parts of meas. cell	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Hastelloy / Hastelloy	C
Tantalum / Tantalum	E
Monel / Monel	H
Gold / Gold	L
Process connection	
Female thread ¼ - 18 NPT with flange connection to DIN 19 213	
• Vent opposite process connection - Mounting thread M10	0
- Mounting thread $^{7}/_{16}$ - 20 UNF	2
• Vent on side of process flange - Mounting thread M10	4
- Mounting thread $^{7}/_{16}$ - 20 UNF	6
Non-wetted parts materials	
Process flange screws:	
• Stainless steel	2
Further designs	Order code
Please add **"Z"** to Order No. and specify Order code(s).	
Instead of FPM (Viton), process flange O-ring made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Process connection G1/2A	**D16**
Remote seal connection (not together with K01, K02 and K04)	**D20**
Vent on side for gas measurements	**H02**
Without process flanges	**K00**
With process flange made of:	
• Hastelloy	**K01**
• Monel	**K02**
• Stainless steel with PVDF insert (max. PN 10 (MWP 145 psi), max. temperature of medium 90 °C (194 °F))	**K04**

[1] Only together with max. span 250, 1,600, 5,000 and 30,000 mbar (3.63, 23.21, 72.5 and 435 psi).

[2] Not suitable for connection of remote seal.

Ordering data	Order No.
SITRANS P measuring cell for differential pressure and PN 32/160 (MWP 464/2320 psi) for DS III and DS III PA series	7MF4994 - ■■■■■
Meas. cell filling / **Meas. cell cleaning**	
Silicone oil, Normal	1
Inert filling liquid, Grease-free	3
rated measuring range	
PN 32 (MWP 464 psi)	
20 mbar[2] (0.29 psi)	B
PN 160 (MWP 2320 psi)	
60 mbar (0.87 psi)	C
250 mbar (3.63 psi)	D
600 mbar (8.7 psi)	E
1,600 mbar (23.2 psi)	F
5,000 mbar (72.5 psi)	G
30,000 mbar (435 psi)	H
Wetted parts materials (process flanges made of stainless steel)	
Seal diaphragm / Parts of meas. cell	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Hastelloy / Hastelloy	C
Tantalum [1] / Tantalum	E
Monel [1] / Monel	H
Gold [1] / Gold	L
Process connection	
Female thread ¼ - 18 NPT with flange connection to DIN 19 213	
• Vent opposite process connection - Mounting thread M10	0
- Mounting thread $^{7}/_{16}$ - 20 UNF	2
• Vent on side of process flange - Mounting thread M10	4
- Mounting thread $^{7}/_{16}$ - 20 UNF	6
Non-wetted parts materials	
Process flange screws:	
• Stainless steel	2
Further designs	Order code
Please add **"Z"** to Order No. and specify Order code(s).	
Instead of FPM (Viton), process flange O-ring made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Remote seal flanges (not together with K01, K02 and K04)	**D20**
Vent on side for gas measurements	**H02**
Stainless steel process flanges for vertical differential pressure lines (not together with K01, K02 or K04)	**H03**
Without process flanges	**K00**
With process flange made of:	
• Hastelloy	**K01**
• Monel	**K02**
• Stainless steel with PVDF insert (max. PN 10 (MWP 145 psi), max. temperature of medium 90 °C (194 °F))	**K04**

Ordering data	Order No.
SITRANS P measuring cell for differential pressure and PN 420, (MWP 6092 psi) DS III and DS III PA series	**7MF4995 - 1** ■■■■■
Rated measuring range	
250 mbar (3.63 psi)	D
600 mbar (8.7 psi)	E
1,600 mbar (23.2 psi)	F
5,000 mbar (72.5 psi)	G
30,000 mbar (435 psi)	H
Wetted parts materials (process flanges made of stainless steel)	
Seal diaphragm / Parts of meas. cell	
Stainless steel / Stainless steel	A
Hastelloy / Stainless steel	B
Gold [1] / Gold	L
Process connection	
Female thread ¼ - 18 NPT with flange connection to DIN 19 213	
• Vent opposite process connection - Mounting thread M12 / 7/16 - 20 UNF	1
• Vent on side of process flange - Mounting thread M12 / 7/16 - 20 UNF	3 / 5 / 7
Non-wetted parts materials	
Process flange screws:	
• Stainless steel	2
Further designs	Order code
Please add **"Z"** to Order No. and specify Order code(s).	
Instead of FPM (Viton), process flange O-ring made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Stainless steel process flanges for vertical differential pressure lines	**H03**
Without process flanges	**K00**

[1]) Only together with max. span 250, 1,600, 5,000 and 30,000 mbar (3.63, 23.21, 72.5 and 435 psi).

Ordering data	Order No.
SITRANS P measuring cell for level, DS III and DS III PA series	**7MF4996 - 1** ■■■■
Rated measuring range	
250 mbar (3.63 psi)	D
600 mbar (8.7 psi)	E
1,600 mbar (23.2 psi)	F
5,000 mbar (72.5 psi)	G
Wetted parts materials (process flanges made of stainless steel)	
Seal diaphragm / Parts of meas. cell	
Stainless steel / Stainless steel	A
Process connection of low-pressure side	
Female thread ¼ - 18 NPT with flange connection to DIN 19 213	
• Vent opposite process connection - Mounting thread M10 / 7/16 - 20 UNF	0 / 2
Non-wetted parts materials	
Process flange screws:	
• Stainless steel	2
Further designs	Order code
Please add **"Z"** to Order No. and specify Order code(s).	
Instead of FPM (Viton), process flange O-ring made of:	
• PTFE (Teflon)	**A20**
• FEP (with silicone core, approved for food)	**A21**
• FFPM (Kalrez (Compound: 4079))	**A22**
• NBR (Buna N)	**A23**
Acceptance test certificate B to EN 10 204-3.1 B	**C12**
Without process flanges	**K00**

12.3 Ordering data for accessories

Ordering data	Order No.
Instruction Manuals	
Instruction Manual for SITRANS P, DS II series	
• German	**A5E00047090**
• English	**A5E00047092**
• French	**A5E00053218**
• Spanish	**A5E00053220**
• Italian	**A5E00053219**
Brief instructions (Leporello) for SITRANS P, DS III series	
• German/English	**A5E00047093**
CD with documentation for SITRANS P, DS III series, DS III PA, MS, MK II, MPS and Z	
• German, English, French, Spanish, Italian	**A5E00090345**
Service Manual for replacement of electronics, measuring cell and connection board	
• German/English	**A5E00078060** (only available on the Internet)
HART communication	
HART communicator	See on the right side
HART modem	**7MF4997-1DA**

Note:
You can download the above-mentioned Instruction Manuals free-of-charge from the Internet site [redacted]

Ordering data	Order No.
HART communicator with rechargeable battery, charger for AC 230 V Type of protection: intrinsic safety EEx ia IIC T4, with carrying case, 4 MB memory, with DDs of Siemens devices	
Language	
• German	**7MF4998-8KF**
• English	**7MF4998-8KT**
Loading of further device descriptions Please specify DDs in plain text	**7MF4998-8KU**

Certificates

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The certificates are enclosed as a collection of loose leaves in the operating instructions (or on CD).

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Appendix 15

15.1 Literature and catalogs

No.	Title	Issued by	Order number
/1/	PNO guide PROFIBUS PA	PNO Technologiefabrik Haid-und-Neu-Str. 7 D-76131 Karlsruhe	2.091
/2/	SIMATIC field technology package	Siemens AG	Internet address: http://www.ad.siemens.de:8080/virlib/html_00/doc/index.htm on: Profibus descriptions (free) / system description / **PA system description, German**
/3/	Catalog, ST 50 SIMATIC S5/PC/505 Automation Systems	Siemens AG	E86060-K4650-A111-A8-7600
/4/	Catalog, ST 70 Components for Totaly Integrated Automation	Siemens AG	E86060-K4670-A111-A7-7600
/5/	Catalog, ST 80 **Human Machine Interface Products/Systems**	Siemens AG	E86060-K4680-A101-A9-7600
/6/	Catalog, IK PI SIMATIC NET Industrial Communication and Field Devices	Siemens AG	E86060-K6710-A101-B2-7600
/7/	Catalog, ST PCS 7 SIMATIC PCS 7 Process Control System	Siemens AG	E86060-K4678-A111-A5-7600

15.2 Summary of error messages and status codes

Hex	Digital display	Source of measured value set	PDM display	Cause	Measure
00	B_000	Output (cyclic data only), counter output (cyclic data only)	Bad	Is used if no other information is available. Device not available or cyclic connection interrupted.	---
0B	B_011	Secondary variable 3	Bad, not connected, value constant	Variable is not calculated	Correct the "Measuring transducer type" setting
0C	B_012	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output [1], counter output [2]	Bad, device error	Device has an irreparable error	Replace the electronics.
04	B_004	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output [1], counter output [2]	Bad, configuration error	Adjustment range too small	Repeat the adjustment process with pressure values which are further apart from one another.
0F	B_015	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output [1], counter output [2]	Bad, device error, value constant	Device has an irreparable error.	Change the electronics.
10	B_016	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output [1], counter output [2]	Bad, sensor error	Sensor shows error.	Have the measuring cell checked by service personnel.
11	B_017	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output [1], counter output [2]	Bad, sensor error, fallen below limit value	Negative pressure too high Fallen below lower overload limit (< -20 % of nominal measuring range).	Increase the pressure in a positive direction.

Hex	Digital display	Source of measured value set	PDM display	Cause	Measure
12	B_018	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output [1]), counter output [2])	Bad, sensor error, limit value exceeded	Positive pressure too high Upper overload limit exceeded (> 120 % of nominal measuring range).	Reduce the pressure.
1F	B_031	Output, counter output	Bad, out of order, value constant	The function block is put out of order with a target mode command. A parameterized safety value is output.	For normal operation, reset the target mode to “AUTO”.
47	U_071	Output	Uncertain, last usable value, value constant	Input condition “Fail safe” is met, the pararmeterized safety setting is set to “Keep last valid value”.	Check the recording of measured values.
48	U_072	Counter output	Uncertain, replacement value	Use of the totalizer block when the measured value status = “bad” and the parameterized safety setting is set to “Safe operation”. The total value changes. Fault behavior = safe operation.	Check the recording of measured data.
4B	U_075	Output, counter output	Uncertain, replacement value, value constant	Value is not an automatic measured value. This identifies a parameterized, static substitute value or a preset value.	Check the recording of measured values.
4F	U_079	Output, counter output	Uncertain, initial value, value constant	After run-up, an intial value is entered in the device memory.	Reject the value in the user program.
50	U_080	Non-linearized pressure value, secondary variable 1, secondary variable 2, (measured value (primary variable), secondary variable 3, output, counter output	Uncertain, value inaccurate	Non-permissible operating parameters or maintenance alarm.	Check the operating parameters, e.g. the permitted ambient temperature. Immediate maintenance work required.

1) Only if fault behavior of the analog input function block is set to “Incorrectly calculated measured value at the output”.
2) Only if fault behavior of the counter function block is set to “Operation”.

Hex	Digital display	Source of measured value set	PDM display	Cause	Measure
51	U_081	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output, counter output	Uncertain, value inaccurate, fallen below limit value	Fallen below lower nominal measuring range limit (< 0 %).	Increase the pressure in a positive direction.
52	U_082	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output, counter output	Uncertain, value inaccurate, limit value exceeded	Upper nominal measuring range limit exceeded (> 100 %).	Reduce the pressure.
80		Electronics temperature, Sensor temperature, non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output, counter output	---	Normal operation	---
84	G_132	Electronics temperature, Sensor temperature, non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output, counter output	Good, update event	A parameter relevant to the behavior of the slave has been changed. The display is extinguished after 10s.	Message to the control system.
89	G_137	Output, counter output	Good, fallen below warning limit	Fallen below lower parameterized warning limit.	Correct error using user programme.
8A	G_138	Output, counter output	Good, warning limit exceeded	Upper parameterized warning limit exceeded.	Correct error using user programme.
8D	G_141	Electronics temperature, output, counter output	Good, fallen below alarm limit	Fallen below lower parameterized alarm limit.	Correct error using user programme.
8E	G_142	Electronics temperature, output, counter output	Good, alarm limit exceeded	Upper parameterized alarm limit exceeded.	Correct error using user programme.
A4	G_164	Non-linearized pressure value, secondary variable 1, secondary variable 2, measured value (primary variable), secondary variable 3, output, counter output	Good, maintenance required	Maintenance interval has expired: Calibration or servicing.	Maintenance work, calibration of the electronics or servicing of the measuring cell is required.

Hex	Digital display	Source of measured value set	PDM display	Cause	Measure
-	F_001	-	-	Local operation disabled	Release write protection
-	F_002	-	-	Change of bus address not possible as the device is exchanging data with class 1 master.	End communication with class 1 Master.
-	F_003	-	-	Change of device operating mode not possible, as the device is exchanging data with class 1 master.	End communication with class 1 Master.
-	F_004	-	-	Display overflow	Check the physical unit and decimal point position settings, and adjust them to the current measured value.
-	F_005	-	-	Value is read-only.	-
-	F_006		-	Adjustment unsuccessful.	Check adjustment range, repeat procedure.
-	F_007		-	Measurements across whole measuring range no longer possible after zero point adjustment.	Check measuring range, if necessary reduce inconsistency.
-	F_008		-	Local operation is disabled by SIMATIC PDM.	Set the parameter “Local operation” to “Enabled” with SIMATIC PDM.

15.3 Certificates

The certificates are enclosed with the operating instructions in compiled form as a loose collection of sheets.

General

The pressure equipment directive **97/23/EC** applies to the alignment of the statutory orders of the European member states for pressure equipment. Such equipment in the sense of the directive includes vessels, pipelines and accessories with a maximum permissible pressure of more than **0.5 bar** above atmospheric.

The pressure equipment directive can be used starting November 29, 1999, and is compulsory starting May 29, 2002.

Division according to the danger potential

Equipment is divided in line with the pressure equipment directive according to the danger potential (medium/pressure/volume/nominal diameter) into the categories I to IV or Article 3 Paragraph 3.

The following criteria are decisive for assessment of the danger potential, and are also shown in Diagrams 1 to 4 and 6 to 9:

• Fluid group	Group 1 or 2
• Aggregate state	Liquid or gaseous
• Type of pressurized equipment	
- Vessel	Product of pressure and volume (PS * V [barL])
- Pipeline	Nominal diameter, pressure or product of pressure and nominal diameter (PS * DN)

Fuelled pressure equipment or equipment heated in another manner are shown separately in Diagram 5.

Note:
Liquids according to Article 3 are those liquids whose steam pressure is **not** more than **0.5 bar** above standard atmospheric pressure (1013 mbar) at the maximum permissible temperature.

The **maximum permissible temperature** for the used liquids is the maximum process temperature which can occur, as defined by the user. This must be within the limits defined for the equipment.

Division of media (liquid/gaseous) into the fluid groups

Fluids are divided according to Article 9 into the following fluid groups:

Group 1

Potentially explosive
R phrases:
e.g.: 2, 3 (1, 4, 5, 6, 9, 16, 18, 19, 44)

Highly toxic
R phrases:
e.g.: 26, 27, 28, 39 (32)

Highly flammable
R phrases:
e.g.: 12 (17)

Toxic
R phrases:
e.g.: 23, 24, 25 (29, 31)

Readily flammable
R phrases:
e.g.: 11, 15, 17 (10, 30)

Fire stimulating
R phrases:
e.g.: 7, 8, 9 (14, 15, 19)

Flammable if the maximum permissible temperature is above the flash point.

Group 2

All fluids not belonging to Group 1.

Also applies to fluids which are e.g. dangerous to the environment, corrosive, dangerous to health, irritant or carcinogenic (if not highly toxic).

Conformity rating

Pressure equipment of categories I to IV must comply with the safety requirements of the directive and be assigned the CE symbol.

They must comply with a conformity rating procedure according to Appendix III of the directive.

Pressure equipment according to Article 3 Paragraph 3 must be designed and manufactured in agreement with the sound engineering practice SEP applying in a member country, and must not be assigned a CE symbol (CE symbols from other directives are not affected).

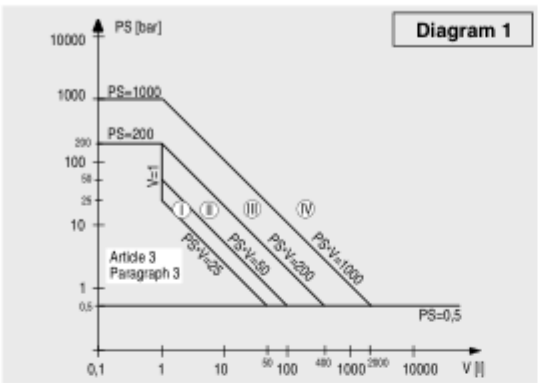
Siemens has carried out a conformity rating, assigned a CE symbol, and issued a declaration of conformity for its products (providing the equipment is not within the context of Article 3 Paragraph 3).

Supervision of the design, dimensioning, testing and manufacture is carried out according to module H (comprehensive quality assurance) by the TÜV Nord (Northern Technical Inspectorate) as the specified office.

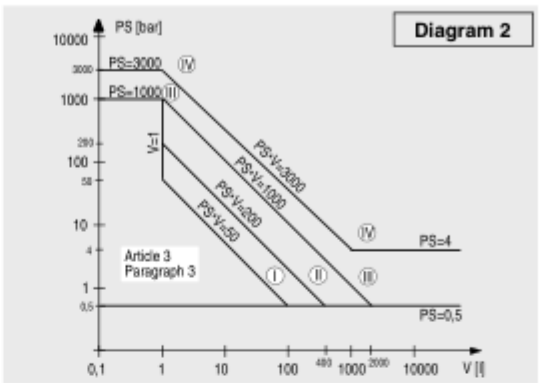
Notes:

- Equipment designed for media with a high danger potential (e.g. gases of fluid group 1) may also be used for media with a lower danger potential (e.g. gases of fluid group 2, or liquids of fluid groups 1 and 2).
- The pressure equipment directive according to Article 1 Paragraph 1 does not apply to equipment such as e.g. mobile offshore plants, ships, aircraft, water supply and waste water networks, nuclear plants, rockets and pipelines outside industrial plants.

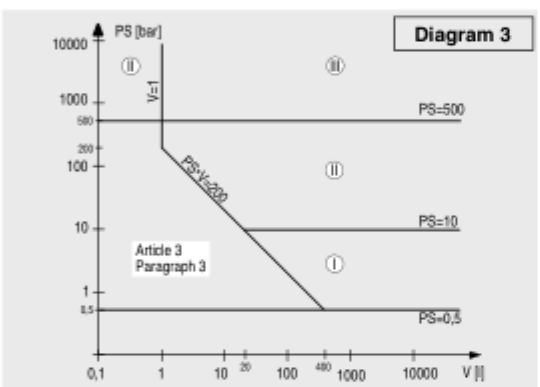
Diagrams



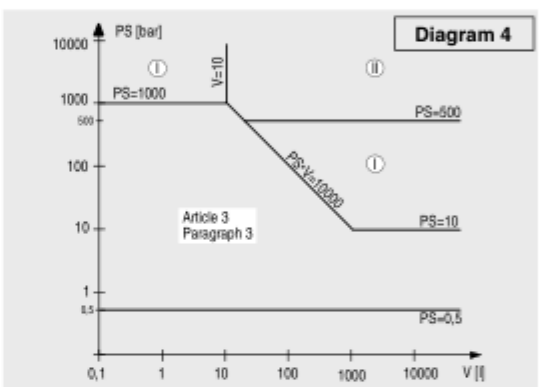
- Gases of fluid group 1
- Vessels according to Article 3 Number 1.1 Letter a) First dash
- Exception: unstable gases belonging to Categories I and II must be included in Category III.



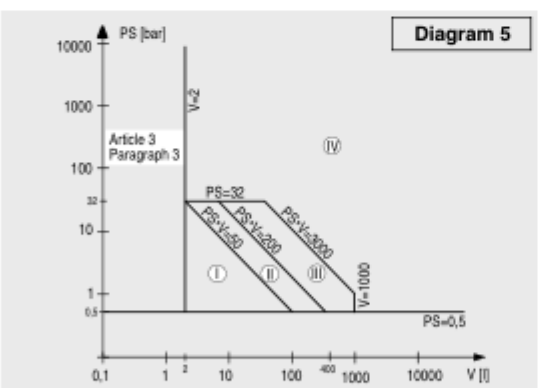
- Gases of fluid group 2
- Vessels according to Article 3 Number 1.1 Letter a) Second dash
- Exception: fire extinguishers and bottles for breathing apparatus: at least Category III.



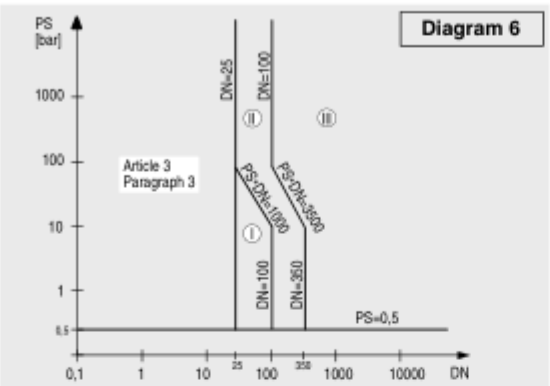
- Liquids of fluid group 1
- Vessels according to Article 3 Number 1.1 Letter b) First dash



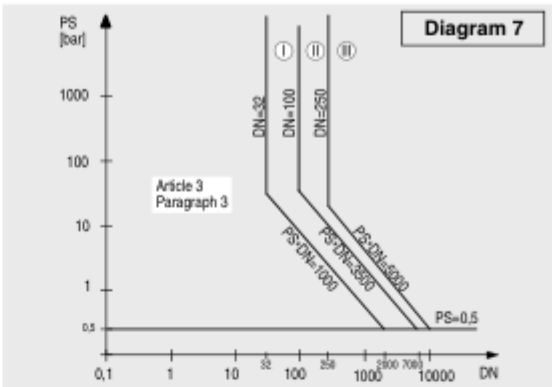
- Liquids of fluid group 2
- Vessels according to Article 3 Number 1.1 Letter b) Second dash
- Exception: modules for producing warm water



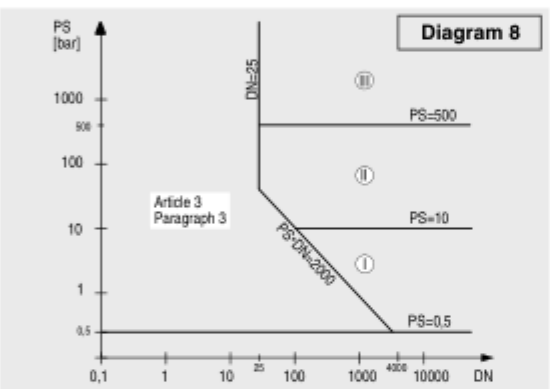
- Fuelled pressure equipment or equipment heated in another manner above 110 °C and liable to overheating.
- Vessel according to Article 3 Number 1.2
- Exception: pressure cooker, test procedure at least according to Category III.



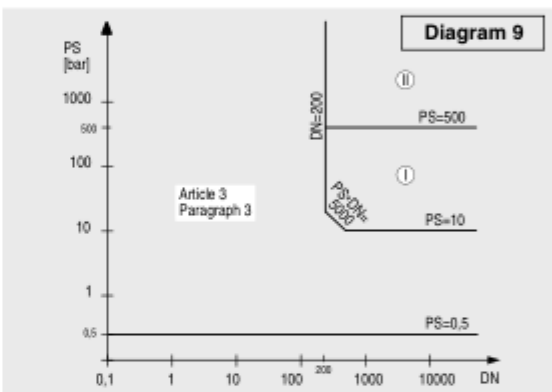
- Gases of fluid group 1
- Pipelines according to Article 3 Number 1.3 Letter a) First dash
- Exception: unstable gases belonging to Categories I and II must be included in Category III.



- Gases of fluid group 2
- Pipelines according to Article 3 Number 1.3 Letter a) Second dash
- Exception: liquids at temperatures > 350 °C belonging to Category II must be included in Category III.



- Liquids of fluid group 1
- Pipelines according to Article 3 Number 1.3 Letter b) First dash



- Liquids of fluid group 2
- Pipelines according to Article 3 Number 1.3 Letter b) Second dash

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