Operating Instructions Edition 05/2004

sitrans p

DS III FF SERIES

Transmitter for pressure,
differential pressure, flow, level and
absolute pressure
7MF4*35-...

SIEMENS

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SITRANS P, DS III FF series 7MF4*35-...

Edition 05/2004

Operating Instructions

Transmitters for pressure, differential pressure and flow, level,
absolute pressure from differential pressure series and absolute pressure from pressure series, DS III series with FOUNDATION™ Fieldbus

Edition of operating manual	Firmware identification License plate	System integration
01	FW: FF11.01.01	Standard fieldbus compatible control systems

Table 1 History of operating instructions

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

indicates 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

highlights 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 critical 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 operating instructions.

Excluded Liability

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

Qualified Personnel

are persons familiar with the installation, assembly, commissioning 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 electrical 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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"Foundation" of "FOUNDATION™ Fieldbus" is a registered trademark of the Fieldbus Foundation.

Patents

Manufactured under one or more of the following patents

U.S. 6,424,872 U.S. 09/598,697 PCT/US001/17022 U.S. 60/384,846 U.S. 5,909,368 U.S. 5,333,114 U.S. 5,485,400 U.S. 5,825,664 Australian Patent #638507 Canadian Patent #2,066,743 European Patent # 04905001 UK Patent # 0495001 France # 0495001 Germany # 69032954.7 Netherlands # 0495001 Japan Patent # 3137643 U.S. 6,055,633 EP1029406A2 U.S. 6,104,875 AU9680998A1

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, DS III FF series transmitter measures the pressure of corrosive, non-corrosive and 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 fieldbus interface.

1.2 Product features

- Transmitter with bus connection according to IEC 61158-2
- 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 FOUNDATION™ Fieldbus
- The transmitter can be parameterized locally using three buttons or via the fieldbus interface.

1.3 Measuring type

1.3.1 Pressure

This type of transmitter measures the pressure of corrosive, non-corrosive and critical gases, vapors and liquids. Nominal measuring ranges are possible from 1 to 400 bar (14.5 to 5802 psi).

1.3.2 Differential pressure and flow

This type of transmitter is used to measure:

- The differential pressure, e.g. the active pressure
- A small positive or negative pressure
- The flow q ~ $\sqrt{\Delta p}$ (together with the primary differential pressure device)

These three physical values can be measured for corrosive, non-corrosive and critical gases, vapors and liquids. Nominal measuring ranges are possible from 20 mbar to 30 bar (0.29 to 435 psi).

1.3.3 Level

This type of transmitter with mounting flange measures the level of corrosive, non-corrosive and critical liquids in open and closed containers. Nominal measuring ranges are possible between 250 mbar to 5 bar (3.63 to 72.5 psi). The nominal width of the mounting flange is DN 80 or DN 100, or 3 inch or 4 inch.

In the 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, page 145) according to the required corrosion resistance.

1.3.4 Absolute pressure

This type of transmitter measures the absolute pressure of corrosive, non-corrosive and critical gases, vapors and liquids.

Two series are available: "Pressure" series (nominal measuring ranges from 250 mbar to 30 bar (3.63 to 435 psi)) and "Differential pressure" series (nominal measuring ranges from 250 mbar to 100 bar (3.63 to 1450 psi)). The “differential pressure series” is characterized by a high overload capacity.

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, page 163.

The rating plate (Figure 1, page 13 and Figure 3, page 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, page 163.

1 Order number
2 Serial number

Figure 1 Example for a rating plate

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

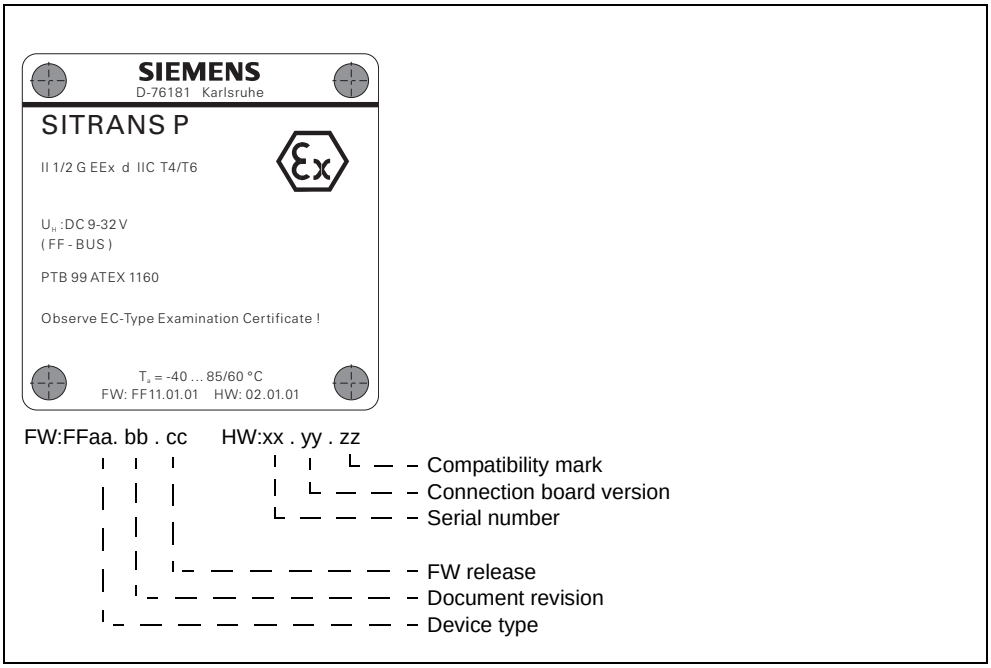


Figure 2 Example of license plate

The electronics housing is made of die-cast aluminum or stainless steel precision casting. There is an unscrewable, round cover on the front and rear. The front cover (see (4) Figure 3, page 15) can be designed as a window in order to be able to read measured values directly from the digital display. The inlet (see (2) Figure 3, page 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 (see (5) Figure 4, page 15). The PE conductor terminal (see (2) Figure 4, page 15) is mounted at the front of the housing.

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

At the top of the housing you can see a plastic cover (see (3) Figure 3, page 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

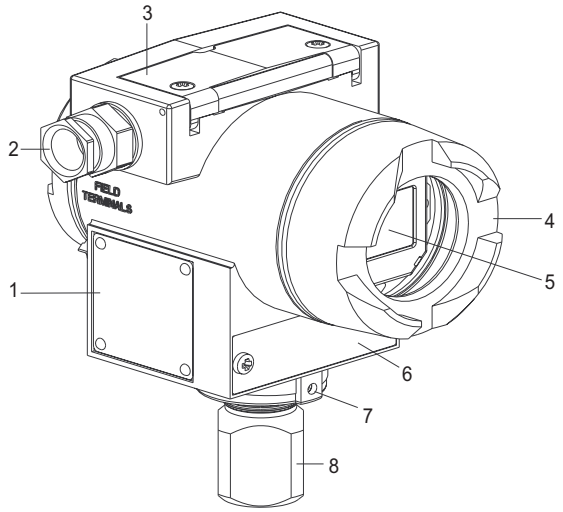


Figure 3 Front view of device SITRANS P, DS III FF series, pressure series

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

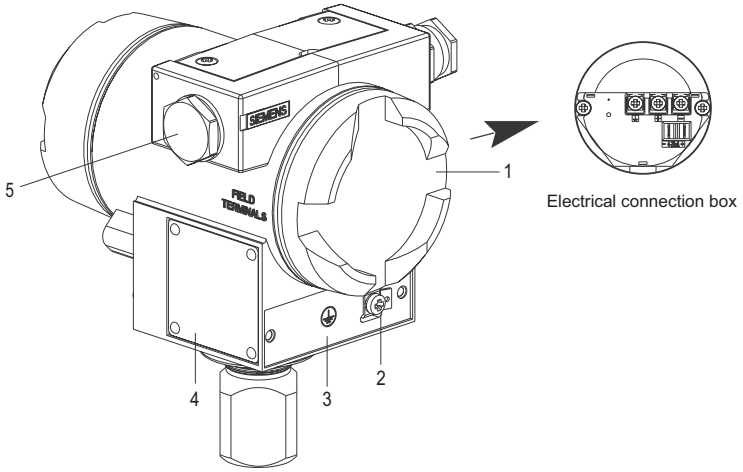


Figure 4 Rear view of device SITRANS P, DS III FF series, pressure series

1.4.2 Mode of operation

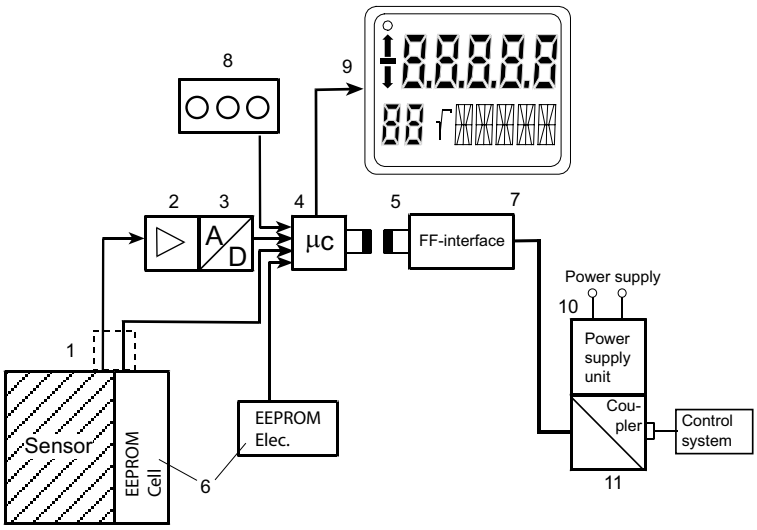
This chapter describes how the transmitter operates and what protection and safety measures you need to observe. First of the design of the electronics is described, then the sensors used for the individual measuring modes in the various versions of the device.

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 (see (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 FOUNDATION™ Fieldbus (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, diagnosis and perform configuration using the fieldbus' data transmission.



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 Fieldbus interface
8 Three input keys (local operation)
9 Digital display
10 Auxiliary power source
11 FF coupler or link

Figure 5 Transmitter SITRANS P, DS III FF series, electronics

1.4.2.2 Pressure

The pressure p_e is fed in through the process connection (see (3) Figure 6, page 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 (913 psi) measure the input pressure compared with atmospheric, those with measuring spans ≥ 160 bar (2320 psi) compared with a vacuum.

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 (913 psi)).

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

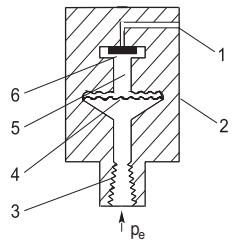


Figure 6 Pressure measuring cell, functional diagram

1.4.2.3 Differential pressure and flow

The differential pressure is transmitted via the seal diaphragms (see (7) Figure 7, page 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_-

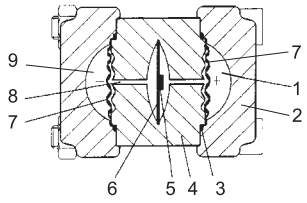


Figure 7 Measuring cell for differential pressure and flow, functional diagram

1.4.2.4 Level

The input pressure (hydrostatic pressure) acts through the seal diaphragm (see (10) Figure 8, page 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

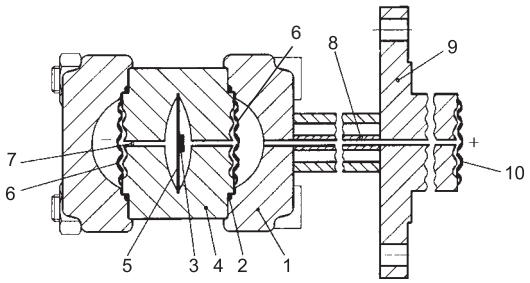


Figure 8 Measuring cell for level, functional diagram

1.4.2.5 Absolute pressure from the differential pressure series

The absolute pressure is transmitted via the seal diaphragm (see (6) Figure 9, page 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

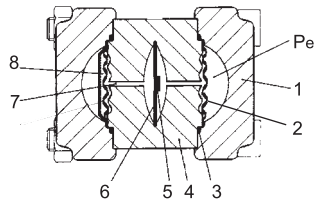


Figure 9 Measuring cell for absolute pressure, functional diagram

1.4.2.6 Absolute pressure from the pressure series

The pressure is transmitted via the seal diaphragm (see (3) Figure 10, page 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

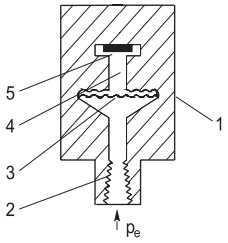


Figure 10 Measuring cell for absolute pressure from pressure series, functional diagram

Communication structure for FOUNDATION™ Fieldbus

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. They can be parameterized by data transfer.

The pressure transmitter SITRANS P, DS III FF series is implemented as a Basic Field Device with Link Master capability according to fieldbus specifications. It comprises the following blocks:

- Resource Block
- 3 Analog Input Function Block
- PID Function Block
- Pressure Transducer Block with Calibration
- LCD Transducer Block

The following figure shows an overview of the function and transducer blocks with their respective inputs and outputs. The link master capability is not shown.

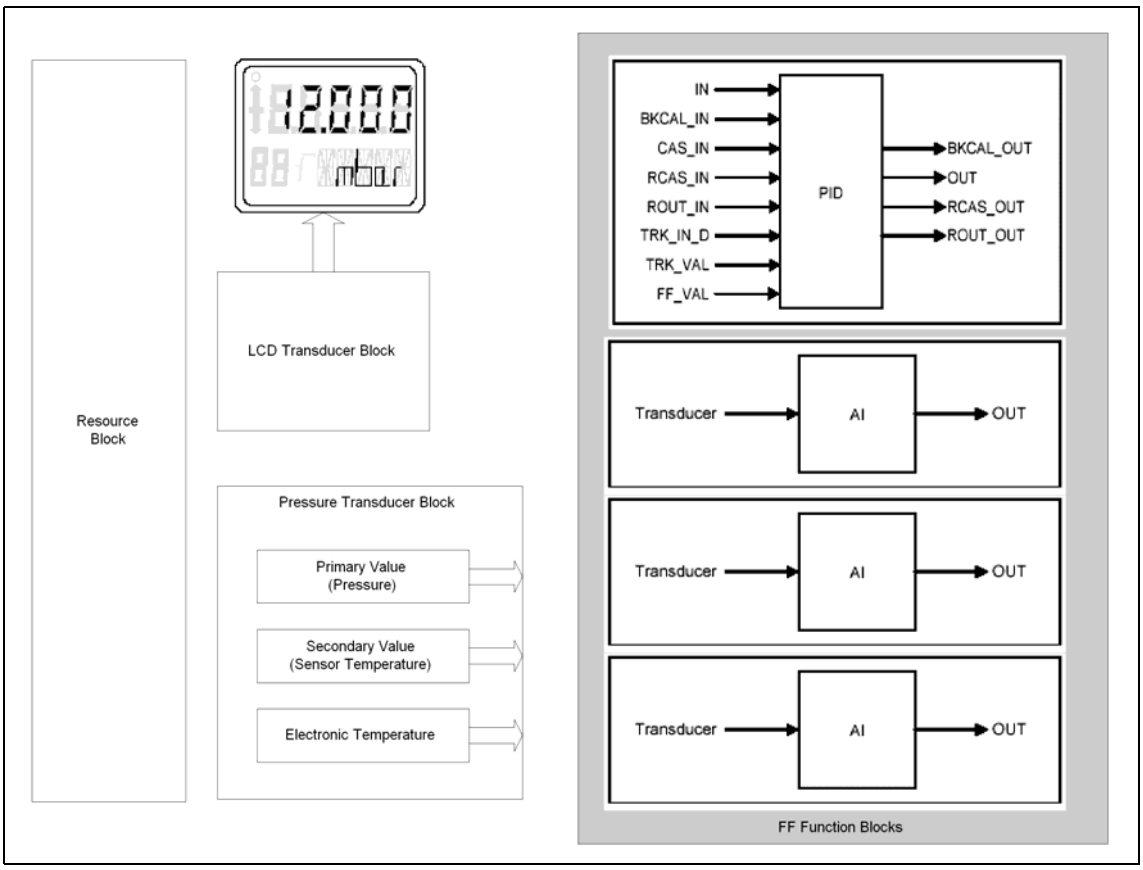


Figure 11 Block structure of the SITRANS P, DS III FF series

2.2 Description of individual blocks

2.2.1 Resource Block

The Resource Block contains data that is specific to the hardware that is associated with the resource. This includes the device type and revision, manufacturer ID, serial number and resource state. All data is modeled as contained, so there are no links to this block. The data is not processed in the way that a function block processes data.

2.2.2 Analog Input Function Block

The analog input function block (AI) is connected to one of the channels of the pressure transducer block. It is the source of measurements for a function block application. The Analog Input is implemented as described in the fieldbus specification.

The following figure illustrates the basic functionality of the AI Function Block.

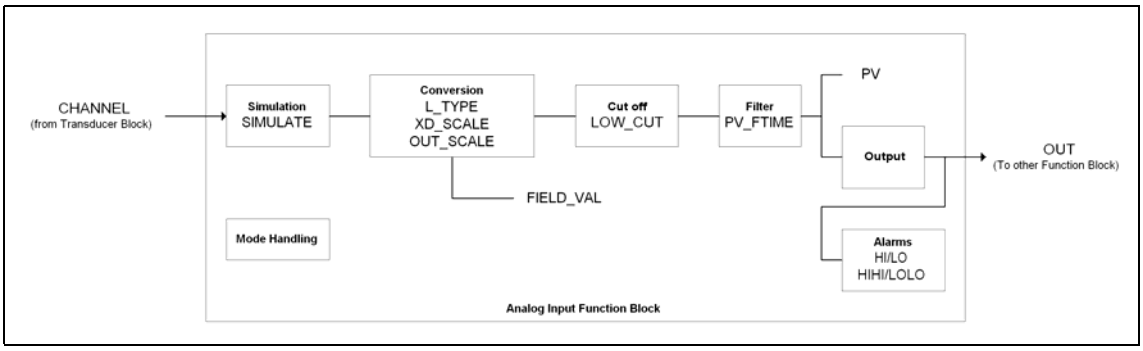


Figure 12 Analog Input Function Block Operation

2.2.3 PID Function Block

The PID function block implements a controller function. The inputs can be received over the bus or locally from the analog input function blocks. The output can be transmitted to other devices that have other receiving inputs, such as analog output function blocks of a positioner. The PID function block can be cascaded.

The following figure illustrates the basic operation of the PID function block.

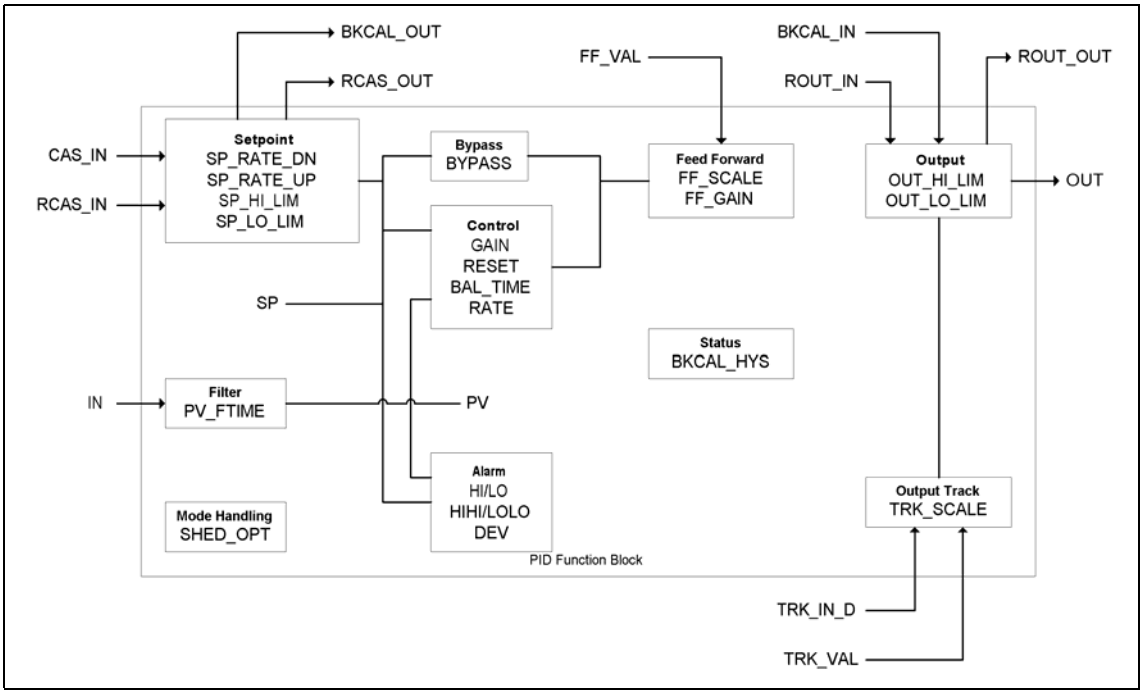


Figure 13 PID Function Block Operation

2.2.4 Pressure Transducer Block with Calibration

The sensor transducer function block decouples the analog input function blocks from the local input sensor hardware. It contains information such as calibration, sensor type, etc.

The pressure transducer block is closely modeled according to the preliminary specification draft (pressure transducer block with calibration). This block features a calibration timer that works similar to the service timer of the resource block. It is based on the operating hours of the sensor. In addition to the function block simulation this transducer block offers the opportunity to simulate the measurement values of all three channels that can be used by analog input function blocks.

The following figure illustrates the basic functionality of the Pressure Transducer Block.

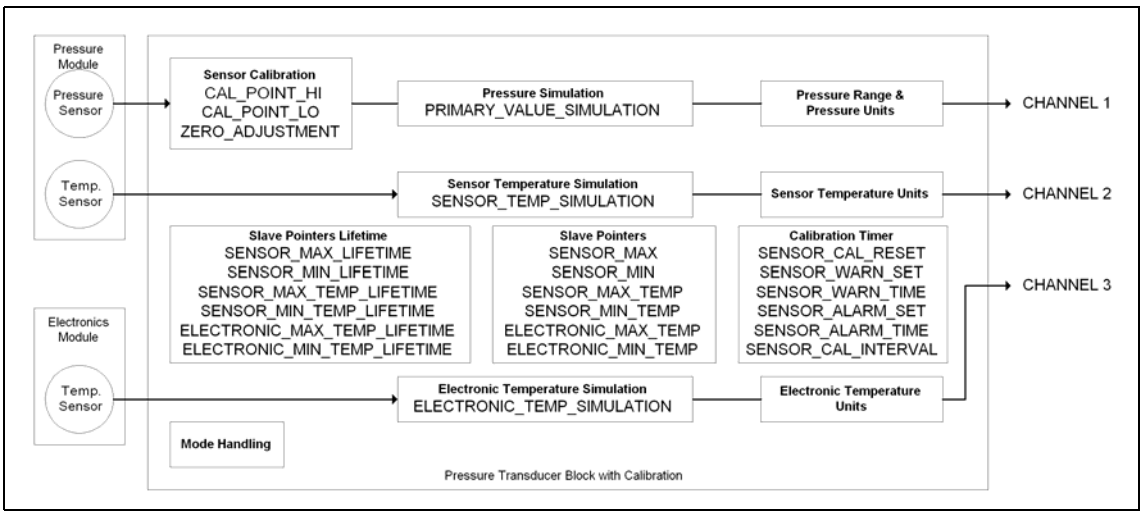


Figure 14 Pressure Transducer Block with Calibration Operation

2.2.5 LCD Transducer Block

The LCD Transducer Block is a custom block that is used to configure the measurement display. Up to four values from the device can be displayed along with customized tags.

This block features the configuration of up to four measurements and a tag for the local display. The tags are accessible to identify a device in the field.

The following figure illustrates the basic functionality of the LCD Transducer Block.

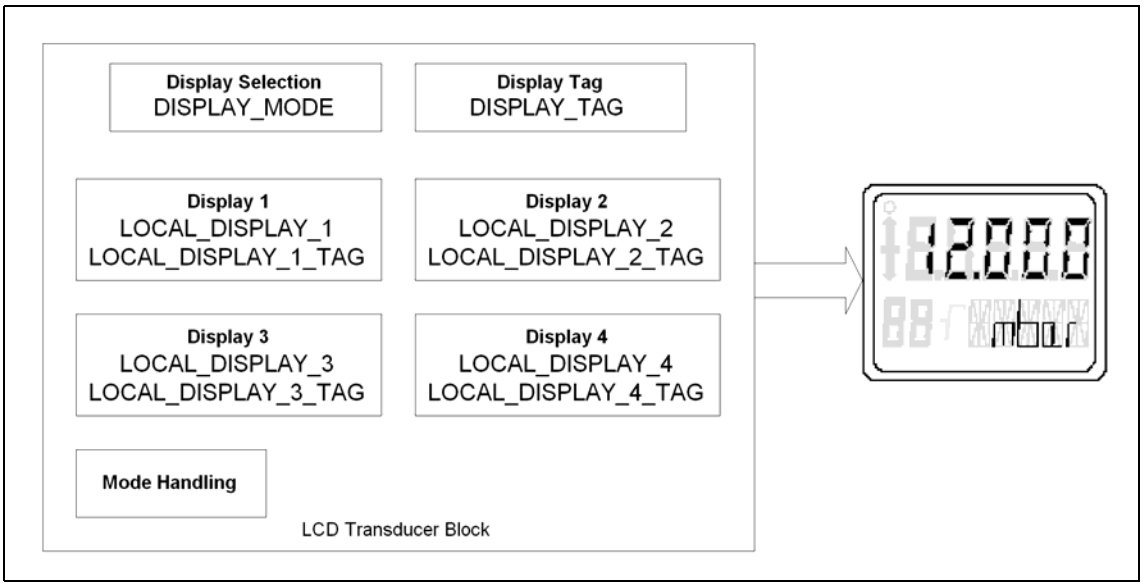


Figure 15 LCD Transducer Block Operation

System integration

3

3.1 Data transmission

The Foundation Fieldbus protocol was designed for distributed control which allows the control functions to reside in the field devices. A system can be set up in the traditional fashion where a central system retrieves all the inputs, processes them and sends the outputs back to the actuators. During the engineering of a control system the designer may also choose to let the processing of the information be done in field devices. This mainly depends on the features and configuration utilities supported by the system.

From the engineering tool a so called schedule is derived. This schedule is used to instruct devices when they should publish their outputs or results and to which data a device has to subscribe and listen. This schedule is loaded into the available link masters. One of them is the Link Active Scheduler (LAS) which is used for the arbitration of the bus. Other link masters can work as Backup LAS, i.e. they will take over the arbitration if the LAS fails. For details on how to setup a specific Fieldbus System please refer to the manuals of the respective vendor.

3.1.1 Addressing

Every fieldbus device must have a unique node address and physical device tag for the FOUNDATION™ Fieldbus to operate properly. The node address must be unique within the link (segment), the physical device tag must be unique within the whole network.

The default physical device tag of the SITRANS P, DS III FF series is the concatenation of the string "SITRANS_P_DS3_", the last 5 digits of the electronics and the complete sensor serial number ("xxxxx_SE:yyyyyyy, where xxxxx are the last 5 digits of the electronic serial number and yyyyyyy is the sensor serial number). The default node address is set to the value of 22.

When configuring the device, the node address must be set to a value which is unique within the link. To avoid address conflicts, the SITRANS P, DS III FF series sets its address automatically to one of the temporary addresses of 248 to 251 if it detects another device with the same node address.

3.1.2 Configuration

For the configuration of the SITRANS P, DS III FF series you need:

- the Device Description (DD)
- the capability file (for offline configuration)
- a configuration tool such as the National Instruments NIFBUS-Configurator or a tool integrated in your control system

The Device Description (DD) describes in machine readable format all the information available at the fieldbus interface. It also contains information how to display information to the user and how to arrange the parameters in hierarchic menus. Another element of the DD is a number of so called methods, which contain standard operating procedures for the device and ease the configuration. Extensive help texts are also included in the DD to describe the meaning and handling of various parameters.

Hosts and configuration tools can use the information contained in the DD to generate a user friendly configuration interface.

The DD consists of two files:

- 0101.ffo (DD binary)
- 0101.sym (Symbol information)

The capability file (010101.cff) contains all information necessary for offline configuration.

Please refer to the manual of your configuration tool or control system how to install the files.

3.1.2.1 Status

Status provides information about:

- the usability of the measured value in the user programme
- the device status (self-diagnosis/system diagnosis)
- 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. The digital codes shown in the following tables will appear in the unit/error code (see (2) Figure 16, page 31) section of the digital display when the variable being displayed has a status condition active.

In the following table you see the status coding for status good:

Digital	Meaning
G_001, G_004	Unreported block alarm
G_002, G_005	Lower or upper alarm limit reached
G_003, G_006	Lower or upper alarm limit reached
Gc001 Gc008	Initialized value of BKCAL_IN (cascade) Initiates fault state (cascade)

Table 2 Status coding for “Quality good”

In the following table you see the status coding for status bad:

Digital	Meaning
B_001	Configuration error
B_003	Value not calculated or device error
B_004	Sensor error (brake)
B_006	Value is not communicated
B_007	Out of Service

Table 3 Status coding for “Quality bad”

In the following table you see the status coding for status uncertain:

Digital	Meaning
U_002	Substitute value
U_004	Lower overrange limit exceeded (<20 %) Upper overrange limit exceeded (>120 %) Inexact value

Table 4 Status coding for “Quality uncertain”

Local operation and display

4

4.1 General operating instructions

You can operate the device locally using the keys [M], [↑] and [↓]. See Figure 20, page 34. 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 (see (1) Figure 16) 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

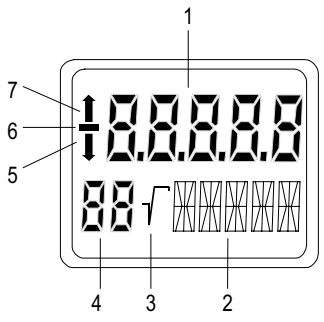


Figure 16 Structure of the digital display

4.1.2 Measured value display

The measured value display consists of five 7-segment fields with a sign (see (6) Figure 16) and overflow indicator (see (5) and (7) Figure 16). 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.

4.1.3 Unit display

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

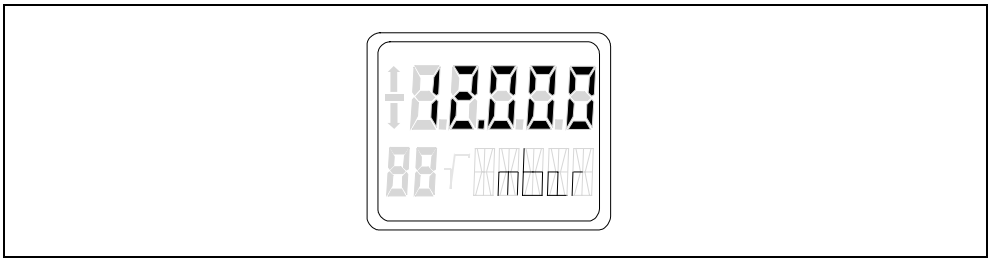


Figure 17 Example of measured value displays

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, page 36 and chapter 3.1.2.1, page 29), which indicates the type of error. This information is also available via the fieldbus interface.

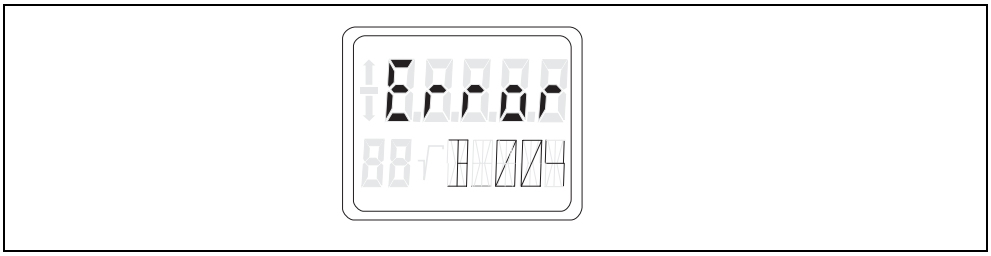


Figure 18 Error message, example “Sensor error”

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 the current reading is 0.2 mbar and could be set to 0 (mode 07).

1 Numerical value
2 Physical unit
3 Mode display

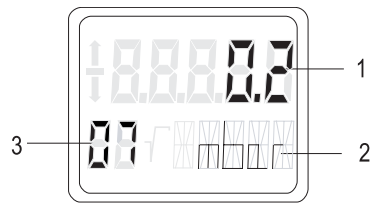


Figure 19 Example of a mode display

If no mode is selected, the digital display will be in the measured value display function.

4.1.6 Physical unit

In the following tabels you can see how a physical unit is shown on the display.

Unit	ID	Display
Pa	1130	Pa
MPa	1132	MPa
kPa	1133	KPa
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_2O(4°C)	1147	i4H2O
inH_2O(68°F)	1148	i2H2O
mmH_2O(4°C)	1150	m4H2O
mmH_2O(68°F)	1151	m2H2O
ftH_2O(68°F)	1154	f2H2O

Table 5 Available units of pressure (P)

Unit	ID	Display
inHg (0°C)	1156	i0 HG
mmHg (0°C)	1158	m0 HG

Table 5 Available units of pressure (P)

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

Table 6 Available units of temperature (T)

4.2 Operation with the keyboard

The position of the keyboard is as shown in Figure 20. You can use it to locally parameterize the transmitter. You can select and execute all the functions described in Table 7 with settable modes using key [M]. These are available as part of an extended range of functions via fieldbus. See chapter 5, page 39.

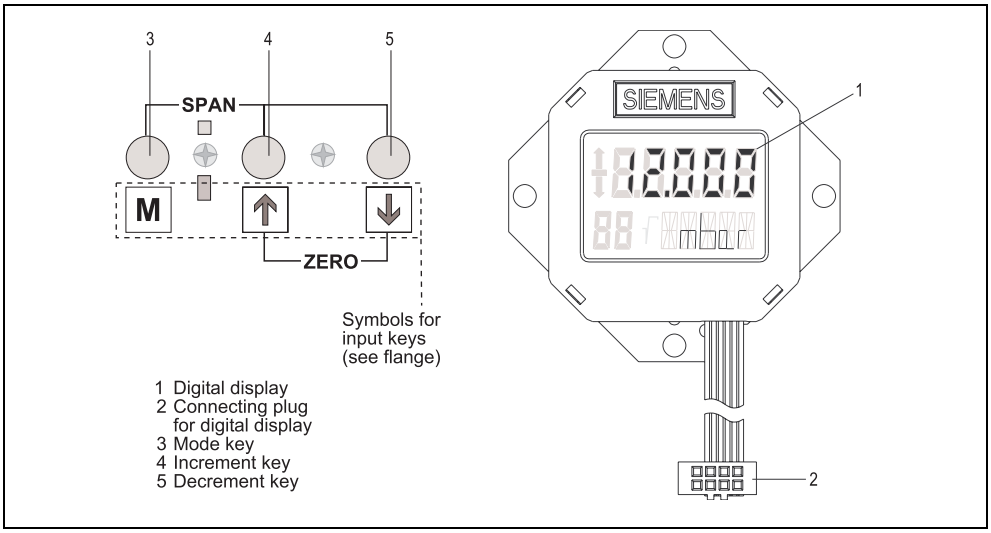


Figure 20 Position of the keyboard (three input keys)

- The Hard Write Lock must be released for keyboard operation.
  See chapter 4.2.4, page 37.
- If you hold down a key for longer than 1 seconds, 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 key [↑] or [↓] 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, page 36.

Function	**Mode**	**Key function**			**Display, explanations**
	[M] 1)	**[↑]**	**[↓]**	**[↑] and [↓]**	
Measured value display					Display of the measured value
Error display					Error, if transmitter disturbed
Zero point adjustment “Position correction” 2)	7	—	—	execute	
Key and function disable	10	change		5 s release	

Table 7 Summary of operating functions using keys

1. If “L” appears in the display, the Hard Write Lock is working.
2. If the keys [↑] and [↓] are pressed simultaneously for about 2 seconds, the displayed value disappears and the current value appears after about 2 seconds.

4.2.1 Standard Display of Variables

Up to four different values and tags can be displayed. They are set by configuring the LCD Transducer Block. The Mode display is off. A tag (DISPLAY_TAG) can be displayed. This is indicated by the text "taG" in the measured value. The unit/error code will then display the tag value.

Before a value is displayed the measured value will show "dSP *" where the "*" is replaced by the numbers 1 to 4. This indicates which display will be shown next. Then the actual value is displayed in the measured value field of the display, the respective display tag (LOCAL_DISPLAY_*_TAG) and the unit is shown in the unit/error code field.

See Figure 16, page 31.

The following status codings exist.

Display	Meaning
B_xxx	Bad, Substatus xxx
U_xxx	Uncertain, Substatus xxx
G_xxx	Good, Substatus xxx
Gcxxx	Good Cascade, Substatus xxx

Table 8 Standard display of variables

4.2.2 Error display

If an error is encountered. The measured value is replaced by the text "Error" and the status of the value is displayed in the unit/error code field.

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

Display	Meaning
F_001	Key and function disable
F_004	Decimal point unfavorable
F_007	Measuring range limited
F_008	Local operation disabled

Table 9 Error messages available

4.2.3 Mode 7: Zero adjustment

In this mode measurement errors due to mounting position can be corrected.

- Press key [M].
- Set mode 7.
  - In the mode field of the display "07" is shown.
  - The measurement display shows the pressure of the Pressure Transducer Block.
  - The unit/error code field shows the calibration unit.
- Press the keys [↑] and [↓] both simultaneously for about 2 seconds.
  After 2 seconds either "F_007" or "OK" is shown.
  "F_007" indicates that the correction has failed
  "OK" indicates that the correction was successful
- Leave mode with key [M].

NOTE

This function is also available in transmitters measuring absolute pressure. Make sure to apply real zero (i.e. absolute zero in a absolute pressure transmitter) before this function is executed. This function can only be reset by means of communications. See chapter 5.5, page 91.

See Figure 16, page 31.

4.2.4 Mode 10: Key and function disable (FF: Hard Write Lock)

In this mode you can activate the Hard Write Lock.

- Press key [M].
- Set mode 10.
  - In the mode field of the display "10" is shown.
  - The unit/error code field shows "Lock".
  - In the measured value field of the display either "--" or "L" is shown.
    "--" indicates that the Hard Write Lock is disabled
    "L" indicates that the Hard Write Lock is enabled
- Save with key [M].

See Figure 16, page 31.

For more information on the Hard Write Lock see chapter 5.1.2, page 39.

4.2.5 Removing the Hard Write Lock

If in the normal display mode the text "L" is displayed in the mode field of the display the Hard Write Lock is set. See (4) Figure 16, page 31.

- To release the Hard Write Lock press key [M] for more than 5 seconds.
- The "L" will be removed.

4.2.6 Enabling/Disabling Simulation

The SITRANS P, DS III FF series has a special jumper that enables or disables the simulation features of the device. The electronic compartment with the LCD display must be opened.

CAUTION

Opening the device in hazardous areas is prohibited if the device and its certification do not allow this. Even in intrinsically safe applications the simulation jumper must not be changed.

The figure shows the LCD connector and the simulation jumper.

1 Simulation jumper
2 Reserved
3 LCD display

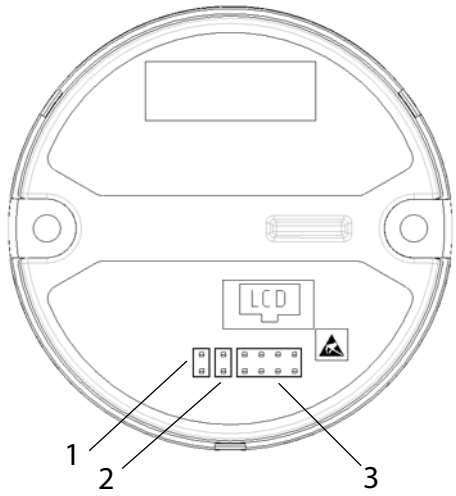


Figure 21 Connectors and jumpers

The connector marked with "Reserved" must not be touched or connected. If the simulation jumper is set the device accepts simulation requests from the fieldbus communication link. If the jumper is not set the simulation requests are denied. An ongoing simulation is cancelled if the simulation jumper is removed. The simulation jumper works for the simulation of the function blocks as well as the simulation of the Pressure Transducer Block.

Fieldbus Communication 5

5.1 Overview

For operation via FOUNDATION™ Fieldbus it is necessary to use PC software such as National Instruments NI-FBUS Configurator. Please consult the appropriate operating instructions for details of how to operate this. The full scope of functions of the SITRANS P, DS III FF series is available via fieldbus communication.

5.1.1 Introduction

The pressure transmitter SITRANS P, DS III FF series is implemented as a Basic Field Device with Link Master capability according to fieldbus specifications. It comprises the following blocks:

- Resource Block
- 3 Analog Input Function Block
- PID Function Block
- Pressure Transducer Block with Calibration
- LCD Transducer Block

5.1.2 Hard Write Lock

The LCD Transducer Block features a separate LCD controller. The Hard Write Lock can only be enabled locally by the push buttons. See chapter 4.2.4, page 37. If this write lock is set the device will not accept changes from the communication. If you want to prevent local tampering with the Hard Write Lock you must seal the access to the push buttons. Bolts with special heads are available as spare parts.

5.1.3 Simulations

The SITRANS P, DS III FF series supports the standard simulation of the fieldbus protocol for the function blocks. In addition to this the Pressure Transducer Block features a simulation mechanism that can be set to fixed values or ramps.

The simulations can be disabled by removing the simulation jumper.

See chapter 4.2.6, page 38.

5.2 Resource Block (RB2)

5.2.1 Overview

The resource block contains data that is specific to the hardware that is associated with the resource. This includes the device type, device revision, manufacturer ID, serial number and resource state. All data is modeled as contained, so there are no links to this block. The data is not processed in the way that a function block processes data. This block offers a service timer based on the operating hours of the electronics. This can be used to cause the alarms for "Device needs maintenance soon" and "Device needs maintenance now".

NOTE

The resource block must be in automatic mode for any function blocks of the device to execute.

5.2.2 Parameter Description

The resource block contains all standard parameters as specified in [FF-891-1.5] and some manufacturer specific parameters. These include additional static information about the device and several counters for operating time.

For detailed information see the following table.

Label/Name/Handling	Index (rel)	Description/Format
ACK_OPTION Acknowledge Option Read & Write	38	Selection of whether alarms associated with the resource block will be automatically acknowledged. Bit Clear (0): Auto acknowledge disabled Bit Set (1): Auto acknowledge enabled Bit 0: Write has been disabled Bit 7: Block Alarm Data format: Bit string with 16 bits (2 bytes) Default value: 0
ALARM_SUM (Record) Alarm Summary **1. CURRENT** Current Read only **2. UNACKNOWLEDGED** Unacknowledged Read only **3. UNREPORTED** Unreported Read only **4. DISABLED** Disabled Read & Write	37 37.1 37.2 37.3 37.4	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the block, coded in 4 bit strings. Data format: Record with 4 Parameters (8 bytes) The active status of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes) The unacknowledged state of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes) The unreported status of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes) The disabled state of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
ALERT_KEY Alert Key Read & Write	04	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Default value: 0

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
BLOCK_ALM (Record) Block Alarm	36	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the active status, if the subcode has changed. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	36.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	36.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Clear and reported 2: Clear and not reported 3: Active and reported 4: Active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	36.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	36.4	An enumeration specifying the cause of the alert to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
5. Value Value Read only	36.5	The value of the associated parameter at the time the alert was detected. Data format: Unsigned 8

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
BLOCK_ERR Block Error Read Only	6	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown. The following bits are supported: Bit 3: Simulation Active – *The simulation jumper is set, simulation can be activated.* Bit 6: Device Needs Service Soon – *A Service Warning has occurred indicating that service should be performed soon.* Bit 9: Memory Failure – *A ROM checksum error has been detected.* Bit 10: Lost Static Data – *A checksum error within the FF static data has been detected.* Bit 11: Lost NV Data – *A checksum error within the application data has been detected.* Bit 13: Device Needs Service Now – *A Service Alarm has occurred indicating service should be performed.* Bit 15: Out of Service – *Actual mode is Out of Service*. Data format: Bit string with 16 bits (2 bytes)
CLR_FSTATE Clear Fault State Read & Write	30	Writing a Clear to this parameter will clear the device fault state. 0: Uninitialized 1: Off – *Normal operating condition* 2: Clear – *Block fault state conditions will be cleared* Data format: Unsigned 8 Default value: 1 Note: *This parameter defaults to Off and Read Only since there are not output blocks in this device.*
COMPATIBILITY (Record) Compatibility	76	Compatibility numbers are used to test whether the sensor and the electronics are compatible. The actual compatibility number must be in the range between the Minimum and Maximum compatibility numbers. Data format: Record with 3 parameters (3 bytes)
1. MINIMUM Minimum Read Only	76.1	The Minimum Compatibility number Data format: Unsigned 8
2. MAXIMUM Maximum Read Only	76.2	The Minimum Compatibility number Data format: Unsigned 8
3. ACTUAL Actual Read Only	76.3	The Actual Compatibility number Data format: Unsigned 8
CONFIRM_TIME Confirm Time Read & Write	33	The time this device waits for a confirmation of a notify message before resending the message. Setting the CONFIRM_TIME to 0 will prevent retries. Data format: Unsigned 32 Default value: 64000 (2000 ms)

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
CYCLE_SEL Cycle Selection Read & Write	20	Used to select the block execution method for this resource. Bit 0: Scheduled Bit 1: Block Execution Bit 2: Manufacturer Specific Data format: Bit string with 16 bits (2 bytes) Default value: 0XC000 (Scheduled | Block Execution)
CYCLE_TYPE Cycle Type Read Only	19	Identifies the function block execution methods for this device. Bit 0: Scheduled Bit 1: Block Execution Bit 2: Manufacturer Specific Data format: Bit string with 16 bits (2 bytes) Default value: 0XC000 (Scheduled | Block Execution)
DD_RESOURCE DD Resource Read Only	9	String identifying the tag of the resource which contains the Device Description of this device. Data format: Visible string (32 bytes)
DD_REV DD Revision Read Only	13	Revision of the DD associated with this device. Used by the interface to locate the DD file for this device. Data format: Unsigned 8
DEV_REV Device Revision Read Only	12	Manufacturer's revision number associated with this device. Used by the interface to locate the DD file for this device. Data format: Unsigned 8
DEV_TYPE Device Type Read Only	11	Manufacturer's Model number associated with this device. Used by the interface to locate the DD file for this device. 11: SITRANS P, DS III FF series Data format: Unsigned 16
DEVICE_CERTIFICATION Device Certification Read Only	47	Device Certifications (Agency Approvals) Data format: Visible string (32 bytes)
DEVICE_DESCRIPTOR Device Descriptor Read & Write	44	A text description that can be written to the device by the user to describe the device. Data format: Visible string (32 bytes)
DEVICE_DESIGNATION Device Designation Read Only	46	The manufacturer's product designation for this device. Data format: Visible string (16 bytes) Default value: SITRANS_P_DS3_FF
DEVICE_INSTAL_DATE Device Installation Date Read & Write	48	The date (ASCII text) when the device was installed in the system. Example: 12.01.2003 Data format: Visible string (32 bytes)
DEVICE_MESSAGE Device Message Read & Write	45	A text message that can be written to the device by the user. Data format: Visible string (32 bytes)
DEVICE_OP_HOURS Device Operating Hours Read Only	51	Total powered operating hours of this device electronics. Data format: Unsigned 32

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
DEVICE_PRODUCT_CODE Device Product Code Read Only	50	The manufacturer's order number (MLFB) for this device. Data format: Visible string (48 bytes)
DEVICE_SER_NUM Device Serial Number Read Only	49	The manufacturer's unique serial number for this device. Data format: Visible string (32 bytes)
DIAG_ERR Diagnostic Errors Read Only	53	This parameter reflects the diagnostic errors associated with this device. It is a bit string, so that multiple errors may be shown. This parameter is intended for future use Data format: Bit string with 16 bits (2 bytes)
DIAG_ERR_ENABLE Diagnostic Errors Enabled Read & Write	52	Selection of whether individual diagnostic errors associated with the device will be reported. This parameter is intended for future use. Bit Clear (0): Diagnostic Error reporting disabled Bit Set (1): Diagnostic Error reporting enabled Data format: Bit string with 16 bits (2 bytes) Default value: 0
DIAGNOSIS_SIMULATION Diagnosis Simulation **1. VALUE** Value Read & Write **2. ENABLE** Enable Read & Write	75 75.1 75.2	This enables the simulation of the DIAG_ERR parameter. This parameter is intended for future use. Data format: Record with 2 parameters (3 bytes) This is the bit string that is used to replace the DIAG_ERR parameter when the ENABLE parameter is set to Enabled. Data format: Bit string with 16 bits (2 bytes) This parameter can be used to enable the Diagnosis Simulation VALUE parameter to replace the DIAG_ERR parameter. 0: Disabled 1: Enabled Data format: Unsigned 8 Default value: 0
DRAIN_VENT_MTL Drain Vent Material Read & Write	61	This is the construction material of the removable plug that exists on the flange that can be opened temporarily to remove unwanted process from the sensor. 2: 316 Stainless Steel 3: Hastelloy C 30: Hastelloy C 276 238: Hastelloy C4 239: Monel 400 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
ELEC_HOUSING_CONN Electronic Housing Connection Read & Write	67	This is the connection for the electrical cable entry on the electronics housing 0: Pg 13.5 Screwed Gland 1: Female Thread M20 x 1.5 2: ½ - 14 NPT Female 3: Han 7D plug compl 4: Han 7D plug single 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
ELEC_HOUSING_MTL Electronic Housing Material Read Only	66	This is the construction material of the electronics housing. 1: 304 Stainless Steel 2: 316 Stainless Steel 19: 316L Stainless Steel 25: Aluminum 235: CF – 8M Stainless Steel 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
EXPLOSION_PROTECTION Explosion Protection Read Only	68	This identifies the certification of the field device for use in hazardous areas. 0: Intrinsically Safe EEx ia IIC T4/T5/T6 1: Flame-Proof EEx d IIC T5/T6 2: BASEEFA Ex N 3: FM Intrinsically Safe 4: FM Explosion Proof 5: CSA Intrinsically Safe 6: CSA Explosion Proof 7: Ex- tested zone 2, BASEEFA 8: Ex- protection FM IS & Explosion Proof 9: CSA Intrinsically Safe & Explosion Proof 10: FM & CSA Intrinsically Safe & Explosion Proof 11: Ex zone 2 (TUV) 12: EEx ia & EEx d 13: Intrinsically Safe EEx ib IIC T4 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
FAULT_STATE Fault State Read Only	28	Condition set by loss of communication to an output block, failure promoted to an output block or a physical contact. When the fault state condition is set, the outputs will perform their FSTATE actions. 0: Uninitialized 1: Clear – *Normal operating condition* 2: Active – *Fault state is active* Data format: Unsigned 8 Default value: 1 Note: *This parameter defaults to Clear since there are not output blocks in this device.*
FEATURES Features Read Only	17	Used to show the supported resource block options. Bit 0: Unicode Strings Supported Bit 1: Reports Supported Bit 2: Fault State Supported Bit 3: Soft Write Lock Supported Bit 4: Hard Write Lock Supported Bit 5: Output Read back Supported Bit 6: Direct Write to Output Hardware Supported Bit 7: Change to BYPASS in an Auto Mode Supported Bit 8: MVC Report Distribution Supported Bit 9: MVC Publishing/Subscribing Supported Data format: Bit string with 16 bits (2 bytes) Default value: 0x5800 (Reports | Soft Write Lock | Hard Write Lock)
FEATURE_SEL Feature Selection Read & Write	18	Used to select the resource block options. See FEATURES Data format: Bit string with 16 bits (2 bytes) Default value: 0x5800 (Reports | Soft Write Lock | Hard Write Lock)
FREE_SPACE Free Space Read Only	24	Indicates the percentage of memory available for configuring additional function blocks. Since this is a pre-configured device the value is fixed at 0 %. Data format: Float value (4 bytes) Range value: 0.0 % ….. 100.0 % Default value: 0.0 %
FREE_TIME Free Time Read Only	25	Indicates the percentage of the block processing time that is available to process additional blocks. Since this is a pre-configured device the value is fixed at 0%. Data format: Float value (4 bytes) Range value: 0.0 % ….. 100.0 % Default value: 0.0 %

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
GRANT_DENY (Record) Grant Deny	14	Options for controlling access by host computers and local control panels to the operating, tuning, and alarm parameters of the block. Data format: Record with 2 parameters (2 bytes)
1. GRANT Grant Read & Write	14.1	Depending on the philosophy of the plant, the operator or higher level device (HLD), or a local operators panel (LOP) in the case of Local, may turn on a item of the Grant attribute – Program, Tuning, Alarm, or Local. Bit 0: Program – *A HLD may change* Bit 1: Tune – *A HLD may change* Bit 2: Alarm – *A HLD may change* Bit 3: Local – *A LOP may change* Data format: Bit string with 8 bits (1 byte) Default value: 0x00
2. DENY Deny Read & Write	14.2	The Denied attribute enables a monitoring program to determine if control has been temporarily taken away Bit 0: Program Denied Bit 1: Tune Denied Bit 2: Alarm Denied Bit 3: Local Denied Data format: Bit string with 8 bits (1 byte) Default value: 0x00
HARD_TYPES Hardware Types Read Only	15	Indicates the types of hardware available as channels in this device. Bit 0: Scalar Input Bit 1: Scalar Output Bit 2: Discrete Input Bit 3: Discrete Output Data format: Bit string with 16 bits (2 bytes) Default value: 0x8000 (Scalar Input)
HARDWARE_REVISION Hardware Revision Read Only	42	The revision state of the hardware (electronics) of this field device. Data format: Visible string (16 bytes)

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
HART_COMMAND (Record) HART Command	77	These parameters are only used by Siemens in manufacturing of the transmitter. It provides specific commands to calibrate and load default data into the transmitter. Data format: Record with 5 parameters (40 bytes)
1. COMMAND Command Read & Write	77.1	The HART command number Data format: Unsigned 8
2. BYTE_COUNT Byte Count Read & Write	77.2	The HART Byte Count Data format: Unsigned 8
3. RESPONSE_CODE Response Code Read & Write	77.3	The HART Response Code Data format: Unsigned 8
4. DEVICE_STATUS Device Status Read & Write	77.4	The HART Device Status Data format: Unsigned 8
5. HDATA HART Data Read & Write	77.5	The HART Data Data format: Octet string (36 bytes)
ITK_VER ITK Version Read Only	41	Major revision number of the interoperability test case used to register this device. Data format: Unsigned 16
LIM_NOTIFY Limit Notify Read & Write	32	Maximum number of unconfirmed alert notify messages allowed. Setting the value to 0 will prevent messages from being sent. Data format: Unsigned 8 Value range: 0 …. MAX_NOTIFY Default value: 8
MANUFAC_ID Manufacturer ID Read Only	10	Manufacturer Identification Number. Used by an interface device to locate the DD file for the resource. Data format: Unsigned 32 Default value: 0x00534147 (Siemens AG)
MAX_NOTIFY Maximum Notify Read Only	31	The maximum number of unconfirmed notify messages this device is capable of sending without getting confirmation. Data format: Unsigned 8 Default value: 8
MEMORY SIZE Memory Size Read Only	22	Available configuration memory, in kilobytes, for additional function blocks. Since this is a pre-configured device, no additional memory is available. Data format: Unsigned 16 Default value: 0

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
MIN_CYCLE_T Minimum Cycle Time Read Only	21	Time duration of the shortest cycle interval of which the device is capable of executing. Data format: Unsigned 32 Default value: 1280 (40 ms)
MODE_BLK (Record) Block Mode	5	The actual, target, permitted, and normal modes of the block Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the mode requested by the operator. The Target Mode is limited to the values allowed by the Permitted Mode Parameter. Bit 3: Auto (Automatic Mode) Bit 7: OOS (Out of Service) Data format: Bit string with 8 bits (1 byte)
2. ACTUAL Actual Read Only	5.2	This is the current mode of the block, which may differ from the target based on operating conditions. Its value is calculated as part of the block execution. Bit 3: Auto Bit 7: OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Defines the modes which are allowed for an instance of the block. The permitted mode is configured based on application requirements. Bit 3: Auto Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Default value: 0x11 (Auto | OOS)
4.NORMAL Normal Read & Write	5.4	This is the mode which the block should be set to during normal operating conditions. Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Default value: 0x10 (Auto | OOS)
NV_CYCLE_T Non-volatile Cycle Time Read Only	23	Minimum time interval for writing non-volatile data to memory. A 0 means data can not be written to non-volatile memory. The time units is 1/32 ms. Data format: Unsigned 32

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
O_RING_MTL “O” Ring Material Read & Write	60	The material of the seal between the sensor module and the process connection 10: PTFE (Teflon) 11: FPM (Viton) 12: NBR (Buna N) 13: Ethyl-Prop 16: Tefzel 21: Nitrile Rubber 22: FFPM (Kalrez) 27: FEP/VMQ (Perfluoraethylenpropylen) 232: Copper 234: Turcon-Variseal HF 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
PRESS_BOLTS_MTL Pressure Bolts Material Read & Write	63	The material of the process pressure cap bolts. 0: Carbon Steel 2: 316 Stainless Steel 228: Stainless Steel 1.4057 229: Stainless Steel A4 239: Monel 400 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
PROCESS_CONN_TYPE Process Connection Type Read & Write	59	The hardware, adjacent to the sensor, that physically connects the process to the sensor. 0: Shank G1/2 A DIN 16288 1: ½ – 14 NPTF Female 2: Shank ¼ – 18 NPT, M12 3: ¼ – 18 NPT, 7/16 – 20 UNF 4: ¼ – 18 NPT, M10 5: Oval Flange 6: Oval Flange, UNF 7: Oval Flange, M10 8: Oval Flange, M12 237: PMC Standard 238: PMC Minibolt 239: ½ – 14 NPT Male 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
PROCESS_FLANGE_MTL Process Flange Material Read & Write	65	Construction material of the flange. 1: Stainless Steel 2: 316 Stainless Steel 3: Hastelloy C 4: Monel 5: Tantalum 6: Titanium 19: 316L Stainless Steel 24: Kynar 30: Hastelloy C 276 233: 316 SST/CF – 8M SST 239: Monel 400 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
PROCESS_FLANGE_TYPE Process Flange Type Read & Write	64	The hardware, adjacent to the sensor, that physically connects the process to the sensor. 5: Oval Flange 12: Conventional 14: Remote Seal 15: Level 3" — ANSI 150 16: Level 4" — ANSI 150 17: Level 3" — ANSI 300 18: Level 4" — ANSI 300 19: Level DN 80 — PN 40 20: Level DN 100 — PN 25/40 21: Level DN 100 — PN 10/16 22: Level 2" — ANSI 150 23: Level 2" — ANSI 300 25: Level DN 50 — PN 40 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
REM_SEAL_DIA_MTL Remote Seal Diaphragm Material Read & Write	56	Material of the process wetted parts of the remote seal. 2: Stainless Steel 316 3: Hastelloy C 5: Tantalum 6: Titanium 9: Cobalt-Chromium-Nickel 19: 316L Stainless Steel 30: Hastelloy C 276 234: Stainless Steel 1.4571 235: Zirconium 237: Gold/Stainless Steel 238: Hastelloy C4 239: Monel 400 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
REM_SEAL_FILL Remote Seal Fill Read & Write	57	Fill fluid of the remote seal. 1: Silicone Oil M5 2: Silicone Oil M50 3: High Temperature Oil 4: Inert 5: Glycerin/H_2O 6: Vegetable Oil 7: Halo Carbon Oil 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
REM_SEAL_NUM Number of Remote Seals Read & Write	54	Physical number of installed remote seals. 1: One Seal 2: Two Seals 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
REM_SEAL_TUBE_LEN Remote Seal Tubing Length Read & Write	58	Length of tubing on the remote seal. 0: 0 mm 1: 50 mm 2: 100 mm 3: 150 mm 4: 200 mm 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
REM_SEAL_TYPE Remote Seal Type Read & Write	55	A device that is capable of detecting and processing the process pressure to the module. 3: Flange with Tube 4: Cell Construction 5: Flange without Tube (RFW) 6: Cell + Extension 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
RESTART Restart Read & Write	16	Allows a manual restart to be initialized (changing this parameter may be fatal to communications). 0: Uninitialized 1: Run – *Normal state* 2: Restart Resource 3: Restart using Defaults 4: Restart Processor (warm start) – *Communication might cease during a processor restart* Data format: Unsigned 8
RS_STATE Resource State Read Only	7	State of the function block application state machine. 0: Uninitialized – *Invalid State* 1: Start/Restart – *State entered after power restored* 2: Initialization – *Entered from Start/Restart or Failure State* 3: On-Line Linking – *Entered from On-Line or Initialization* 4: On-Line – *Entered from On-Line Linking* 5: Standby – *Entered if mode changed to OOS (Out of Service* 6: Failure – *Entered if failure is detected. Not from Standby* Data format: Unsigned 8
SERVICE_ALARM_SET Service Alarm Setting Read & Write	73	Sets the time in hours after a Service Warning for the Service Alarm to occur. Data format: Float value (4 bytes) Range value: 0.0 h to 596000 h Default value: 720 h
SERVICE_ALARM_TIME Service Alarm Time Read Only	72	The elapsed time in hours since the Service Warning occurred. The value is 0.0 prior to the warning. When this time reaches the SERVICE_ALARM_SET value, bit 13 in the BLOCK_ERR will be set, is SERVICE_INTERVAL has a value of 4. Data format: Float value (4 bytes)

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
SERVICE_INTERVAL Service Interval Read & Write	69	Allows setting the Service Interval Warning options and Alarm options. 1: OFF 2: ON (Timer only) 3: ON (Warning) 4: ON (Warning and Alarm) Data format: Unsigned 8
SERVICE_TIMER_RESET Service Timer Reset Read & Write	74	Allows resetting the Service Timer to 0. 0: Timer Not Reset 1: Timer Reset – *Parameter returns to 0 after initialization* Data format: Unsigned 8
SERVICE_WARN_SET Service Warning Setting Read & Write	71	Sets the time in hours for the Service Warning to occur. Data format: Float value (4 bytes) Range value: 0.0 h to 596000 h Default value: 8760 h
SERVICE_WARN_TIME Service Warning Time Read Only	70	The elapsed time in hours since the SERVICE_TIMER_RESET was reset. When this time reaches the SERVICE_WARN_SET value, bit 6 in the BLOCK_ERR parameter will be set, if the SERVICE_INTERVAL parameter has a value of 3 or 4. Data format: Float value (4 bytes)
SET_FSTATE Set Fault State Read & Write	29	Allows the Fault State condition to be manually initiated. 0: Uninitialized 1: OFF – *Normal Operating Condition* 2: SET – *Activate Fault State* Data format: Unsigned 8 Note: *This parameter defaults to read only with a value of 1 since this device does not have any output function blocks.*
SHED_RCAS Shed Remote Cascade Read & Write	26	The time duration at which to give up on computer writes to the function block RCAS location. Shed from RCAS will not occur when SHED_RCAS is set to 0. Data format: Unsigned 32 Default value: 640000 (20 s)
SHED_ROUT Shed Remote Output Read & Write	27	The time duration at which to give up on computer writes to the function block ROUT location. Shed from ROUT will not occur when SHED_ROUT is set to 0. Data format: Unsigned 32 Default value: 640000 (20 s)
SOFTWARE_REVISION Software Revision Read Only	43	The revision state of the software/firmware of the field device. Data format: Visible string 16
ST_REV Static Revision Read Only	1	The revision level of the static data associated with the function block. The revision level will be incremented each time a static parameter in the block is changed. Data format: Unsigned 16

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
STRATEGY Strategy Read & Write	3	The Strategy parameter can be used to identify groupings of blocks. The data is not checked or processed by the block. Data format: Unsigned 16 Default value: 0
TAG_DESC Tag Description Read & Write	2	The user entered description for the resource function block. Data format: Octet string (32 bytes)
TEST_RW (Record) Test Read Write Read & Write	8	Read/Write test parameter. Used only for conformance testing. Data format: Record with 15 parameters (112 bytes)
UPDATE_EVT (Record) Update Event	35	This alert is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	35.1	A discrete enumeration which is set to Unacknowledged when an update occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. UPDATE_STATE Update State Read only	35.2	An enumeration which gives an indication of whether the alert has been reported. 0: Uninitialized 1: Update Reported 2: Update Not Reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	35.3	The time when evaluation of the block was started and a change in event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. STATIC_REVISION Static Revision Read only	35.4	The static revision of the block whose static parameter was changed and is being reported. It is possible for the present value of the static revision to be greater than this because static parameters can be changed at any time. Data format: Unsigned 16
5. RELATIVE_INDEX Relative Index Read Only	35.5	The Object Dictionary (OD) index of the static parameter (minus the function block starting index) whose change caused the alert to occur. If the update event was caused by a write to multiple parameters, then the attribute will be set to 0. Data format: Unsigned 16

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
VENT_VALVE_POS Vent Valve Position Read & Write	62	The Installation position of the vent valve. 0: Opposite Process Connection 1: On Side of Pressure Cap. 250: Not used 251: None 252: Unknown 253: Special Data format: Unsigned 8
WRITE_ALM (Record) Block Alarm	40	The WRITE_ALM is generated whenever the WRITE_LOCK parameter is cleared (set to Not Locked). Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	40.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	40.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Alarm not active and reported 2: Alarm not active and not reported 3: Alarm active and reported 4: Alarm active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	40.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	40.4	An enumeration specifying the cause of the alert to be reported. Data format: Unsigned 16
5. Value Value Read only	40.5	The value of the associated parameter at the time the alert was detected. See WRITE_LOCK Data format: Unsigned 8

Table 10 Resource Block

Label/Name/Handling	Index (rel)	Description/Format
WRITE_LOCK Write Lock Read & Write	34	When “Hard Write Lock Supported” is set in FEATURES_SEL, this parameter will indicate the position of the hardware jumper. When the feature “Hard Write Lock Supported” is not set in FEATURES_SEL, this parameter can be written to Lock or Unlock writing configuration parameters. The hardware jumper must be in the Unlocked position for this feature . 1: Unlocked 2: Locked Data format: Unsigned 8
WRITE_PRI Write Priority Read & Write	39	The priority of the alarm generated by clearing write lock. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0

Table 10 Resource Block

5.2.3 Special Functions and Options

When restarting with defaults the material data is not reset. This must be done manually for the parameters that can be read or written.

When the processor is restarted the device will take a while to recover from the start up. During this time no communication with the device is possible.

The service timer is based on the operating hours of the device. To activate it write first the desired values to SERVICE_WARN_SET and SERVICE_ALARM_SET. When the SERVICE_WARN_SET is reached the bit "Device needs Maintenance soon" in BLOCK_ERR is set, when SERVICE_ALARM_SET is reached the bit "Device needs Maintenance now". The service timer must be activated by writing to SERVICE_INTERVAL. If both bits are required the value "ON (warning + alarm)" must be selected.

The timer and the bits are reset by writing to SERVICE_TIMER_RESET.

5.2.4 Device Description

The Device Description (DD) is based on the standard device description for resource block 2. Manufacturer specific parameters, hierarchic parameter menus and three methods have been added. The methods allow to restart the processor using the current configuration or to restart the processor and reset all configuration data to default. The last method resets the service timer.

The following menu structure is available if the host supports menus. The messages may be abbreviated on the operator panel display.

Menu	Block properties	Identification	TAG_DESC STRATEGY ALERT_KEY ST_REV
		Device	MANUFAC_ID DEVICE_DESIGNATION DEV_TYPE DEV_REV DEVICE_DESCRIPTOR DEVICE_MESSAGE DEVICE_PRODUCT_CODE DEVICE_SER_NUM SOFTWARE_REVISION DEVICE_INSTAL_DATE DEVICE_CERTIFICATION REM_SEAL_NUM REM_SEAL_TYPE REM_SEAL_DIA_MTL REM_SEAL_FILL REM_SEAL_TUBE_LEN PROCESS_CONN_TYPE O_RING_MTL DRAIN_VENT_MTL VENT_VALVE_POS PRESS_BOLTS_MTL PROCESS_FLANGE_TYPE PROCESS_FLANGE_MTL ELEC_HOUSING_MTL ELEC_HOUSING_CONN EXPLOSION_PROTECTION
		Device Description	DD_REV DD_RESOURCE
		Hardware	HARD_TYPES FREE_SPACE FREE_TIME MIN_CYCLE_T NV_CYCLE_T MEMORY_SIZE HARDWARE_REVISION
		Features	FEATURES FEATURE_SEL MAX_NOTIFY LIM_NOTIFY ITK_VER
		Options	GRANT DENY ACK_OPTION CONFIRM_TIME CYCLE_TYPE CYCLE_SEL SHED_RCAS SHED_ROUT

Table 11 Device Description of Resource Block

Menu	Block properties	Options	WRITE_LOCK
		Operation	DEVICE_OP_HOURS
	MODE_BLK	MODE_BLK.TARGET	
		MODE_BLK.ACTUAL	
		MODE_BLK.PERMITTED	
		MODE_BLK.NORMAL	
	Alerts	ALARM_SUM	Current Unacknowledged Unreported Disabled
		BLOCK_ALM	Unacknowledged Alarm State Time Stamp Subcode Value
		UPDATE_EVT	Unacknowledged Update State Time Stamp Static Rev Relative Index
		WRITE_ALM	Unacknowledged Alarm State Time Stamp Subcode Discrete Value
		WRITE_PRI	
	Status	BLOCK_ERR	
		RS_STATE	
		FAULT_STATE	
		SET_FSTATE	
		CLR_FSTATE	
		DIAG_ERR	Diagnostics Errors Enable Diagnostics Errors Diagnostics Simulation Enable Diagnostics Simulation Value
	Diagnostics	Read/Write Test	TEST_RW
		Device Timer	SERVICE_INTERVAL SERVICE_WARN_TIME SERVICE_WARN_SET SERVICE_ALARM_TIME SERVICE_ALARM_SET
		Compatibility	COMPATIBILITY.MINIMUM COMPATIBILITY.MAXIMUM COMPATIBILITY.ACTUAL
Methods	Restart: Default Values Restart: Reset Processor Reset Service Timer		

Table 11 Device Description of Resource Block

The method "Restart: Default Values" can be used to restart with default values. This will also reset the values of the other blocks, like function blocks and transducer blocks.

The method "Restart: Reset Processor" resets the processor and the device starts up again. It is possible that during the startup phase the communication is lost until the processor is reinitialized.

The method "Reset Service Timer" resets the service timer. It is an easy way to acknowledge the occurrence of a service timer warning or alarm.

5.3 Analog Input Function Block

5.3.1 Overview

The analog input function block (AI) is connected to one of the channels of the pressure transducer block. It is the source of measurements for a function block application. The Analog Input is implemented as described in the fieldbus specification.

The following channels can be used as input: Pressure (Primary Value of the pressure transducer block), Sensor Temperature (Secondary Value of the pressure transducer block) and Electronic Temperature (Electronic Temperature of the pressure transducer block).

The SITRANS P, DS III FF series includes three analog input function blocks. Therefore all measurements of the pressure transducer block can be used in an fieldbus application.

NOTE

If more than one Analog Input has the same source the input units of all analog input blocks must have the same value. Otherwise a configuration error will occur.

5.3.2 Parameter Description

The analog input function block (AI) contains all standard parameters as specified in [FF-891-1.5].

For detailed information see the following table.

Label/Name/Handling	Index (rel)	Description/Format
ACK_OPTION Acknowledge Option Read & Write	23	Selection of whether alarms associated with the block will be automatically acknowledged. Bit Clear (0): Auto Acknowledge is Disabled Bit Set (1): Auto Acknowledge is Enabled Bit 0: Unacknowledged Alarm 1 Bit 1: Unacknowledged Alarm 2 Bit 2: Unacknowledged Alarm 3 Bit 3: Unacknowledged Alarm 4 Bit 4: Unacknowledged Alarm 5 Bit 5: Unacknowledged Alarm 6 Bit 6: Unacknowledged Alarm 7 Bit 7: Unacknowledged Alarm 8 Bit 8: Unacknowledged Alarm 9 Bit 9: Unacknowledged Alarm 10 Bit 10: Unacknowledged Alarm 11 Bit 11: Unacknowledged Alarm 12 Bit 12: Unacknowledged Alarm 13 Bit 13: Unacknowledged Alarm 14 Bit 14: Unacknowledged Alarm 15 Bit 15: Unacknowledged Alarm 16 Data format: Bit string with 16 bits (2 bytes)
ALARM_HYS Alarm Hysteresis Read & Write	24	The amount that the PV must return within the alarm limits before the alarm condition clears. The hysteresis is configured as a % of the PV span as defined by OUT_SCALE. Data format: Float value (4 bytes) Value range: 0.0 to 50.0 % Default value: 0.5 %
ALARM_SUM (Record) Alarm Summary	22	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the block, coded in 4 bit strings. Data format: Record with 4 Parameters (8 bytes)
1. CURRENT Current Read only	22.1	The active status of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
2. UNACKNOWLEDGED Unacknowledged Read only	22.2	The unacknowledged state of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
3. UNREPORTED Unreported Read only	22.3	The unreported status of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
4. DISABLED Disabled Read & Write	22.4	The disabled state of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
ALERT_KEY Alert Key Read & Write	4	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Default value: 0
BLOCK_ALM (Record) Block Alarm	21	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the active status, if the subcode has changed. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	8.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	8.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Clear and reported 2: Clear and not reported 3: Active and reported 4: Active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	8.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	8.4	An enumeration specifying the cause of the alert to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
5. Value Value Read only	8.5	The value of the associated parameter at the time the alert was detected. Data format: Unsigned 8

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
BLOCK_ERR Block Error Read Only	6	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown. The following bits are supported: Bit 15: Out of Service – *Actual mode is Out of Service* Data format: Bit string with 16 bits (2 bytes)
CHANNEL Channel Read & Write	15	Used to select the transducer output channel to be used as the analog input to the block. 1: Pressure 2: Sensor Temperature 3: Electronic Temperature Data format: Unsigned 16 Default value: Function Block A1: 1 Function Block A2: 2 Function Block A3: 3
FIELD_VAL (Record) Field Value	19	The value, in % of range, and status from the transducer block or from the simulated input when the simulation function is enabled. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	19.1	The status of the Field Value variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	19.2	The Field Value in % of XD_SCALE range Data format: Float value (4 bytes)

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
GRANT_DENY (Record) Grant Deny	12	Options for controlling access by host computers and local control panels to the operating, tuning, and alarm parameters of the block. Data format: Record with 2 parameters (2 bytes)
1. GRANT Grant Read & Write	12.1	Depending on the philosophy of the plant, the operator or higher level device (HLD), or a local operators panel (LOP) in the case of Local, may turn on a item of the Grant attribute – Program, Tuning, Alarm, or Local. Bit 0: Program – *A HLD may change* Bit 1: Tune – *A HLD may change* Bit 2: Alarm – *A HLD may change* Bit 3: Local – *A LOP may change* Data format: Bit string with 8 bits (1 byte) Default value: 0x00
2. DENY Deny Read & Write	12.2	The Denied attribute enables a monitoring program to determine if control has been temporarily taken away Bit 0: Program Denied Bit 1: Tune Denied Bit 2: Alarm Denied Bit 3: Local Denied Data format: Bit string with 8 bits (1 byte) Default value: 0x00

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
HI_HI_ALARM (Record) High High Alarm	33	The status and time stamp associated with the High High Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	33.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	33.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Clear and reported 2: Clear and not reported 3: Active and reported 4: Active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	33.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	33.4	An enumeration specifying the cause of the alert to be reported. Data format: Unsigned 16
5. Value Value Read only	33.5	The value of the associated parameter at the time the alert was detected. Data format: Unsigned 8
HI_HI_LIM High High Limit Read & Write	26	The limit setting used to detect the High High Alarm condition. The setting is in OUT_SCALE engineering units. Data format: Float value (4 bytes) Default value: 1.# INF
HI_HI_PRI High High Alarm Priority Read & Write	25	The priority setting for the High High Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
HI_ALARM (Record) High Alarm	34	The status and time stamp associated with the High Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	34.1	See HI_HI_ALARM
2. ALARM STATE	34.2	See HI_HI_ALARM
3. TIME STAMP	34.3	See HI_HI_ALARM
4. SUB_CODE	34.4	See HI_HI_ALARM
HI_LIM High Limit Read & Write	28	The limit setting used to detect the High Alarm condition. The setting is in OUT_SCALE engineering units. Data format: Float value (4 bytes) Default value: 1.# INF
HI_PRI High Alarm Priority Read & Write	27	The priority setting for the High Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0
IO_OPTS I/O Options Read & Write	13	Enables the selection of input options that affect the process variable. The following options are available: Bit 10: Low Cutoff Enabled Data format: Bit string with 16 bits (2 bytes) Default value: 0x0000
L_TYPE Linearization Read & Write	16	Linearization type determines if the value from the transducer block is used directly (Direct) or if the value is to be converted to different units (Indirect), or with Square Root (Indirect Square Root) using the input range defined by the transducer and the associated output range. 0: Uninitialized 1: Direct 2: Indirect 3: Indirect Square Root Data format: Unsigned 8 Default value: 0
LO_ALARM (Record) Low Alarm	35	The status and time stamp associated with the Low Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	35.1	See HI_HI_ALARM
2. ALARM STATE	35.2	See HI_HI_ALARM
3. TIME STAMP	35.3	See HI_HI_ALARM
4. SUB_CODE	35.4	See HI_HI_ALARM
LO_LIM Low Limit Read & Write	30	The limit setting used to detect the Low Alarm condition. The setting is in OUT_SCALE engineering units. Data format: Float value (4 bytes) Default value: –1.# INF
LO_PRI Low Alarm Priority Read & Write	29	The priority setting for the Low Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
LO_LO_ALARM (Record) Low Low Alarm	36	The status and time stamp associated with the Low Low Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	36.1	See HI_HI_ALARM
2. ALARM STATE	36.2	See HI_HI_ALARM
3. TIME STAMP	36.3	See HI_HI_ALARM
4. SUB_CODE	36.4	See HI_HI_ALARM
LO_LO_LIM Low Low Limit Read & Write	32	The limit setting used to detect the Low Low Alarm condition. The setting is in OUT_SCALE engineering units. Data format: Float value (4 bytes) Default value: –1.# INF
LO_LO_PRI Low Low Alarm Priority Read & Write	31	The priority setting for the Low Low Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0
LOW_CUT Low Cutoff Read & Write	17	When the scaled output signal falls below this value, the PV will go to 0.0 as determined by the PV filter time constant. This function is active when the IO_OPTS Bit 10 is set and is only useful for 0 based signals such as flow. Data format: Float value (4 bytes) – *must be a positive number* Default value: 0.0

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
MODE_BLK (Record) Block Mode	5	The actual, target, permitted, and normal modes of the block Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the mode requested by the operator. The Target Mode is limited to the values allowed by the Permitted Mode Parameter. Bit 3: Auto (Automatic Mode) Bit 4: Man (Manual Mode) Bit 7: OOS (Out of Service) Data format: Bit string with 8 bits (1 byte)
2. ACTUAL Actual Read Only	5.2	This is the current mode of the block, which may differ from the target based on operating conditions. Its value is calculated as part of the block execution. Bit 3: Auto Bit 4: Man Bit 7: OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Defines the modes which are allowed for an instance of the block. The permitted mode is configured based on application requirements. Bit 3: Auto Bit 4: Man Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Default value: 0x19 (Auto | Man | OOS)
4.NORMAL Normal Read & Write	5.4	This is the mode which the block should be set to during normal operating conditions. Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Default value: 0x10 (Auto)
OUT (Record) Output	8	The status and value of the block output. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	8.1	The status of the OUT variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	8.2	The OUT Value in engineering units of OUT_SCALE range Data format: Float value (4 bytes)

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
OUT_SCALE (Record) Output Scale	11	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal point to be used to display the block output. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read & Write	11.1	The engineering unit value which represents the upper end of the range associated with the block output. Data format: Float value (4 bytes)
2. EU_0 EU at 0% Read & Write	11.2	The engineering unit value which represents the lower end of the range associated with the block output. Data format: Float value (4 bytes)
3. UNITS_INDEX Units Index Read & Write	11.3	The Device Description units code index for the block output. Note: *Refer to FOUNDATION™ Fieldbus Specification Ff-131 FS 1.0 section 3 for a complete listing of unit index codes.* Data format: Unsigned 16
4. DECIMAL Decimal Read & Write	11.4	The number of digits to the right of the decimal point to be used by an interface device for displaying the block output. Data format: Unsigned 8
PV (Record) Process Variable	7	The status and value of the Process Variable. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	7.1	The status of the Process Variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	7.2	The Process Variable in engineering units of OUT_SCALE range Data format: Float value (4 bytes)
PV_FTIME Process Variable Filter Time Read & Write	18	The time constant of a single order exponential filter for the Process Variable. Time is in seconds. Data format: Float value (4 bytes) – *must be a positive number* Default value: 0.0 s

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
SIMULATE (Record) Simulation Variable	9	The status and value of the simulation variable to be used as the block input when the simulation jumper is set. Data format: Record with 5 parameters (11 bytes)
1. SIMULATE_STATUS Simulation Status Read & Write	9.1	The status of the simulation variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. SIMULATE_VALUE Simulation Value Read & Write	9.2	The value of the simulation variable in the units of the transducer block output. Data format: Float value (4 bytes)
3. TRANSDUCER_STATUS Transducer Status Read Only	9.3	The actual status of the transducer block output. Data format: Unsigned 8
4. TRANSDUCER_VALUE Transducer Value Read Only	9.4	The actual value of the transducer output. Data format: Float value (4 bytes)
5. ENABLE_DISABLE Enable Disable Read & Write	9.5	The enumeration of enable/disable simulation 0: Not Initialized 1: Simulation Disabled 2: Simulation Active Data format: Unsigned 8
ST_REV Static Revision Read Only	1	The revision level of the static data associated with the function block. The revision level will be incremented each time a static parameter in the block is changed. Data format: Unsigned 16
STATUS_OPTS Status Options Read & Write	14	Enables the selection of options for the analog input block. The following options are available: Bit 3: Propagate Fault Forward Bit 6: Uncertain if Limited Bit 7: BAD if Limited Bit 8: Uncertain if in Man Mode Data format: Bit string with 16 bits (2 bytes) Default value: 0x0000
STRATEGY Strategy Read & Write	3	The Strategy parameter can be used to identify groupings of blocks. The data is not checked or processed by the block. Data format: Unsigned 16 Default value: 0
TAG_DESC Tag Description Read & Write	2	The user entered description for the sensor transducer function block. Data format: Octet string (32 bytes)

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
UPDATE_EVT (Record) Update Event	20	This alert is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	20.1	A discrete enumeration which is set to Unacknowledged when an update occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. UPDATE_STATE Update State Read only	20.2	An enumeration which gives an indication of whether the alert has been reported. 0: Uninitialized 1: Update Reported 2: Update Not Reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	20.3	The time when evaluation of the block was started and a change in event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. STATIC_REVISION Static Revision Read only	20.4	The static revision of the block whose static parameter was changed and is being reported. It is possible for the present value of the static revision to be greater than this because static parameters can be changed at any time. Data format: Unsigned 16
5. RELATIVE_INDEX Relative Index Read Only	20.5	The Object Dictionary (OD) index of the static parameter (minus the function block starting index) whose change caused the alert to occur. If the update event was caused by a write to multiple parameters, then the attribute will be set to 0. Data format: Unsigned 16

Table 12 Analog Input Block

Label/Name/Handling	Index (rel)	Description/Format
XD_SCALE (Record) Transducer Scale	10	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal point associated with the channel input. . Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read & Write	10.1	The engineering unit value which represents the upper end of the range associated with the channel input. Data format: Float value (4 bytes)
2. EU_0 EU at 0% Read & Write	10.2	The engineering unit value which represents the lower end of the range associated with the channel input. Data format: Float value (4 bytes)
3. UNITS_INDEX Units Index Read & Write	10.3	The Device Description units code index for the channel input. This UNITS_INDEX must match the UNITS_INDEX of the transducer or the block will not transition to Man or Auto Data format: Unsigned 16
4. DECIMAL Decimal Read & Write	10.4	The number of digits to the right of the decimal point to be used by an interface device for displaying the channel input. Data format: Unsigned 8

Table 12 Analog Input Block

5.3.3 Special Functions and Options

The three Analog Inputs are come preconfigured for measuring Pressure, Sensor Temperature and Electronic Temperature. If only these are of interest only L_TYPE must be selected which is uninitialized. In most applications also the scaling of the input and output values of the analog input function block must be adjusted to the application.

5.3.4 Device Description

The Device Description (DD) is based on the standard device description for the analog input function block, hierarchic parameter menus have been added.

The following menu structure is available if the host supports menus. The messages may be abbreviated on the operator panel display.

Menu	Block properties	Identification	TAG_DESC STRATEGY ALERT_KEY ST_REV
		Scaling	XD_SCALE OUT_SCALE

Table 13 Device Description of Analog Input Block

Menu	Block properties	Alarm Limits	HI_HI_LIM HI_LIM LO_LIM LO_LO_LIM ALARM_HYS HI_HI_PRI HI_PRI LO_PRI LO_LO_PRI
		Tuning	L_TYPE LOW_CUT PV_FTIME
		Options	GRANT DENY IO_OPTS STATUS_OPTS ACK_OPTION
	Inputs	CHANNEL SIMULATE FIELD_VAL	
	Outputs	OUT PV	
	MODE_BLK	MODE_BLK.TARGET MODE_BLK.ACTUAL MODE_BLK.PERMITTED MODE_BLK.NORMAL	
	Alerts	ALARM_SUM BLOCK_ALM UPDATE_EVT HI_HI_ALM HI_ALM LO_ALM LO_LO_ALM	
	Status	BLOCK_ERR	

Table 13 Device Description of Analog Input Block

5.4 PID Function Block

5.4.1 Overview

The PID function block (PID) implements a controller function. The inputs can be received over the bus or locally from the analog input function blocks. The output can be transmitted to other devices that have other receiving inputs, such as analog output function blocks of a Positioner. The PID function block can be cascaded.

5.4.2 Parameter Description

The PID function block contains all standard parameters as specified in [FF-891-1.5].

For detailed information see the following table.

Label/Name/Handling	Index (rel)	Description/Format
ACK_OPTION Acknowledge Option Read & Write	46	Selection of whether alarms associated with the block will be automatically acknowledged. Bit Clear (0): Auto Acknowledge is Disabled Bit Set (1): Auto Acknowledge is Enabled Bit 0: Write has been disabled Bit 1: High High Alarm Bit 2: High Alarm Bit 3: Low Low Alarm Bit 4: Low Alarm Bit 5: Deviation High Alarm Bit 6: Deviation Low Alarm Bit 7: Block Alarm Data format: Bit string with 16 bits (2 bytes) Default value: 0x00
ALARM_HYS Alarm Hysteresis Read & Write	47	The amount that the PV must return within the alarm limits before the alarm condition clears. The hysteresis is configured as a % of the PV span as defined by PV_SCALE. Data format: Float value (4 bytes) Value range: 0.0 to 50.0 % Default value: 0.5 %
ALARM_SUM (Record) Alarm Summary	45	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the block, coded in 4 bit strings. Data format: Record with 4 Parameters (8 bytes)
1. CURRENT Current Read only	45.1	The active status of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
2. UNACKNOWLEDGED Unacknowledged Read only	45.2	The unacknowledged state of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
3. UNREPORTED Unreported Read only	45.3	The unreported status of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
4. DISABLED Disabled Read & Write	45.4	The disabled state of each alarm Meaning of the bits: See ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
ALERT_KEY Alert Key Read & Write	4	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Default value: 0

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
BAL_TIME Balance Time Read & Write	25	This specifies the time, in seconds, for the internal working value of bias or ratio to return to the operator set bias or ratio. In the PID block, it is used to specify the time constant at which the integral term will move to obtain balance when the output is limited and the mode is Auto, Cas, or RCas. Data format: Float value (4 bytes) Value range: ≥ 0.0 s Default value: 0.0 s
BKCAL_HYS Back Calculation Hysteresis Read & Write	30	The amount that the block output must change away from the output limit before the limit status is turned off. It is expressed as a percent of the output span as defined by OUT_SCALE. Data format: Float value (4 bytes) Value range: 0.0 to 50.0 % Default value: 0.5 %
BKCAL_IN (Record) Back Calculation Input	27	The analog input value and status from a downstream block's BKCAL_OUT. It is used for backward output tracking to enable bumpless transfers. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	27.1	The status of the Back Calculation variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	27.2	The Back Calculation Value. Data format: Float value (4 bytes)
BKCAL_OUT (Record) Back Calculation Output	31	The analog value and status provided to an upstream block's BKCAL_IN when the loop is broken or limited. It is used for backward output tracking, as determined by status bits, to enable bumpless transfers in closed loop control applications. Data format: Record with 2 parameters (5 bytes)
1. STATUS **2. VALUE**	31.1 31.2	See PID Block -> BKCAL_IN See PID Block -> BKCAL_IN

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
BLOCK_ALM (Record) Block Alarm	44	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the active status, if the subcode has changed. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	44.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	44.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Clear and reported 2: Clear and not reported 3: Active and reported 4: Active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	44.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	44.4	An enumeration specifying the cause of the alert to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
5. Value Value Read only	44.5	The value of the associated parameter at the time the alert was detected. Data format: Unsigned 8
BLOCK_ERR Block Error Read Only	6	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown. The following bits are supported: Bit 1: Block Configuration Bit 15: Out of Service – *Actual mode is Out of Service* Data format: Bit string with 16 bits (2 bytes)

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
BYPASS Bypass Read & Write	17	Used to bypass the normal calculation of the PID. OUT will equal SP when turned ON. In order to prevent a bump on transfer to/from Bypass, the SP will automatically be initialized to the output value and the path broken flag will be set for one execution. 0: Uninitialized 1: OFF 2: ON Data format: Unsigned 8 Default value: 0
CAS_IN (Record) Back Calculation Output	18	This parameter is the remote setpoint value, which must come from an fieldbus block, or a DCS block through a defined link. Data format: Record with 2 parameters (5 bytes)
1. STATUS	18.1	See PID Block -> BKCAL_IN
2. VALUE	18.2	See PID Block -> BKCAL_IN
CONTROL_OPTS Control Options Read & Write	13	Options which the user may select to alter the calculations done in the control block. The following bits are supported: Bit 0: Bypass Enable Bit 1: Setpoint-Process Track Man Bit 2: Setpoint-Process Track Rout Bit 3: Setpoint-Process Track LO-IMan Bit 4: Setpoint Track retain Bit 5: Direct acting Bit 7: Track enable Bit 8: Track in manual Bit 9: Process variable for BKCAL_OUT Bit 12: Restrict Setpoint to limits in Cas or RCas Bit 13: No output limits in Man Data format: Bit string with 16 bits (2 bytes) Default value: 0x0000

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
DV_HI_ALARM (Record) Deviation High Alarm	64	The status and time stamp associated with the Deviation High Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	64.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	64.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Clear and reported 2: Clear and not reported 3: Active and reported 4: Active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	64.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	64.4	An enumeration specifying the cause of the alert to be reported. Data format: Unsigned 16
5. Value Value Read only	64.5	The value of the associated parameter at the time the alert was detected. Data format: Unsigned 8
DV_HI_LIM Deviation High Alarm Limit Read & Write	57	The limit setting used to detect the Deviation High Alarm condition. The setting is in PV_SCALE engineering units. Data format: Float value (4 bytes) Default value: 1.# INF (Not Active)
DV_HI_PRI Deviation High Alarm Priority Read & Write	56	The priority setting for the Deviation High Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
DV_LO_ALARM (Record) Deviation Low Alarm	65	The status and time stamp associated with the Deviation Low Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	65.1	See PID Block -> DV_HI_ALARM
2. ALARM STATE	65.2	See PID Block -> DV_HI_ALARM
3. TIME STAMP	65.3	See PID Block -> DV_HI_ALARM
4. SUB_CODE	65.4	See PID Block -> DV_HI_ALARM
5. VALUE	65.5	See PID Block -> DV_HI_ALARM
DV_LO_LIM Deviation Low Alarm Limit Read & Write	59	The limit setting used to detect the Deviation Low Alarm condition. The setting is in PV_SCALE engineering units. Data format: Float value (4 bytes) Default value: –1.# INF (Not Active)
DV_LO_PRI Deviation Low Alarm Priority Read & Write	58	The priority setting for the Deviation Low Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0
FF_GAIN Feed Forward Gain Read & Write	42	The gain that the feed forward signal is multiplied by before it is added to the calculated controller output. Data format: Float value (4 bytes) Default value: 0.0
FF_SCALE (Record) Feed Forward Scale	41	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal point associated with the feed forward input FF_VAL. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read & Write	41.1	The engineering unit value which represents the upper end of the range associated with the feed forward input. Data format: Float value (4 bytes) Default value: 100.0 %
2. EU_0 EU at 0% Read & Write	41.2	The engineering unit value which represents the lower end of the range associated with the feed forward input. Data format: Float value (4 bytes) Default value: 0.0 %
3. UNITS_INDEX Units Index Read & Write	41.3	The Device Description units code index for the FF input. Note: *Refer to FOUNDATION™ Fieldbus Specification FF-131 FS 1.0 section 3 for a complete listing of unit index codes.* Data format: Unsigned 16 Default value: %
4. DECIMAL Decimal Read & Write	41.4	The number of digits to the right of the decimal point to be used by an interface device for displaying the FF input. Data format: Unsigned 8 Default value: 0

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
FF_VAL (Record) Feed Forward Value	40	The input that is used as the feed forward value in the PID algorithm. Data format: Record with 2 parameters (5 bytes)
1. STATUS **2. VALUE**	40.1 40.2	See PID Block -> BKCAL_IN See PID Block -> BKCAL_IN
GAIN Gain Read & Write	23	The Proportional Gain setting used by the PID algorithm. Data format: Float value (4 bytes) Default value: 0.0
GRANT_DENY (Record) Grant Deny	12	Options for controlling access by host computers and local control panels to the operating parameters, tuning parameters and alarm parameters of the block. Data format: Record with 2 parameters (2 bytes)
1. GRANT Grant Read & Write	12.1	Depending on the philosophy of the plant, the operator or higher level device (HLD), or a local operators panel (LOP) in the case of Local, may turn on a item of the Grant attribute – Program, Tuning, Alarm, or Local. Bit 0: Program – *A HLD may change* Bit 1: Tune – *A HLD may change* Bit 2: Alarm – *A HLD may change* Bit 3: Local – *A LOP may change* Data format: Bit string with 8 bits (1 byte) Default value: 0x00
2. DENY Deny Read & Write	12.2	The Denied attribute enables a monitoring program to determine if control has been temporarily taken away Bit 0: Program Denied Bit 1: Tune Denied Bit 2: Alarm Denied Bit 3: Local Denied Data format: Bit string with 8 bits (1 byte) Default value: 0x00
HI_HI_ALARM (Record) High High Alarm	60	The status and time stamp associated with the High High Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED **2. ALARM STATE** **3. TIME STAMP** **4. SUB_CODE** **5. VALUE**	60.1 60.2 60.3 60.4 60.5	See PID Block -> DV_HI_ALARM See PID Block -> DV_HI_ALARM See PID Block -> DV_HI_ALARM See PID Block -> DV_HI_ALARM See PID Block -> DV_HI_ALARM
HI_HI_LIM High High Alarm Limit Read & Write	49	The limit setting used to detect the High High Alarm condition. The setting is in PV_SCALE engineering units. Data format: Float value (4 bytes) Default value: 1.# INF (Not Active)

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
HI_HI_PRI High High Alarm Priority Read & Write	48	The priority setting for the High High Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0
HI_ALARM (Record) High Alarm	61	The status and time stamp associated with the High Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	61.1	See PID Block -> DV_HI_ALARM
2. ALARM STATE	61.2	See PID Block -> DV_HI_ALARM
3. TIME STAMP	61.3	See PID Block -> DV_HI_ALARM
4. SUB_CODE	61.4	See PID Block -> DV_HI_ALARM
5. VALUE	61.5	See PID Block -> DV_HI_ALARM
HI_LIM High Alarm Limit Read & Write	51	The limit setting used to detect the High Alarm condition. The setting is in PV_SCALE engineering units. Data format: Float value (4 bytes) Default value: 1.# INF
HI_PRI High Alarm Priority Read & Write	50	The priority setting for the High Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0
IN (Record) Input	15	The primary input value of the block. Data format: Record with 2 parameters (5 bytes)
1. STATUS	15.1	See PID Block -> BKCAL_IN
2. VALUE	15.2	See PID Block -> BKCAL_IN
LO_ALARM (Record) Low Alarm	62	The status and time stamp associated with the Low Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	62.1	See PID Block -> DV_HI_ALARM
2. ALARM STATE	62.2	See PID Block -> DV_HI_ALARM
3. TIME STAMP	62.3	See PID Block -> DV_HI_ALARM
4. SUB_CODE	62.4	See PID Block -> DV_HI_ALARM
5. VALUE	62.5	See PID Block -> DV_HI_ALARM
LO_LIM Low Alarm Limit Read & Write	53	The limit setting used to detect the Low Alarm condition. The setting is in PV_SCALE engineering units. Data format: Float value (4 bytes) Default value: –1.# INF (Not Active)
LO_PRI Low Alarm Priority Read & Write	52	The priority setting for the Low Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
LO_LO_ALARM (Record) Low Low Alarm	63	The status and time stamp associated with the Low Low Alarm. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	63.1	See PID Block -> DV_HI_ALARM
2. ALARM STATE	63.2	See PID Block -> DV_HI_ALARM
3. TIME STAMP	63.3	See PID Block -> DV_HI_ALARM
4. SUB_CODE	63.4	See PID Block -> DV_HI_ALARM
5. VALUE	63.5	See PID Block -> DV_HI_ALARM
LO_LO_LIM Low Low Alarm Limit Read & Write	55	The limit setting used to detect the Low Low Alarm condition. The setting is in PV_SCALE engineering units. Data format: Float value (4 bytes) Default value: –1.# INF (Not Active)
LO_LO_PRI Low Low Alarm Priority Read & Write	54	The priority setting for the Low Low Alarm. Data format: Unsigned 8 Value range: 0 … 15 Default value: 0

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
MODE_BLK (Record) Block Mode	5	The actual, target, permitted, and normal modes of the block Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the mode requested by the operator. The Target Mode is limited to the values allowed by the Permitted Mode Parameter. Bit 0: ROut (Remote Output Mode) Bit 1: RCas (Remote Cascade Mode) Bit 2: Cas (Cascade Mode) Bit 3: Auto (Automatic Mode) Bit 4: Man (Manual Mode) Bit 7: OOS (Out of Service) Data format: Bit string with 8 bits (1 byte)
2. ACTUAL Actual Read Only	5.2	This is the current mode of the block, which may differ from the target based on operating conditions. Its value is calculated as part of the block execution. Bit 0: ROut Bit 1: RCas Bit 2: Cas Bit 3: Auto Bit 4: Man Bit 5: LO (Local Override Mode) Bit 6: IMan (Initialization Manual Mode) Bit 7 OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Defines the modes which are allowed for an instance of the block. The permitted mode is configured based on application requirements. Bit 0: ROut Bit 1: RCas Bit 2: Cas Bit 3: Auto Bit 4: Man Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Default value: 0x19 (Auto | Man | OOS)
4.NORMAL Normal Read & Write	5.4	This is the mode which the block should be set to during normal operating conditions. Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Default value: 0x10 (Auto)
OUT (Record) Output	9	The output value of the block. Data format: Record with 2 parameters (5 bytes)
1. STATUS	9.1	See PID Block -> BKCAL_IN
2. VALUE	9.2	See PID Block -> BKCAL_IN

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
OUT_HI_LIM Output High Limit Read & Write	28	Limits the maximum output value of the PID block. Setting is in engineering units of OUT_SCALE (+/- 10 %) Data format: Float value (4 bytes) Default value: 100.0 %
OUT_LO_LIM Output Low Limit Read & Write	29	Limits the minimum output value of the PID block. Setting is in engineering units of OUT_SCALE (+/- 10 %) Data format: Float value (4 bytes) Default value: 0.0 %
OUT_SCALE (Record) Output Scale	11	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal associated with the block output.
1. EU_100	11.1	See PID Block -> FF_SCALE
2. EU_0	11.2	See PID Block -> FF_SCALE
3. UNITS_INDEX	11.3	See PID Block -> FF_SCALE
4. DECIMAL	11.4	See PID Block -> FF_SCALE
PV (Record) Process Variable	7	The process variable of the block. Reflects the value and status of the variable which is operated on by the algorithm Data format: Record with 2 parameters (5 bytes)
1. STATUS	7.1	See PID Block -> BKCAL_IN
2. VALUE	7.2	See PID Block -> BKCAL_IN
PV_FTIME Process Variable Filter Time Read & Write	16	The time constant of a single order exponential filter for the Process Variable. Time is in seconds. Data format: Float value (4 bytes) – *must be a positive number* Range values: ≥ 0.0 s Default value: 0.0 s
PV_SCALE (Record) Process Variable Scale	10	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal associated with the Process Variable parameter.
1. EU_100	10.1	See PID Block -> FF_SCALE
2. EU_0	10.2	See PID Block -> FF_SCALE
3. UNITS_INDEX	10.3	See PID Block -> FF_SCALE
4. DECIMAL	10.4	See PID Block -> FF_SCALE
RATE Rate Read & Write	26	The Derivative Time setting used by the PID algorithm. Data format: Float value (4 bytes) Default value: 0.0
RCAS_IN (Record) Remote Cascade Input	32	The target setpoint and status from a supervisory host for the analog setpoint when RCas mode is used. Value to be in units of PV_SCALE Data format: Record with 2 parameters (5 bytes)
1. STATUS	32.1	See PID Block -> BKCAL_IN
2. VALUE	32.2	See PID Block -> BKCAL_IN

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
RCAS_OUT (Record) Remote Cascade Output	35	The block setpoint and status after ramping – provided to a supervisory host for back calculation to allow action to be taken by the host under limiting or mode change. Data format: Record with 2 parameters (5 bytes)
1. STATUS **2. VALUE**	35.1 35.2	See PID Block -> BKCAL_IN See PID Block -> BKCAL_IN
RESET Reset Read & Write	24	The Integral action setting used by the PID algorithm. Units in seconds/repeat. Data format: Float value (4 bytes) Default value: 1.# INF s/repeat
ROUT_IN (Record) Remote Output Input	33	The target output and status from a supervisory host for the analog output when ROut mode is used. Value to be in units of OUT_SCALE Data format: Record with 2 parameters (5 bytes)
1. STATUS **2. VALUE**	33.1 33.2	See PID Block -> BKCAL_IN See PID Block -> BKCAL_IN
ROUT_OUT (Record) Remote Output Output	36	The block output and status after ramping – provided to a supervisory host for back calculation to allow action to be taken by the host under limiting or mode change. Data format: Record with 2 parameters (5 bytes)
1. STATUS **2. VALUE**	36.1 36.2	See PID Block -> BKCAL_IN See PID Block -> BKCAL_IN
SHED_OPT Shed Options Read & Write	34	Defines the action to be taken on a remote control device timeout. 0: Uninitialized 1: Normal Shed (Normal Return) 2: Normal Shed (No Return) 3: Shed to Auto (Normal Return) 4: Shed to Auto (No Return) 5: Shed to Man (Normal Return) 6: Shed to Man (No Return) 7: Shed to Retained Target (Normal Return) 8: Shed to Retained Target (No Return) Data format: Unsigned 8 Default value: 0
SP (Record) Setpoint Variable	8	The setpoint variable of the block. Reflects the value and status of the variable which is operated on by the algorithm Data format: Record with 2 parameters (5 bytes)
1. STATUS **2. VALUE**	8.1 8.2	See PID Block -> BKCAL_IN See PID Block -> BKCAL_IN

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
SP_HI_LIM Setpoint High Limit Read & Write	21	Limits the maximum setpoint value of the PID block. Setting is in engineering units of PV_SCALE (+/- 10 %) Data format: Float value (4 bytes) Default value: 100.0 %
SP_LO_LIM Setpoint Low Limit Read & Write	22	Limits the minimum setpoint value of the PID block. Setting is in engineering units of PV_SCALE (+/- 10 %) Data format: Float value (4 bytes) Default value: 0.0 %
SP_RATE_DN Setpoint Rate Down Read & Write	19	The ramp rate at which downward setpoint changes are acted on in Auto mode, in PV units/second. If the rate is set to 0 or the block is in a mode other than Auto, the setpoint will be used immediately. Data format: Float value (4 bytes) Default value: 1.# INF (Not Active)
SP_RATE_UP Setpoint Rate Up Read & Write	20	The ramp rate at which upward setpoint changes are acted on in Auto mode, in PV units/second. If the rate is set to 0 or the block is in a mode other than Auto, the setpoint will be used immediately. Data format: Float value (4 bytes) Default value: 1.# INF (Not Active)
ST_REV Static Revision Read Only	1	The revision level of the static data associated with the function block. The revision level will be incremented each time a static parameter in the block is changed. Data format: Unsigned 16
STATUS_OPTS Status Options Read & Write	14	Enables the selection of options for the PID block. The following options are available: Bit 0: IFS (Initiate Fault State) if Bad IN Bit 1: IFS if Bad CAS_IN Bit 2: Use Uncertain as Good Bit 5: Target to Man if Bad IN Bit 9: Target to next permitted mode if Bad CAS_IN Data format: Bit string with 16 bits (2 bytes) Default value: 0x0000
STRATEGY Strategy Read & Write	3	The Strategy parameter can be used to identify groupings of blocks. The data is not checked or processed by the block. Data format: Unsigned 16 Default value: 0
TAG_DESC Tag Description Read & Write	2	The user entered description for the PID function block. Data format: Octet string (32 bytes)

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
TRK_IN_D (Record) Tracking Input - Discrete	38	The discrete input that is used to initiate external tracking which causes the output to track the TRK_VAL input. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	38.1	The status of the tracking input variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	38.2	The value of the discrete input received from another block parameter to which the block is linked, or a default or user entered value if the block input has not been linked. 0: Discrete State 0 (False/OFF) – *Not Tracking* 1: Discrete State 1 (True/ON) – *Tracking* Data format: Unsigned 8
TRK_SCALE (Record) Tracking Input Scale	37	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal associated with the TRK_VAL parameter.
1. EU_100	37.1	See PID Block -> FF_SCALE
2. EU_0	37.2	See PID Block -> FF_SCALE
3. UNITS_INDEX	37.3	See PID Block -> FF_SCALE
4. DECIMAL	37.4	See PID Block -> FF_SCALE
TRK_VAL (Record) Tracking Input Value	39	The analog input that is used as the tracking value when the external tracking function is enabled by the TRK_IN_D input. Data format: Record with 2 parameters (5 bytes)
1. STATUS	39.1	See PID Block -> BKCAL_IN
2. VALUE	39.2	See PID Block -> BKCAL_IN

Table 14 PID Block

Label/Name/Handling	Index (rel)	Description/Format
UPDATE_EVT (Record) Update Event	43	This alert is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	43.1	A discrete enumeration which is set to Unacknowledged when an update occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. UPDATE_STATE Update State Read only	43.2	An enumeration which gives an indication of whether the alert has been reported. 0: Uninitialized 1: Update Reported 2: Update Not Reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	43.3	The time when evaluation of the block was started and a change in event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. STATIC_REVISION Static Revision Read only	43.4	The static revision of the block whose static parameter was changed and is being reported. It is possible for the present value of the static revision to be greater than this because static parameters can be changed at any time. Data format: Unsigned 16
5. RELATIVE_INDEX Relative Index Read Only	43.5	The Object Dictionary (OD) index of the static parameter (minus the function block starting index) whose change caused the alert to occur. If the update event was caused by a write to multiple parameters, then the attribute will be set to 0. Data format: Unsigned 16

Table 14 PID Block

5.4.3 Special Functions and Options

The inputs of the PID can come from the internal analog input function blocks or from external devices by means of communication. The PID block can be used in cascaded control.

5.4.4 Device Description

The Device Description (DD) is based on the standard device description for the PID function block, hierarchic parameter menus have been added.

The following menu structure is available if the host supports menus. The messages may be abbreviated on the operator panel display.

Menu	Block properties	Identification	TAG_DESC STRATEGY ALERT_KEY ST_REV
		Scaling	PV_SCALE OUT_SCALE FF_SCALE TRK_SCALE
		Tuning	GAIN RESET BAL_TIME RATE SP_RATE_UP SP_RATE_DN PV_FTIME FF_GAIN BYPASS
		Limits	SP_HI_LIM SP_LO_LIM OUT_HI_LIM OUT_LO_LIM
		Alarm Limits	HI_LIM LO_LIM HI_HI_LIM LO_LO_LIM DV_HI_LIM DV_LO_LIM
		Hysteresis	ALARM_HYS BKCAL_HYS
		Alarm Priorities	HI_PRI LO_PRI HI_HI_PRI LO_LO_PRI DV_HI_PRI DV_LO_PRI
		Options	GRANT DENY CONTROL_OPTS STATUS_OPTS SHED_OPT ACK_OPTION BYPASS
	MODE_BLK	MODE_BLK.TARGET MODE_BLK.ACTUAL MODE_BLK.PERMITTED MODE_BLK.NORMAL	

Table 15 Device Description of PID Block

Menu	Alerts	BLOCK_ALM UPDATE_EVT ALARM_SUM HI_ALM LO_ALM HI_HI_ALM LO_LO_ALM DV_HI_ALM DV_LO_ALM
	Status	BLOCK_ERR
	Inputs	IN PV SP CAS_IN RCAS_IN ROUT_IN BKCAL_IN TRK_IN_D TRK_VAL FF_VAL
	Outputs	OUT ROUT_OUT RCAS_OUT BKCAL_OUT

Table 15 Device Description of PID Block

5.5 Pressure Transducer Block with Calibration

5.5.1 Overview

The sensor transducer function block decouples the analog input function blocks from the local input sensor hardware. It contains information such as calibration, sensor type, etc.

The pressure transducer block is closely modeled according to the preliminary specification draft (pressure transducer block with calibration). This block features a calibration timer that works similar to the service timer of the resource block. It is based on the operating hours of the sensor. In addition to the function block simulation this transducer block offers the opportunity to simulate the measurement values of all three channels that can be used by analog input function blocks.

5.5.2 Parameter Description

The pressure transducer block contains all standard parameters as specified in [FF-891-1.5] and some manufacturer specific parameters. These include additional static information about the device and several counters for operating time.

For detailed information see the following table:

Label/Name/Handling	Index (rel)	Description/Format
ALERT_KEY Alert Key Read & Write	4	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Default value: 0
BLOCK_ALM (Record) Block Alarm	8	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the active status, if the subcode has changed. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	8.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	8.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Clear and reported 2: Clear and not reported 3: Active and reported 4: Active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	8.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	8.4	An enumeration specifying the cause of the alert to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
5. Value Value Read only	8.5	The value of the associated parameter at the time the alert was detected. Data format: Unsigned 8

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
BLOCK_ERR Block Error Read Only	6	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown. The following bits are supported: Bit 6: Sensor Needs Service Soon – *A Service Warning has occurred indicating that service should be performed soon* Bit 13: Sensor Needs Service Now – *A Service Alarm has occurred indicating service should be performed* Bit 15: Out of Service – *Actual mode is Out of Service* Data format: Bit string with 16 bits (2 bytes)
CAL_MIN_SPAN Calibration Minimum Span Read Only	18	Defines the smallest allowable difference between the upper and lower calibration points displayed in the units selected by the CAL_UNIT parameter. Data format: Float value (4 bytes)
CAL_POINT_HI Calibration Point High Read & Write	16	The maximum adjustment point of the sensor in CAL_UNIT units used during the last calibration. Writing a value to this parameter will equate the maximum calibration value to the actual pressure applied to the input. Also sets SENSOR_CAL_METHOD to “104”. Data format: Float value (4 bytes)
CAL_POINT_LO Calibration Point Low Read & Write	17	The minimum adjustment point of the sensor in CAL_UNIT units used during the last calibration. Writing a value to this parameter will equate the minimum calibration value to the actual pressure applied to the input. Also sets SENSOR_CAL_METHOD to “104”. Data format: Float value (4 bytes)
CAL_UNIT Calibration Units Read & Write	19	Defines the engineering units used when calibrating the transmitter. The following units are available: 1130: Pa (pascal) 1132: MPa (megapascal) 1133: kPa (kilopascal) 1137: bar 1138: mbar (millibar) 1139: torr 1140: atm (atmospheres) 1141: psi (pounds per square inch) 1144: g/cm^2 1145: kg/cm^2 (kilogram per square centimeter) 1147: inH_2O (4°C) (inches of water at 4°C) 1148: inH_2O (68°F) (inches of water at 68°F) 1150: mmH_2O (4°C) (millimeters of water at 4°C) 1151: mmH_2O (68°F) (millimeters of water at 68°F) 1154: ftH_2O (68°F) (feet of water at 68°F) 1156: inHg (0°C) (inches of mercury at 0°C) 1158: mmHg (0°C) (millimeters of mercury at 0°C) Data format: Unsigned 16

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
COLLECTION_DIRECTORY Collection Directory Read Only	12	A directory that lists the number, starting index, and DD item identifications for the data collections in each transducer within the transducer block. Data format: Unsigned 32
ELECTRONIC_MAX_TEMP Electronic Maximum Temperature Read & Write	49	The maximum electronic temperature since the last reset. Writing a value of 0 to this parameter will reset the value to the current temperature. Data format: Float value (4 bytes) Note: *This value of the electronic temperature is derived from the actual measurement or simulated value. After a simulation this value should be reset.*
ELECTRONIC_MAX_TEMP _LIFETIME Electronic Maximum Temperature - Lifetime Read Only	51	The maximum electronic temperature since the transmitter was first installed. Data format: Float value (4 bytes) Note: *This value is not affected by simulation.*
ELECTRONIC_MIN_TEMP Electronic Minimum Temperature Read & Write	50	The minimum electronic temperature since the last reset. Writing a value of 0 to this parameter will reset the value to the current temperature. Data format: Float value (4 bytes) Note: *This value of the electronic temperature is derived from the actual measurement or simulated value. After a simulation this value should be reset.*
ELECTRONIC_MIN_TEMP LIFETIME Electronic Minimum Temperature - Lifetime Read Only	52	The minimum electronic temperature since the transmitter was first installed. Data format: Float value (4 bytes) Note: *This value is not affected by simulation.*

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
ELECTRONIC_TEMP RANGE (Record) Electronic Temperature Range	33	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal point to be used to display the electronic temperature. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read Only	33.1	The engineering unit value which represents the upper end of the range associated with the electronic temperature. Data format: Float value (4 bytes) Default value: 85.0 °C
2. EU_0 EU at 0% Read Only	33.2	The engineering unit value which represents the lower end of the range associated with the electronic temperature. Data format: Float value (4 bytes) Default value: –40.0 °C
3. UNITS_INDEX Units Index Read Only	33.3	The Device Description units code index for the electronic temperature. Units are fixed in °C. Data format: Unsigned 16 Default value: 1001: °C (degree Celsius)
4. DECIMAL Decimal Read Only	33.4	The number of digits to the right of the decimal point to be used by an interface device for displaying the electronic temperature. Data format: Unsigned 8 Default value: 2

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
ELECTRONIC_TEMP_ SIMULATION (Record) Electronic Temperature Simulation	55	This enables simulation of the electronic temperature value. Data format: Record with 6 parameters (17 bytes)
1. FIXED_VALUE Fixed Value Read & Write	55.1	This value is used in the simulation of the electronic temperature when the fixed value simulation is selected. Data format: Float value (4 bytes) Default value: 0
2. MINIMUM_VALUE Minimum Value Read & Write	55.2	This value is used as the starting point in the simulation of the electronic temperature when ramp simulation is selected. Data format: Float value (4 bytes) Default value: 0
3. MAXIMUM_VALUE Maximum Value Read & Write	55.3	This value is used as the ending point in the simulation of the electronic temperature when ramp simulation is selected. Data format: Float value (4 bytes) Default value: 0
4. NUMBER_OF_STEPS Number of Steps Read & Write	55.4	The number of steps of the ramp when the ramp simulation is selected. Data format: Unsigned 16 Value range: 1 … 65535 Default value: 1
5. DURATION_OF_STEP Duration of a Step Read & Write	55.5	The duration in seconds of each step when ramp simulation is selected. Data format: Unsigned 16 Value range: 1 … 65535 Default value: 1
6. SMODE Simulation Mode Read & Write	55.6	The simulation mode. The following options can be selected: 0: OFF 1: Fixed Value Simulation 2: Ramping Simulation Data format: Unsigned 8 Default value: 0
ELECTRONIC_ TEMPERATURE (Record) Electronic Temperature	32	The Electronic Temperature and the channel 3 output from the transducer block. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	32.1	The status of the electronic temperature variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	32.2	The value of the electronic temperature in units defined by ELECTRONIC_TEMPERATURE_RANGE.UNITS_INDEX Data format: Float value (4 bytes)

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
MODE_BLK (Record) Block Mode	5	The actual, target, permitted, and normal modes of the block Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the mode requested by the operator. The Target Mode is limited to the values allowed by the Permitted Mode Parameter. Bit 3: Auto (Automatic Mode) Bit 7: OOS (Out of Service) Data format: Bit string with 8 bits (1 byte)
2. ACTUAL Actual Read Only	5.2	This is the current mode of the block, which may differ from the target based on operating conditions. Its value is calculated as part of the block execution. Bit 3: Auto Bit 7: OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Defines the modes which are allowed for an instance of the block. The permitted mode is configured based on application requirements. Bit 3: Auto Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Default value: 0x11 (Auto | OOS)
4.NORMAL Normal Read & Write	5.4	This is the mode which the block should be set to during normal operating conditions. Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Default value: 0x10 (Auto)
MODULE_RANGE_CODE Module Range Code Read Only	60	Identifies the range of the sensor module. 2: 20 mbar (0.29 psi) 3: 60 mbar (0.87 psi) 4: 250 mbar (3.6 psi) 5: 600 mbar (8.7 psi) 6: 1 bar (14.5 psi) 7: 1.3 bar (18.9 psi) 8: 1.6 bar (23.2 psi) 9: 4 bar (58 psi) 10: 5 bar (72.5 psi) 11: 16 bar (232 psi) 12: 30 bar (435 psi) 13: 63 bar (913 psi) 15: 160 bar (2320 psi) 16: 400 bar (5802 psi) 17: 500 bar (7252 psi) 19: 1000 bar (14504 psi) 253: Special Data format: Unsigned 8

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
MODULE_TYPE Module Type Read Only	59	Identifies the sensor module type 0: Differential Pressure (DP), PN 160 1: Gauge Pressure/Pressure (GP) 2: Absolute Pressure (AP), (from DP) 3: DP , High Pressure (HP), PN 420 4: Level, LT or LLT 5: DP, PN 32 6: DP, PN 320 236: PMC-Style 237: AP (from Pressure) 238: DP, PN 240 239 DP, PN 315 240: DP, PN 20 241: DP, PN 360 Data format: Unsigned 8
PRESSURE_OFFSET Pressure Offset Read Only	57	The pressure offset required to zero the transmitter for position error. Data format: Float value (4 bytes)
PRIMARY_VALUE (Record) Primary Value	14	The primary variable and the channel 1 output from the transducer block. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	14.1	The status of the primary variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	14.2	The value of the primary variable in units defined by PRIMARY_VALUE_RANGE.UNITS_INDEX Data format: Float value (4 bytes)

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
PRIMARY_VALUE_RANGE (Record) Primary Value Range	15	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal point to be used to display the primary variable. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read Only	15.1	The engineering unit value which represents the upper end of the range associated with the primary variable. Data format: Float value (4 bytes)
2. EU_0 EU at 0% Read Only	15.2	The engineering unit value which represents the lower end of the range associated with the primary variable. Data format: Float value (4 bytes)
3. UNITS_INDEX Units Index Read Only	15.3	The Device Description units code index for the primary variable. Data format: Unsigned 16
4. DECIMAL Decimal Read Only	15.4	The number of digits to the right of the decimal point to be used by an interface device for displaying the primary variable. Data format: Unsigned 8

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
PRIMARY_VALUE_ SIMULATION (Record) Primary Value Simulation	53	This enables simulation of the primary variable value. Data format: Record with 6 parameters (17 bytes)
1. FIXED_VALUE Fixed Value Read & Write	53.1	This value is used in the simulation of the primary variable when the fixed value simulation is selected. Data format: Float value (4 bytes) Default value: 0
2. MINIMUM_VALUE Minimum Value Read & Write	53.2	This value is used as the starting point in the simulation of the primary variable when ramp simulation is selected. Data format: Float value (4 bytes) Default value: 0
3. MAXIMUM_VALUE Maximum Value Read & Write	53.3	This value is used as the ending point in the simulation of the primary variable when ramp simulation is selected. Data format: Float value (4 bytes) Default value: 0
4. NUMBER_OF_STEPS Number of Steps Read & Write	53.4	The number of steps of the ramp when the ramp simulation is selected. Data format: Unsigned 16 Value range: 1 … 65535 Default value: 1
5. DURATION_OF_STEP Duration of a Step Read & Write	53.5	The duration in seconds of each step when ramp simulation is selected. Data format: Unsigned 16 Value range: 1 … 65535 Default value: 1
6. SMODE Simulation Mode Read & Write	53.6	The simulation mode. The following options can be selected: 0: OFF 1: Fixed Value Simulation 2: Ramping Simulation Data format: Unsigned 8 Default value: 0
PRIMARY_VALUE_TYPE Primary Value Type Read & Write	13	Identifies the primary variable measurement type 107: Differential Pressure 108: Gauge Pressure 109: Absolute Pressure Data format: Unsigned 16

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
SECONDARY_VALUE (Record) Secondary Value	29	The secondary variable (sensor temperature) and the channel 2 output from the transducer block. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	29.1	The status of the secondary variable. Includes QUALITY, LIMITS, & SUBSTATUS attributes for the value. Data format: Unsigned 8
2. VALUE Value Read Only	29.2	The value of the secondary variable in units defined by SECONDARY_VALUE_UNIT parameter. Data format: Float value (4 bytes)
SECONDARY_VALUE_ UNIT Secondary Value Units Read & Write	30	The Device Description units code for the secondary variable (sensor temperature). 1000: K (Kelvin) 1001: °C (degree Celsius) 1002: °F (degree Fahrenheit) 1003: °R (degree Rankine) Data format: Unsigned 16
SENSOR_ALARM_SET Sensor Alarm Setting Read & Write	38	Sets the time in hours after a Sensor Calibration Warning for the Sensor Calibration Alarm to occur. Data format: Float value (4 bytes) Range value: 0.0 h to 596000 h Default value: 720 h
SENSOR_ALARM_TIME Sensor Alarm Time Read Only	37	The elapsed time in hours since the Sensor Calibration Warning occurred. The value is 0.0 prior to the warning. When this time reaches the SENSOR_ALARM_SET value, bit 13 in the BLOCK_ERR will be set, if SENSOR_CAL_INTERVAL has a value of 4. Data format: Float value (4 bytes)
SENSOR_CAL_DATE Sensor Calibration Date Read & Write	25	The date when the device was last calibrated Data format: Date - MM/DD/YY HH:MM:SS
SENSOR_CAL_INTERVAL Sensor Calibration Interval Read & Write	34	Allows setting the Sensor Calibration Interval Warning & Alarm options. 1: OFF 2: ON (Timer only) 3: ON (Warning) 4: ON (Warning and Alarm) Data format: Unsigned 8
SENSOR_CAL_LOC Sensor Calibration Location Read & Write	24	The location where the device was last calibrated. Data format: Visible string (32 bytes)
SENSOR_CAL_METHOD Sensor Calibration Method Read & Write	23	The method currently used as the sensor calibration. 103: Factory Trim Standard Calibration 104: User Trimmed Standard Calibration Data format: Unsigned 8

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
SENSOR_CAL_RESET Sensor Calibration Reset Read & Write	39	Allows resetting the Sensor Calibration Timer to 0. 0: Timer Not Reset 1: Timer Reset – *Parameter returns to 0 after initialization* Data format: Unsigned 8
SENSOR_CAL_WHO Sensor Calibration Who Read & Write	26	The name of the person performing the last calibration. Data format: Visible string (32 bytes)
SENSOR_FILL_FLUID Sensor Fill Fluid Read Only	28	The fill fluid of the sensor module. 1: Silicone Oil 2: Inert 239: Fluorolube 240: Silicone Oil / Grease Free 252: Unknown 253: Special Data format: Unsigned 16
SENSOR_ISOLATOR_MTL Sensor Isolator Material Read Only	27	The wetted material part of the seal diaphragm / measuring cell. 1: Stainless Steel / Stainless Steel (304) 2: Stainless Steel / Stainless Steel (316) 3: Hastelloy-C / Hastelloy-C 4: Monel / Monel 5: Tantalum / Tantalum 6: Titanium / Titanium 15: Gold / Gold 19: Stainless Steel / Stainless Steel (316L) 30: Hastelloy-C276 / Hastelloy-C276 236: Hastelloy-C / Stainless Steel 237: Gold / Stainless Steel 238: Version RS 239: Monel-400 252: Unknown 253: Special Data format: Unsigned 16
SENSOR_MAX_STATIC_ PRESS Sensor Maximum Static Pressure Read Only	40	The maximum permitted static pressure of the sensor Data format: Float value (4 bytes)
SENSOR_MAX_TEMP Sensor Maximum Temperature Read & Write	45	The maximum sensor temperature since the last reset. Writing a value of 0 to this parameter will reset the value to the current temperature. Data format: Float value (4 bytes) Note: *This value of the sensor temperature is derived from the actual measurement or simulated value. After a simulation this value should be reset.*

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
SENSOR_MAX_TEMP_ LIFETIME Sensor Maximum Temperature - Lifetime Read Only	47	The maximum sensor temperature since the transmitter was first installed. Data format: Float value (4 bytes) Note: *This value is not affected by simulation.*
SENSOR_MAX_VALUE Sensor Maximum Value Read & Write	41	The maximum static pressure that was applied to the sensor since the last reset. Writing a 0.0 to this parameter will reset the value to the current pressure. Data format: Float value (4 bytes) Note: *This value of the pressure sensor is derived from the actual measurement or simulated value. A user calibration will also be taken into account. After a simulation this value should be reset.*
SENSOR_MAX_VALUE_ LIFETIME Sensor Maximum Value - Lifetime Read Only	43	The maximum static pressure applied since the transmitter was first installed. Data format: Float value (4 bytes) Note: T*he lifetime value always uses the internal value from the factory calibration. A user calibration or simulation does not affect the value.*
SENSOR_MIN_TEMP Sensor Minimum Temperature Read & Write	46	The minimum sensor temperature since the last reset. Writing a value of 0 to this parameter will reset the value to the current temperature. Data format: Float value (4 bytes) Note: *This value of the sensor temperature is derived from the actual measurement or simulated value. After a simulation this value should be reset.*
SENSOR_MIN_TEMP_ LIFETIME Sensor Minimum Temperature - Lifetime Read Only	48	The minimum sensor temperature since the transmitter was first installed. Data format: Float value (4 bytes) Note: *This value is not affected by simulation.*
SENSOR_MIN_VALUE Sensor Minimum Value Read & Write	42	The minimum static pressure that was applied to the sensor since the last reset. Writing a 0.0 to this parameter will reset the value to the current pressure. Data format: Float value (4 bytes) Note: *This value of the pressure sensor is derived from the actual measurement or simulated value. A user calibration will also be taken into account. After a simulation this value should be reset.*
SENSOR_MIN_VALUE_ LIFETIME Sensor Minimum Value - Lifetime Read Only	44	The minimum static pressure applied since the transmitter was first installed. Data format: Float value (4 bytes) Note: *The lifetime value always uses the internal value from the factory calibration. A user calibration or a simulation does not affect the value.*

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
SENSOR_OP_HOURS Sensor Operating Hours Read Only	56	The total powered operating hours of the sensor. Data format: Unsigned 32
SENSOR_RANGE (Record) Sensor Range	21	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal point to be used to display the sensor input. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read Only	21.1	The engineering unit value which represents the upper end of the range associated with the sensor input. Data format: Float value (4 bytes)
2. EU_0 EU at 0% Read Only	21.2	The engineering unit value which represents the lower end of the range associated with the sensor input. Data format: Float value (4 bytes)
3. UNITS_INDEX Units Index Read Only	21.3	The Device Description units code index for the sensor input. 1130: Pa (pascal) 1132: MPa (megapascal) 1133: kPa (kilopascal) 1137: bar 1138: mbar (millibar) 1139: torr 1140: atm (atmospheres) 1141: psi (pounds per square inch) 1144: g/cm^2 1145: kg/cm^2 (kilogram per square centimeter) 1147: inH_2O (4 °C) (inches of water at 4 °C) 1148: inH_2O (68 °F) (inches of water at 68 °F) 1150: mmH_2O (4 °C) (millimeters of water at 4 °C) 1151: mmH_2O (68 °F) (millimeters of water at 68 °F) 1154: ftH_2O (68 °F) (feet of water at 68 °F) 1156: inHg (0 °C) (inches of mercury at 0 °C) 1158: mmHg (0 °C) (millimeters of mercury at 0 °C) Data format: Unsigned 16
4. DECIMAL Decimal Read Only	21.4	The number of digits to the right of the decimal point to be used by an interface device for displaying the sensor input. Data format: Unsigned 8 Default value: 2
SENSOR_SN Sensor Serial Number Read Only	22	The manufacturer's unique serial number for the sensor. Data format: Visible string (32 bytes)

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
SENSOR_TEMP_RANGE (Record) Sensor Temperature Range	31	The high & low range limit values, the engineering units, and the number of digits to the right of the decimal point to be used to display the sensor temperature. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read Only	31.1	The engineering unit value which represents the upper end of the range associated with the sensor temperature. Data format: Float value (4 bytes) Default value: 100.0 °C
2. EU_0 EU at 0% Read Only	31.2	The engineering unit value which represents the lower end of the range associated with the sensor temperature. Data format: Float value (4 bytes) Default value: –40.0 °C
3. UNITS_INDEX Units Index Read Only	31.3	The Device Description units code index for the sensor temperature. Units are fixed in °C. Data format: Unsigned 16 Default value: 1001: °C (degree Celsius)
4. DECIMAL Decimal Read Only	31.4	The number of digits to the right of the decimal point to be used by an interface device for displaying the sensor temperature. Data format: Unsigned 8 Default value: 2

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
SENSOR_TEMP_ SIMULATION (Record) Sensor Temperature Simulation	54	This enables simulation of the sensor temperature value. Data format: Record with 6 parameters (17 bytes)
1. FIXED_VALUE Fixed Value Read & Write	54.1	This value is used in the simulation of the sensor temperature when the fixed value simulation is selected. Data format: Float value (4 bytes) Default value: 0
2. MINIMUM_VALUE Minimum Value Read & Write	54.2	This value is used as the starting point in the simulation of the sensor temperature when ramp simulation is selected. Data format: Float value (4 bytes) Default value: 0
3. MAXIMUM_VALUE Maximum Value Read & Write	54.3	This value is used as the ending point in the simulation of the sensor temperature when ramp simulation is selected. Data format: Float value (4 bytes) Default value: 0
4. NUMBER_OF_STEPS Number of Steps Read & Write	54.4	The number of steps of the ramp when the ramp simulation is selected. Data format: Unsigned 16 Value range: 1 … 65535 Default value: 1
5. DURATION_OF_STEP Duration of a Step Read & Write	54.5	The duration in seconds of each step when ramp simulation is selected. Data format: Unsigned 16 Value range: 1 … 65535 Default value 1
6. SMODE Simulation Mode Read & Write	54.6	The simulation mode. The following options can be selected: 0: OFF 1: Fixed Value Simulation 2: Ramping Simulation Data format: Unsigned 8 Default value: 0
SENSOR_TYPE Sensor Type Read Only	20	The sensor type. Data format: Unsigned 16 Default value: 125: Piezo Resistive
SENSOR_WARN_SET Sensor Warning Setting Read & Write	36	Sets the time in hours for the Sensor Calibration Warning to occur. Data format: Float value (4 bytes) Range value: 0.0 h to 596000 h Default value: 8760 h

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
SENSOR_WARN_TIME Sensor Warning Time Read Only	35	The elapsed time in hours since the SENSOR_CAL_RESET was reset. When this time reaches the SENSOR_WARN_SET value, bit 6 in the BLOCK_ERR parameter will be set, if the SENSOR_CAL_INTERVAL parameter has a value of 3 or 4. Data format: Float value (4 bytes)
ST_REV Static Revision Read Only	1	The revision level of the static data associated with the function block. The revision level will be incremented each time a static parameter in the block is changed. Data format: Unsigned 16
STRATEGY Strategy Read & Write	3	The Strategy parameter can be used to identify groupings of blocks. The data is not checked or processed by the block. Data format: Unsigned 16 Default value: 0
TAG_DESC Tag Description Read & Write	2	The user entered description for the sensor transducer function block. Data format: Octet string (32 bytes)
TRANSDUCER_ DIRECTORY Transducer Directory Read Only	9	A directory that lists the number and starting index for transducers in the transducer block. Data format: Unsigned 16 Default value: 0x0000
TRANSDUCER_TYPE Transducer Type Read Only	10	Identifies the type of transducer. 100: Standard Pressure with Calibration 101: Standard Temperature with Calibration 102: Standard Dual Temperature with Calibration 103: Standard Radar Level with Calibration 104: Standard Flow with Calibration 105: Standard Basic Positioner with Calibration 106: Standard Advanced Positioner with Calibration 107: Standard Discrete Valve 65535: Other Data format: Unsigned 16 Default value: 100

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
UPDATE_EVT (Record) Update Event	7	This alert is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	7.1	A discrete enumeration which is set to Unacknowledged when an update occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. UPDATE_STATE Update State Read only	7.2	An enumeration which gives an indication of whether the alert has been reported. 0: Uninitialized 1: Update Reported 2: Update Not Reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	7.3	The time when evaluation of the block was started and a change in event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. STATIC_REVISION Static Revision Read only	7.4	The static revision of the block whose static parameter was changed and is being reported. It is possible for the present value of the static revision to be greater than this because static parameters can be changed at any time. Data format: Unsigned 16
5. RELATIVE_INDEX Relative Index Read Only	7.5	The Object Dictionary (OD) index of the static parameter (minus the function block starting index) whose change caused the alert to occur. If the update event was caused by a write to multiple parameters, then the attribute will be set to 0. Data format: Unsigned 16
XD_ERROR Transducer Error Read Only	11	These are transducer error codes defined in the FF Transducer specifications FF-903 section 4.8 Block Alarm Subcodes. 16: Unspecified Error 17: General Error 18: Calibration Error 20: Electronics Failure 21: Mechanical Failure 22: I/O Failure 23: Data Integrity Error 24: Software Error 25: Algorithm Error Data format: Unsigned 8

Table 16 Sensor Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
ZERO_ADJUSTMENT Zero Adjustment Read & Write	58	The command used to start the pressure zero adjustment. 0: OFF 1: Start – *Returns to 0 after initialization* Data format: Unsigned 8

Table 16 Sensor Transducer Block

5.5.3 Special Functions and Options

The calibration timer is based on the operating hours of the sensor. To activate it write first the desired values to SENSOR_WARN_SET and SENSOR_ALARM_SET. When the SENSOR_WARN_SET is reached the bit "Device needs Maintenance soon" in BLOCK_ERR is set, when SENSOR_ALARM_SET is reached the bit "Device needs Maintenance now". The calibration timer is intended to set the time until the next calibration is required. The calibration timer must be activated by writing to SENSOR_CAL_INTERVAL. If both bits are required the value "ON (warning + alarm)" must be selected.

The timer and the bits are reset by writing to SENSOR_CAL_RESET.

Calibration is possible via the parameters CAL_POINT_HI and CAL_POINT_LO. The parameter CAL_MIN_SPAN indicates the minimum span that is required between CAL_POINT_LO and CAL_POINT_HI. CAL_UNIT is the unit in which the transducer block expects the values of the high and low calibration point. When writing to CAL_POINT_LO only an offset is changed. If a value is written to CAL_POINT_HI the value at CAL_POINT_LO is unaffected, i.e. the gain is changed. The following procedure should be used when calibrating:

1. Set the block mode to Out of Service.
2. Choose your calibration unit (CAL_UNIT).
3. Apply the lower calibration pressure and let it stabilize.
4. Write the actual pressure value to CAL_POINT_LO.
5. Verify the pressure reading (PRIMARY_VALUE). The status might be bad due to the block mode Out of Service. If the value is not within the accuracy return to step 4.
6. Apply the high calibration pressure and let it stabilize.
7. Write the actual pressure value to CAL_POINT_HI.
8. Verify the pressure reading (PRIMARY_VALUE). The status might be bad due to the block mode Out of Service. If the value is not within the accuracy return to step 7.
9. Set the block mode to Auto.

The parameters SENSOR_CAL_DATE, SENSOR_CAL_LOC and SENSOR_CAL_WHO can be used to track the calibration for audit trails.

In addition to the calibration a zero adjustment is available. This is intended to remove offsets due to mounting position. This is similar to Mode 07 of the local operation (see chapter 4.2.3, page 37). The following procedure should be used:

1. Set block mode to Out of Service.
2. Apply zero pressure and let it stabilize.
3. Perform the ZERO_ADJUSTMENT (set to value "Start").
4. Verify the pressure reading (PRIMARY_VALUE). The status might be bad due to the block mode Out of Service. If the value is not within the accuracy return to step 3.
5. Set block mode to Auto.

NOTE

This ZERO_ADJUSTMENT is also available in transmitters measuring absolute pressure. Make sure to apply real zero before this function is executed, i. e. absolute zero in a absolute pressure transmitter. This function can only be reset by means of communications. Set SENSOR_CAL_METHOD to "Factory Trim".

The total offset can be read in the parameter PRESSURE_OFFSET, i.e. the combination of the zero adjustment and lower sensor calibration. SENSOR_CAL_METHOD describes the calibration method. It is either "Factory Trim" or "User Trim". By writing "Factory Trim" to this parameter the calibration and zero adjustment are returned to factory defaults. When a zero adjustment or calibration is performed this will automatically return to "User Trim".

The simulation feature can be accessed by the following parameters for the pressure, the sensor and the electronic temperature respectively:

- PRIMARY_VALUE_SIMULATION
- SENSOR_TEMP_SIMULATION
- ELECTRONIC_TEMP_SIMULATION

The parameters of these records have the following meaning:

Parameter	Description
FIXED_VALUE	Simulation value, when SMODE=Fixed Value Simulation
MINIMUM_VALUE	Lower value of the simulation, when SMODE=Ramp Simulation
MAXIMUM_VALUE	Upper value of the simulation, when SMODE=Ramp Simulation

Table 17 Parameters of Simulation

Parameter	Description
NUMBER_OF_STEPS	The number of steps between MINIMUM_VALUE and MAXIMUM_VALUE. Each steps lasts DURATION_OF_STEP seconds, when SMODE=RAMP Simulation
DURATION_OF_STEP	Duration of a step in seconds, when SMODE=Ramp Simulation
SMODE	Simulation mode When this parameter is OFF, the measured parameters are returned. When set to Fixed Value the FIXED_VALUE will be returned. When set to Ramp Simulation a Ramp will be generated that has NUMBER_OF_STEPS equally spaced values between MINIMUM_VALUE and MAXIMUM_VALUE. Each step will last DURATION_OF_STEP seconds.

Table 17 Parameters of Simulation

The simulation is disabled when the simulation jumper is not set. See Figure 21, page 38. If the simulation is used the slave pointers that can be reset are affected by the simulated values. After a simulation they should be reset by writing to the maximum/minimum values. The lifetime slave pointers always run on the actual measurements. Thus no simulation affects them.

The lifetime slave pointers are not affected by simulation. The lifetime pressure slave pointers, SENSOR_MAX_VALUE_LIFETIME and SENSOR_MIN_VALUE_LIFETIME, always run on the factory calibrated measurements. A user calibration will not change the values.

5.5.4 Device Description

The Device Description (DD) is based on the standard device description for pressure transducer block with calibration. Manufacturer specific parameters, hierarchic parameter menus and three methods have been added. The methods allow to reset the calibration timer, to reset the calibration parameters to factory defaults and to perform the zero trim (perform a zero adjustment).

The following menu structure is available if the host supports menus. The messages may be abbreviated on the operator panel display.

Menu	Block properties	Identification	TAG_DESC STRATEGY ALERT_KEY ST_REV TRANSDUCER_TYPE
		Sensor	SENSOR_TYPE SENSOR_RANGE SENSOR_SN SENSOR_ISOLATOR_MTL SENSOR_FILL_FLUID SENSOR_MAX_STATIC_ PRESS
		Calibration	CAL_POINT_HI CAL_POINT_LO CAL_MIN_SPAN CAL_UNIT SENSOR_CAL_METHOD SENSOR_CAL_LOC SENSOR_CAL_DATE SENSOR_CAL_WHO
		Operation	PRIMARY_VALUE_TYPE PRESSURE_OFFSET SENSOR_OP_HOURS
	Process data	Measurements	Pressure Sensor Temperature Electronic Temperature
		Ranges	Pressure Sensor Temperature Electronic Temperature
	Block mode	MODE_BLK.TARGET MODE_BLK.ACTUAL MODE_BLK.PERMITTED MODE_BLK.NORMAL	
	Alerts	BLOCK_ALM UPDATE_EVT	
	Status	BLOCK_ERR XD_ERROR	
	Diagnostics	Pressure	Slave Pointers Simulation
		Sensor Temperature	Slave Pointers Simulation
		Electronic Temperature	Slave Pointers Simulation
		Calibration Timer	SENSOR_CAL_INTERVAL SENSOR_WARN_TIME SENSOR_WARN_SET SENSOR_ALARM_TIME SENSOR_ALARM_SET
Methods	Reset Calibration Timer Zero Trim Set Factory Calibration		

Table 18 Device Description of Sensor Transducer Block

The method "Reset Calibration Timer" resets the calibration timer. It is an easy way to acknowledge the occurrence of a calibration timer warning or alarm.

The method "Zero Trim" can be used to perform the zero adjustment. The zero pressure must be applied prior to the execution of the method. This method does not place the transducer block in Out of Service. It will execute even if the block is not correct. When the block mode is incorrect the zero trim will not be performed even though the method reports a success.

The method "Set Factory Calibration" resets any calibration, zero adjustment and mounting position correction to the factory default values. This method does not handle the block modes and will report success regardless of the block mode. The execution of this method depends on the implementation of the method interpreter. Certain interpreters might reject the execution. This will be fixed in a new DD or device revision. If this method is not available use the parameter SENSOR_CAL_METHOD, set it to "factory trim standard calibration" and write the parameter to the device. This requires the pressure transducer block to be in mode Out of Service. The method "Restart: Default Values" of the resource block will also reset the calibration to factory defaults. However, this will also cause additional parameters in other blocks to be reset.

5.6 LCD Transducer Block

5.6.1 Overview

The LCD transducer block is a custom block that is used to configure the measurement display. Up to four values from the device can be displayed along with customized tags.

This block features the configuration of up to four measurements and a tag for the local display. The tags are accessible to identify a device in the field.

5.6.2 Parameter Description

The LCD transducer block contains all standard parameters as specified in [FF-891-1.5] and some manufacturer specific parameters.

For detailed information see the following table.

Label/Name/Handling	Index (rel)	Description/Format
ALERT_KEY Alert Key Read & Write	4	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Default value: 0
BLOCK_ALM (Record) Block Alarm	8	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the active status, if the subcode has changed. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	8.1	A discrete enumeration which is set to Unacknowledged when an alarm occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the alarm/event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	8.2	A discrete enumeration which gives an indication of whether the alert is active and whether it has been reported. 0: Uninitialized 1: Clear and reported 2: Clear and not reported 3: Active and reported 4: Active and not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	8.3	The time when evaluation of the block was started and a change in alarm/event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. SUB_CODE Subcode Read only	8.4	An enumeration specifying the cause of the alert to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
5. Value Value Read only	8.5	The value of the associated parameter at the time the alert was detected. Data format: Unsigned 8

Table 19 LCD Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
BLOCK_ERR Block Error Read Only	6	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown. The following bits are supported: Bit 15: Out of Service – *Actual mode is Out of Service* Data format: Bit string with 16 bits (2 bytes)
COLLECTION_DIRECTORY Collection Directory Read Only	12	A directory that lists the number, starting index, and DD item identifications for the data collections in each transducer within the transducer block. Data format: Unsigned 32
DISPLAY_MODE Display Mode Read & Write	25	This parameter sets the mode of the LCD display. 0: Measurement Values Only 1: Tag Display 2: Measurement Values & Tag Displayed Data format: Unsigned 8 Default value: 0
DISPLAY_TAG Display Tag Read & Write	26	The user entered tag for identifying field devices at the local level. Data format: Visible string (16 bytes)
LOCAL_DISPLAY_1 Local Display 1 Read & Write	13	Selects the variable for local display 1. When more than one display is configured, the local display will display each for approximately 3 seconds. 0: Undefined 1: Primary Variable – *Transducer parameter PRIMARY_VALUE* 2: Secondary Variable – *Transducer parameter SECONDARY_VALUE* 3: Electronic Temp – *Transducer parameter ELECTRONIC_TEMP* 4: AI1 Function Block Output – *Parameter OUT* 5: AI2 Function Block Output – *Parameter OUT* 6: AI3 Function Block Output – *Parameter OUT* 7: PID Function Block Input – *Parameter IN* 8: PID Function Block Output – *Parameter OUT* 9: PID Function Block Setpoint – *Parameter SP* 10: PID Function Block Mode – *Parameter MODE_BLK.ACTUAL* Data format: Unsigned 8 Default value: 0

Table 19 LCD Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
LOCAL_DISPLAY_1_ DIGITS Local Display 1 Digits Read & Write	14	Selects the number of digits to the right of the decimal point used for the local display 1. 0: 0 Digits 1: 1 Digit 2: 2 Digits 3: 3 Digits 4: 4 Digits 255: Auto Data format: Unsigned 8 Default value: 0
LOCAL_DISPLAY_1_TAG Local Display 1 Tag Read & Write	15	The user defined tag for identifying local display 1 variable. Data format: Visible string (5 bytes)
LOCAL_DISPLAY_2 Local Display 2 Read & Write	16	Selects the variable for local display 2. When more than one display is configured, the local display will display each for approximately 3 seconds. 0: Undefined 1: Primary Variable – *Transducer parameter PRIMARY_VALUE* 2: Secondary Variable – *Transducer parameter SECONDARY_VALUE* 3: Electronic Temp – *Transducer parameter ELECTRONIC_TEMP* 4: AI1 Function Block Output – *Parameter OUT* 5: AI2 Function Block Output – *Parameter OUT* 6: AI3 Function Block Output – *Parameter OUT* 7: PID Function Block Input – *Parameter IN* 8: PID Function Block Output – *Parameter OUT* 9: PID Function Block Setpoint – *Parameter SP* 10: PID Function Block Mode – *Parameter MODE_BLK.ACTUAL* Data format: Unsigned 8 Default value: 0
LOCAL_DISPLAY_2_ DIGITS Local Display 2 Digits Read & Write	17	Selects the number of digits to the right of the decimal point used for the local display 2. 0: 0 Digits 1: 1 Digit 2: 2 Digits 3: 3 Digits 4: 4 Digits 255: Auto Data format: Unsigned 8 Default value: 0
LOCAL_DISPLAY_2_TAG Local Display 2 Tag Read & Write	18	The user defined tag for identifying local display 2 variable. Data format: Visible string (5 bytes)

Table 19 LCD Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
LOCAL_DISPLAY_3 Local Display 3 Read & Write	19	Selects the variable for local display 3. When more than one display is configured, the local display will display each for approximately 3 seconds. 0: Undefined 1: Primary Variable – *Transducer parameter PRIMARY_VALUE* 2: Secondary Variable – *Transducer parameter SECONDARY_VALUE* 3: Electronic Temp – *Transducer parameter ELECTRONIC_TEMP* 4: AI1 Function Block Output – *Parameter OUT* 5: AI2 Function Block Output – *Parameter OUT* 6: AI3 Function Block Output – *Parameter OUT* 7: PID Function Block Input – *Parameter IN* 8: PID Function Block Output – *Parameter OUT* 9: PID Function Block Setpoint – *Parameter SP* 10: PID Function Block Mode – *Parameter MODE_BLK.ACTUAL* Data format: Unsigned 8 Default value: 0
LOCAL_DISPLAY_3_ DIGITS Local Display 3 Digits Read & Write	20	Selects the number of digits to the right of the decimal point used for the local display 3. 0: 0 Digits 1: 1 Digit 2: 2 Digits 3: 3 Digits 4: 4 Digits 255: Auto Data format: Unsigned 8 Default Value: 0
LOCAL_DISPLAY_3_TAG Local Display 3 Tag Read & Write	21	The user defined tag for identifying local display 3 variable. Data format: Visible string (5 bytes)

Table 19 LCD Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
LOCAL_DISPLAY_4 Local Display 4 Read & Write	22	Selects the variable for local display 4. When more than one display is configured, the local display will display each for approximately 3 seconds. 0: Undefined 1: Primary Variable – *Transducer parameter PRIMARY_VALUE* 2: Secondary Variable – *Transducer parameter SECONDARY_VALUE* 3: Electronic Temp – *Transducer parameter ELECTRONIC_TEMP* 4: AI1 Function Block Output – *Parameter OUT* 5 AI2 Function Block Output – *Parameter OUT* 6: AI3 Function Block Output – *Parameter OUT* 7: PID Function Block Input – *Parameter IN* 8: PID Function Block Output – *Parameter OUT* 9: PID Function Block Setpoint – *Parameter SP* 10: PID Function Block Mode – *Parameter MODE_BLK.ACTUAL* Data format: Unsigned 8 Default value: 0
LOCAL_DISPLAY_4_ DIGITS Local Display 4 Digits Read & Write	23	Selects the number of digits to the right of the decimal point used for the local display 4. 0: 0 Digits 1: 1 Digit 2: 2 Digits 3: 3 Digits 4: 4 Digits 255: Auto Data format: Unsigned 8 Default value: 0
LOCAL_DISPLAY_4_TAG Local Display 4 Tag Read & Write	24	The user defined tag for identifying local display 4 variable. Data format: Visible string (5 bytes)

Table 19 LCD Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
MODE_BLK (Record) Block Mode	5	The actual, target, permitted, and normal modes of the block. Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the mode requested by the operator. The Target Mode is limited to the values allowed by the Permitted Mode Parameter. Bit 3: Auto (Automatic Mode) Bit 7: OOS (Out of Service) Data format: Bit string with 8 bits (1 byte)
2. ACTUAL Actual Read Only	5.2	This is the current mode of the block, which may differ from the target based on operating conditions. Its value is calculated as part of the block execution. Bit 3: Auto Bit 7: OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Defines the modes which are allowed for an instance of the block. The permitted mode is configured based on application requirements. Bit 3: Auto Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Default value: 0x11 (Auto | OOS)
4.NORMAL Normal Read & Write	5.4	This is the mode which the block should be set to during normal operating conditions. Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Default value: 0x10 (Auto)
ST_REV Static Revision Read Only	1	The revision level of the static data associated with the function block. The revision level will be incremented each time a static parameter in the block is changed. Data format: Unsigned 16
STRATEGY Strategy Read & Write	3	The Strategy parameter can be used to identify groupings of blocks. The data is not checked or processed by the block. Data format: Unsigned 16 Default value: 0
TAG_DESC Tag Description Read & Write	2	The user entered description for the LCD transducer function block. Data format: Octet string (32 bytes)
TRANSDUCER_ DIRECTORY Transducer Directory Read Only	9	A directory that lists the number and starting index for transducers in the transducer block. Data format: Unsigned 16 Default value: 0x0000

Table 19 LCD Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
TRANSDUCER_TYPE Transducer Type Read Only	10	Identifies the type of transducer. 100: Standard Pressure with Calibration 101: Standard Temperature with Calibration 102: Standard Dual Temperature with Calibration 103: Standard Radar Level with Calibration 104: Standard Flow with Calibration 105: Standard Basic Positioner with Calibration 106: Standard Advanced Positioner with Calibration 107: Standard Discrete Valve 65535: Other Data format: Unsigned 16 Default value: 65535
UPDATE_EVT (Record) Update Event	7	This alert is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	7.1	A discrete enumeration which is set to Unacknowledged when an update occurs, and set to Acknowledge by a write from a human interface device or other entity which can acknowledge that the event has been noticed. 0: Uninitialized 1: Acknowledged 2: Unacknowledged Data format: Unsigned 8
2. UPDATE_STATE Update State Read only	7.2	An enumeration which gives an indication of whether the alert has been reported. 0: Uninitialized 1: Update Reported 2: Update Not Reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	7.3	The time when evaluation of the block was started and a change in event state was detected that is unreported. The time stamp value will be maintained constant until alert confirmation has been received – even if another change of state occurs. Data format: Time-Value (8 bytes)
4. STATIC_REVISION Static Revision Read only	7.4	The static revision of the block whose static parameter was changed and is being reported. It is possible for the present value of the static revision to be greater than this because static parameters can be changed at any time. Data format: Unsigned 16
5. RELATIVE_INDEX Relative Index Read Only	7.5	The Object Dictionary (OD) index of the static parameter (minus the function block starting index) whose change caused the alert to occur. If the update event was caused by a write to multiple parameters, then the attribute will be set to 0. Data format: Unsigned 16

Table 19 LCD Transducer Block

Label/Name/Handling	Index (rel)	Description/Format
XD_ERROR Transducer Error Read Only	11	These are transducer error codes defined in the FF Transducer specifications FF-903 section 4.8 Block Alarm Subcodes. 16: Unspecified Error 17: General Error 18: Calibration Error 20: Electronics Failure 21: Mechanical Failure 22: I/O Failure 23: Data Integrity Error 24: Software Error 25: Algorithm Error Data format: Unsigned 8

Table 19 LCD Transducer Block

5.6.3 Special Functions and Options

The tags for the measurement displays are limited to five characters. They are displayed in the unit/error code field of the display. See (2) Figure 16, page 31. The DISPLAY_TAG can be up to 16 characters long. If it is longer than five characters the tag will be scrolled through the unit/error code field of the display.

The displayed measurements (LOCAL_DISPLAY_1, LOCAL_DISPLAY_2,...) will not always be showed in consecutive order (1, 2,...). The sequence of display is determined by the configuration order. See chapter 4.2.1, page 36 for details on the display of the values.

5.6.4 Device Description

The Device Description contains the block specific parameters and hierarchic parameter menus.

The following menu structure is available if the host supports menus. The messages may be abbreviated on the operator panel display.

Menu	Block properties	Identification	TAG_DESC STRATEGY ALERT_KEY ST_REV TRANSDUCER_TYPE
		Operation	DISPLAY_MODE
	Display	DISPLAY_TAG LOCAL_DISPLAY_1 LOCAL_DISPLAY_1_DIGITS LOCAL_DISPLAY_1_TAG LOCAL_DISPLAY_2 LOCAL_DISPLAY_2_DIGITS LOCAL_DISPLAY_2_TAG LOCAL_DISPLAY_3 LOCAL_DISPLAY_3_DIGITS LOCAL_DISPLAY_3_TAG LOCAL_DISPLAY_4 LOCAL_DISPLAY_4_DIGITS LOCAL_DISPLAY_4_TAG	
	Block mode	MODE_BLK.TARGET MODE_BLK.ACTUAL MODE_BLK.PERMITTED MODE_BLK.NORMAL	
	Alerts	BLOCK_ALM UPDATE_EVT	
	Status	BLOCK_ERR XD_ERROR	

Table 20 Device Description of LCD Transducer Block

5.7 Link Master Capability

The SITRANS P, DS III FF series has the Link Master Capability. This means that it can function as a Link Active Scheduler (LAS) to control the bus communication and coordinate the bus schedule for control. This enables local control of components.

It can also function as Backup-LAS. If the active LAS encounters a problem or malfunctions the SITRANS P, DS III FF series can step in to maintain the operation of the FF segment. In order to do so the SITRANS P, DS III FF series must receive the schedule for the loop during setup.

For the detailed instructions how the system management functions are configured in your system consult the documentation of the appropriate system supplier.

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 FOUNDATION™ Fieldbus, 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 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 (158 °F) 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 (-4 °F to 140 °F)). The permissible ambient temperature range is -40 °C to +85 °C (-40 °F to 185 °F), 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 installation 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 explosion protection of the transmitter depends on tightness of the diaphragm. Under these operating conditions, the transmitter max only be used for those inflammable gases and liquids to which the diaphragms are adequately chemically resistant to avoid corrosion.

7.1 Installation (except 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, page 139).

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, page 140).

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, page 145 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).

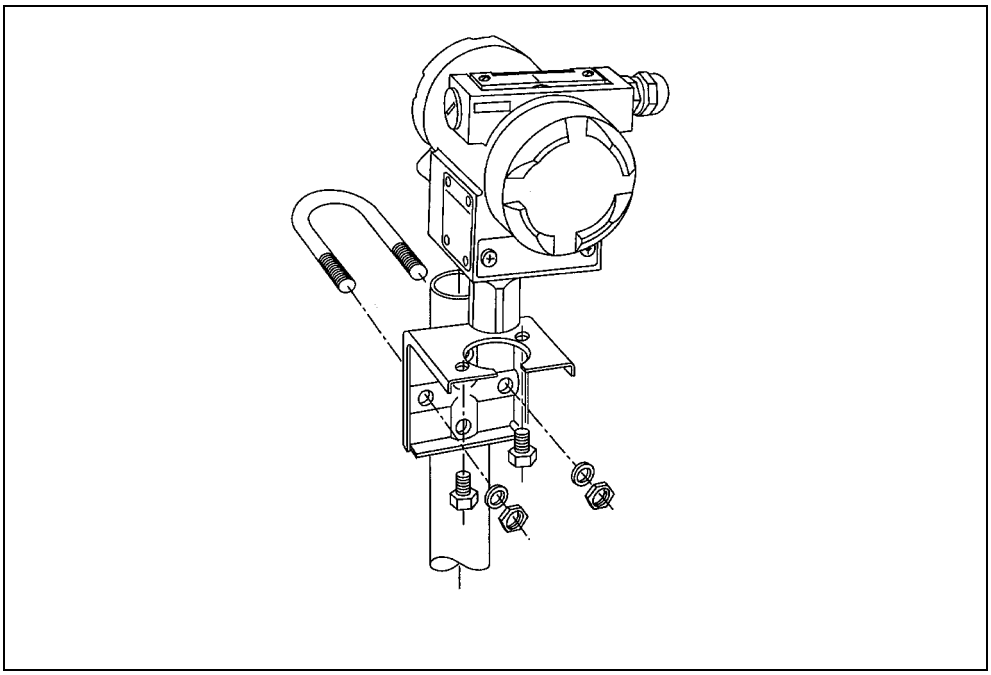


Figure 22 Mounting the SITRANS P, DS III FF series transmitter, with mounting bracket

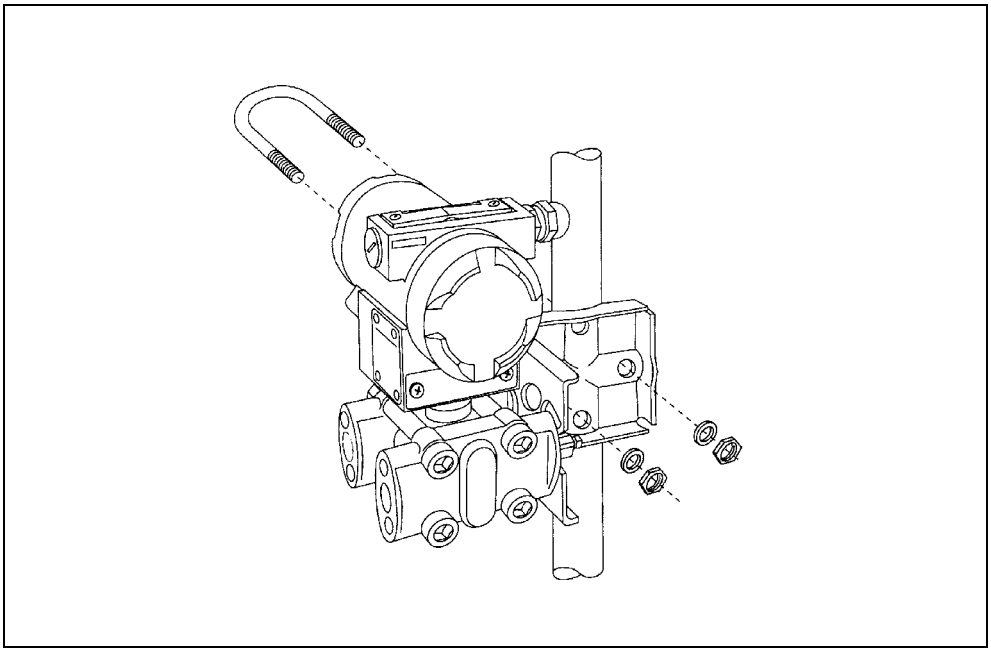


Figure 23 Mounting the SITRANS P, DS III FF series transmitter, with mounting bracket (example differential pressure, horizontal active pressure lines)

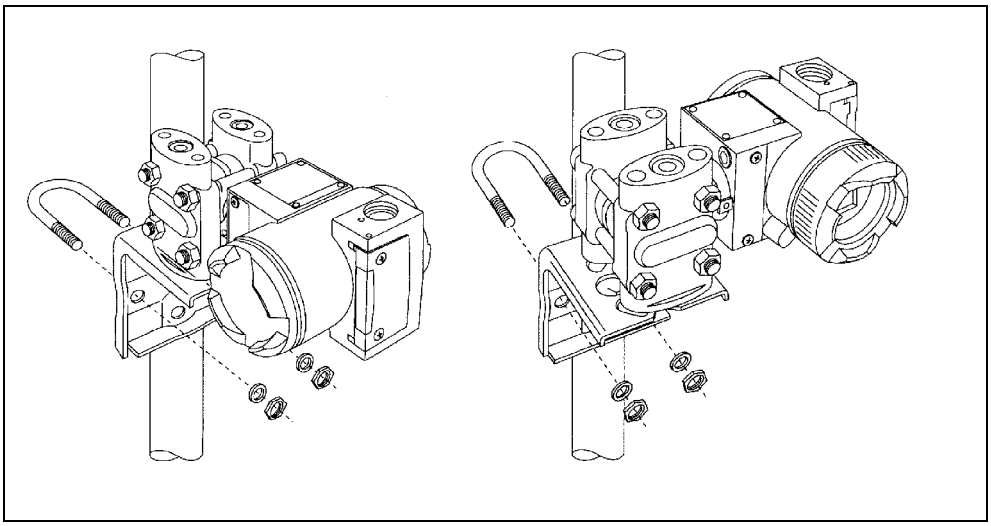


Figure 24 Mounting the SITRANS P, DS III FF series transmitter, with mounting bracket (example differential pressure, vertical active pressure lines)

7.2 Mounting “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 37, page 152) 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 25) because the low pressure chamber is connected to the atmosphere. The open connecting pipe should point downwards to prevent dirt getting in.

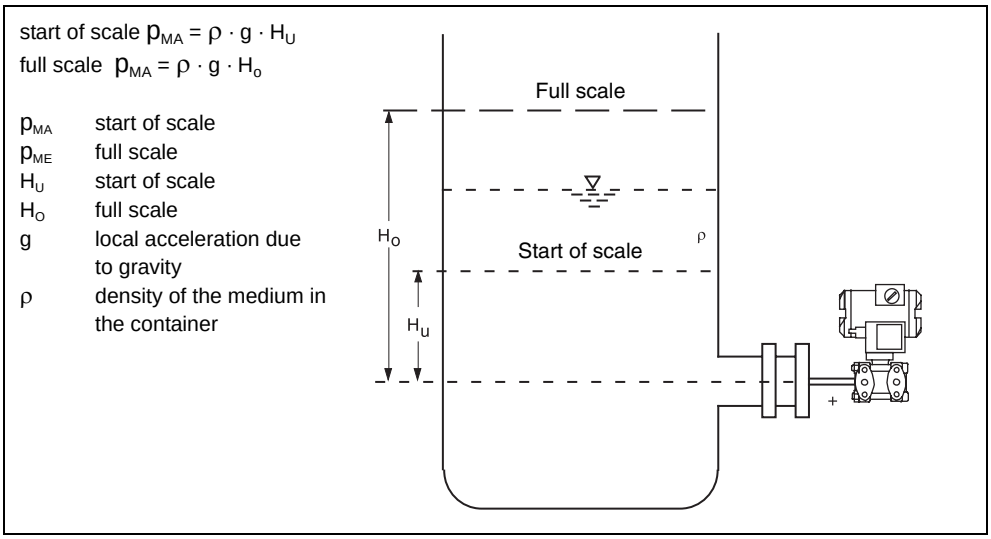


Figure 25 Measuring setup on the open container

When measuring on the closed container without or with only slight condensation (Figure 26) 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.

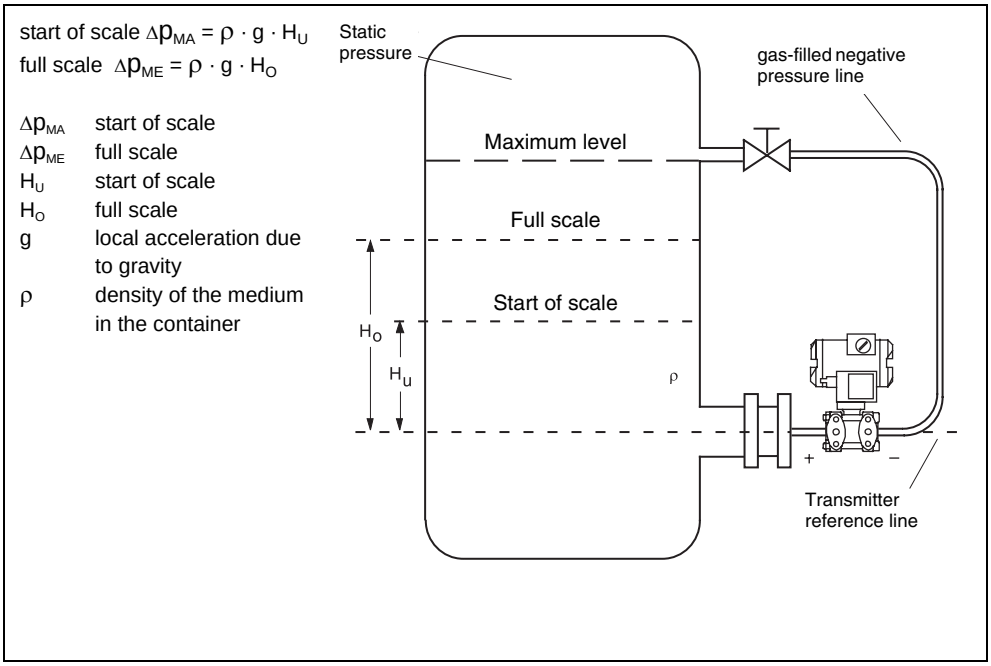


Figure 26 Measuring set up on the closed container (no or only slight condensation escape)

When measuring on the closed container with strong condensation formation (Figure 27), 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.

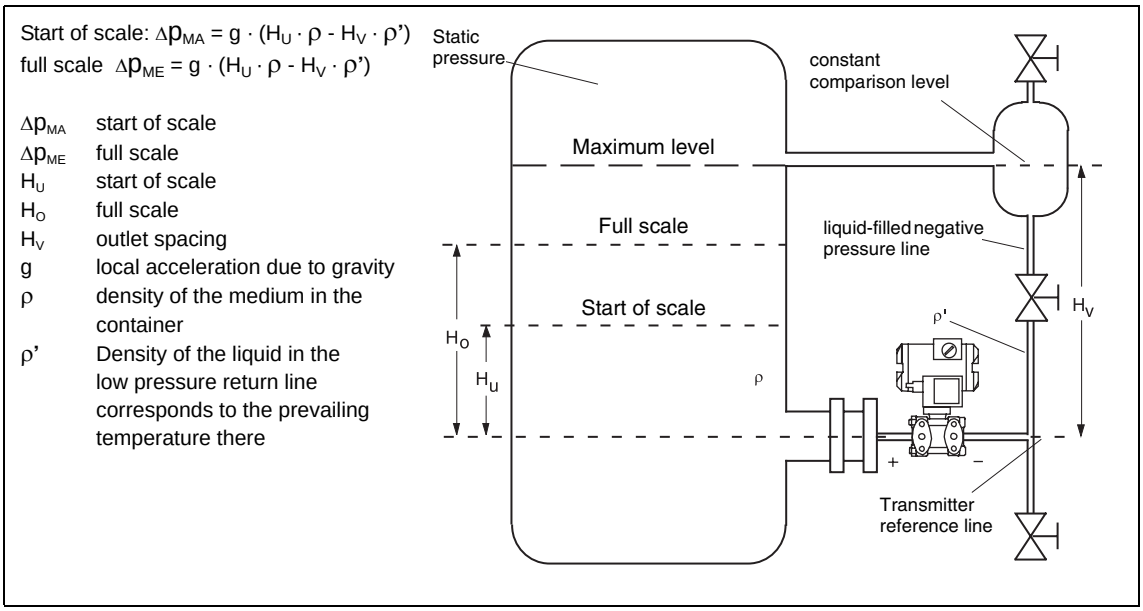


Figure 27 Measuring setup on the closed container (strong condensation formation)

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 23, page 128 and Figure 27 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, DS III FF series 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 (see (1) Figure 28) 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).

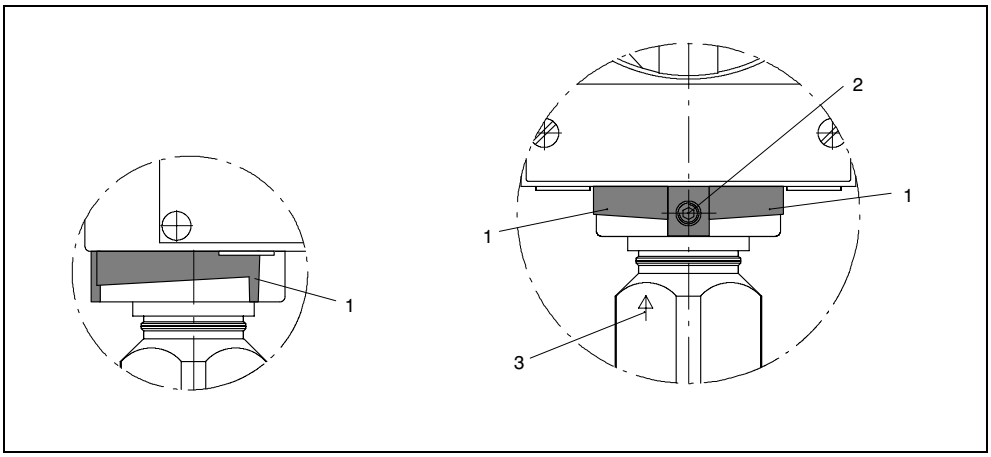


Figure 28 Range of rotation of the measuring cell (in pressure and absolute pressure transmitters of the pressure series)

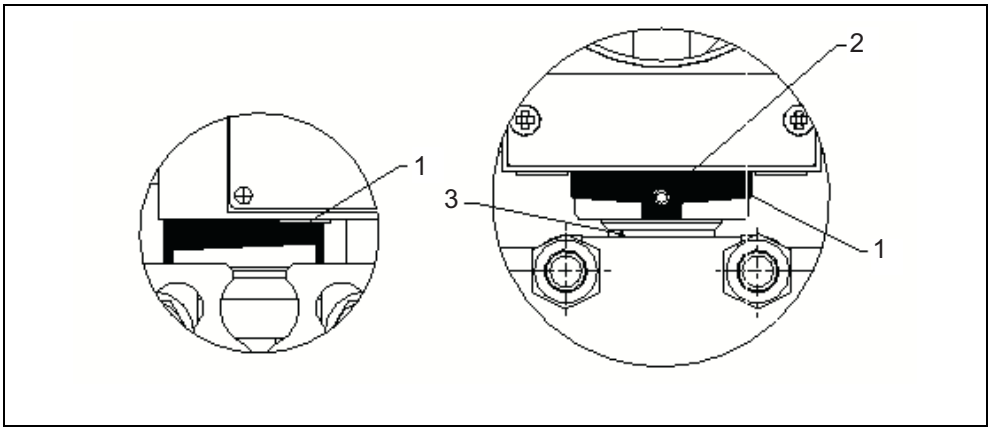


Figure 29 Range of rotation of the measuring cell (in differential pressure and flow and absolute pressure transmitters from the differential pressure and level series)

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 screw-type glands or dummy plugs which must be appropriately certified for transmitters with explosion-proof type of protection!

NOTE

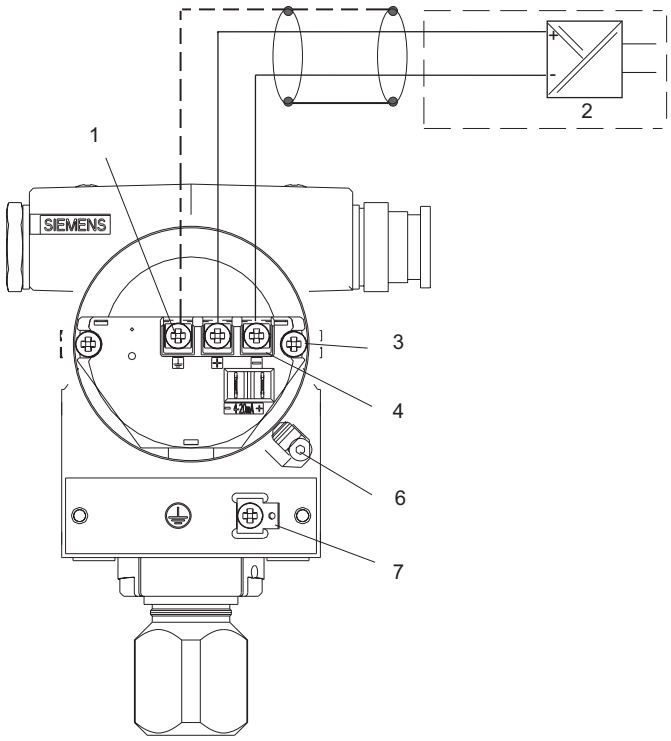
To improve interference it is recommended to:

- 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 IEC 61158-2.
- Only use cables with a diameter of 6 to 12 mm (0.24 to 0.47 inch) 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 (0.31 to 0.47 inch) 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 30).
   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 for the SITRANS P, DS III FF series.
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 catch
7 PE conductor connection/Equipotential terminal

Figure 30 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 to Display

This interface allows to plug the LCD display and to configure the simulations mode of the device.

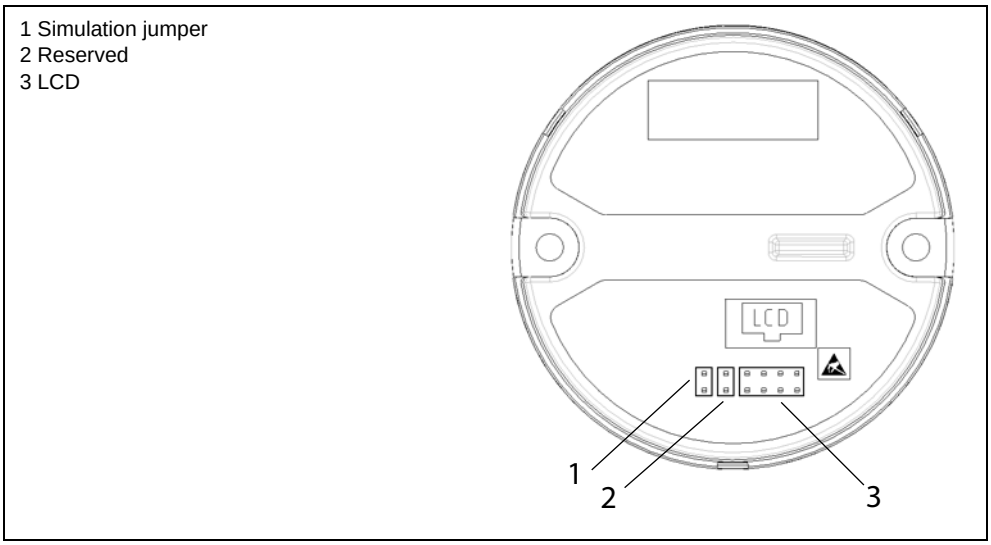


Figure 31 Connectors in electric compartment

Simulation jumper

The SITRANS P, DS III FF series is delivered with one jumper plugged on this connector. In this configuration, the field transmitter allows the simulation of its output value.

Remove this jumper to prevent unintentional simulation.

Reserved

Don’t plug any jumper or cable into this connector, it must always left open. This connector portion is only used in the factory.

LCD

This connector is used for the LCD display. The orientation of the LCD connector is shown on the adhesive label.

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 32, page 139) may result in serious injury or considerable material damage.

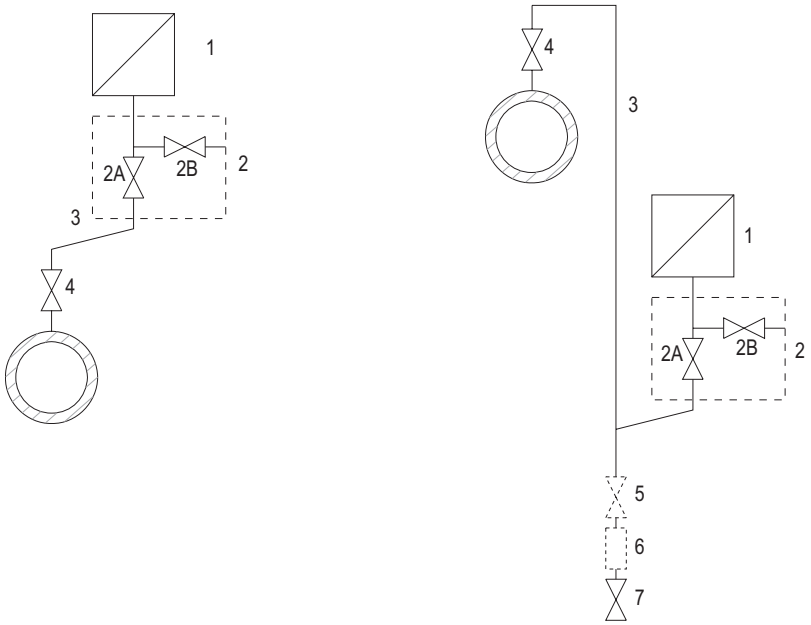
When using toxic media, the transmitter may not be vented.

8.1.1 Measuring gases

Operate the shutoff fittings in the following order:

Initial position: all valves closed

1. Open the shutoff valve. See (2B) Figure 32.
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

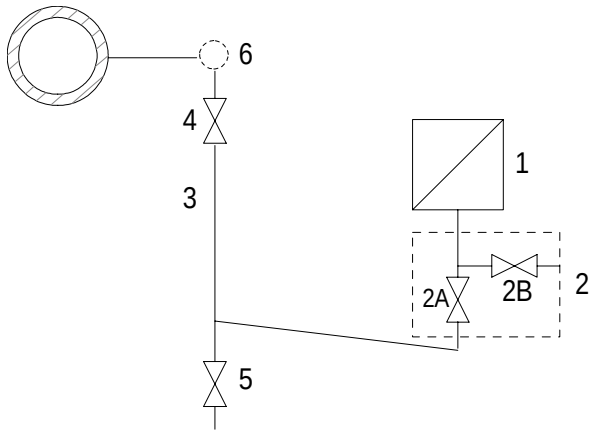
Figure 32 Measuring gases

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. See (2B) Figure 33.
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 33 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.

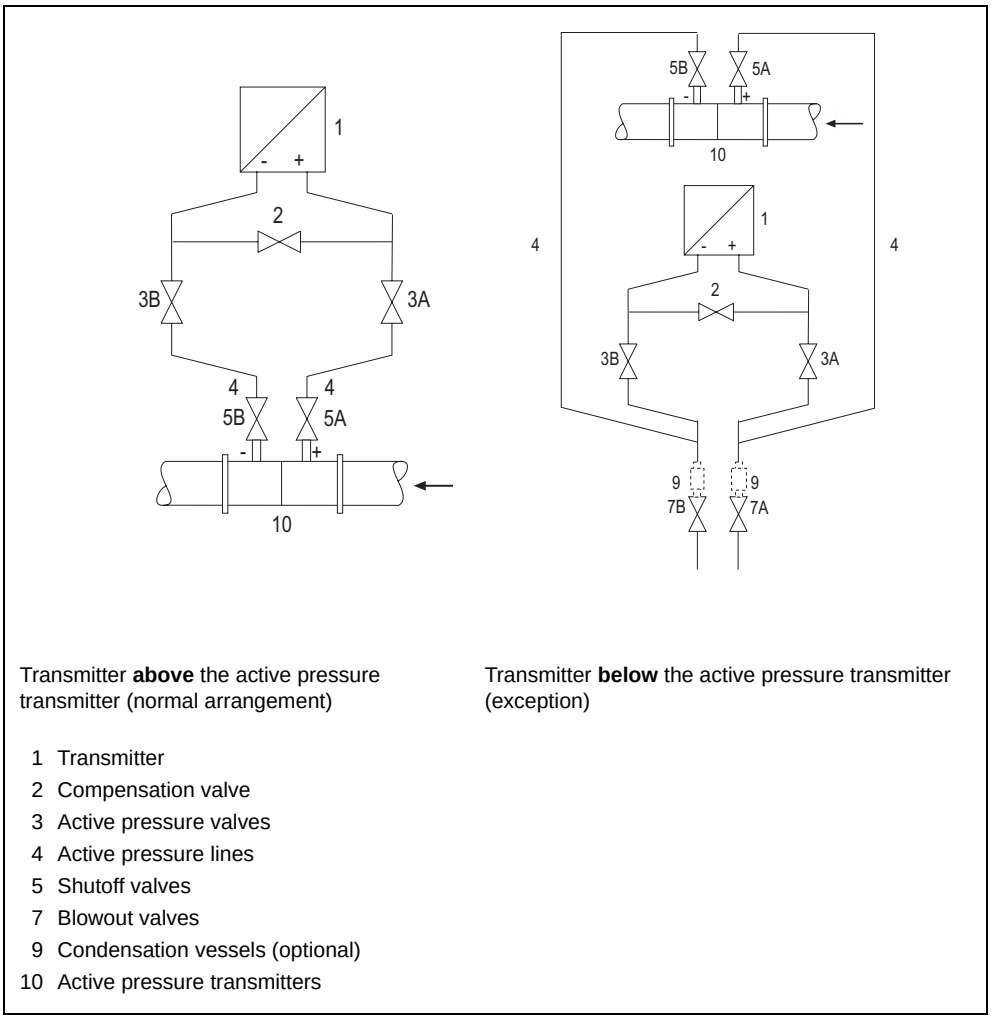
In the case of hot media the individual operating steps must be performed in rapid succession. Otherwise the valves and the transmitter may be heated up beyond the permissible limit, leading to damage.

8.2.1 Measuring gases

Operate the shutoff fittings in the following order:

Initial position: all shutoff valves closed

1. Open both shutoff valves (see (5) Figure 34, page 142) 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 34 Measuring gases

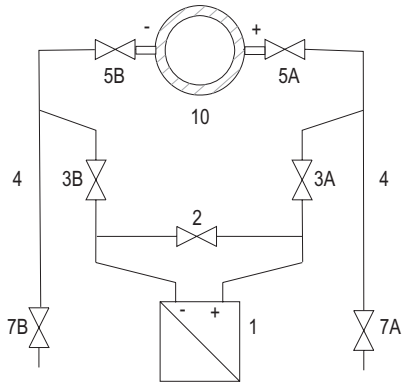
8.2.2 Measuring liquids

Operate the shutoff fittings in the following order:

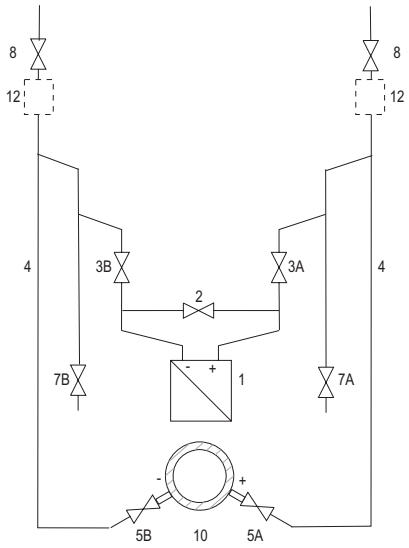
Initial position: all valves closed

1. Open both shutoff valves (see (5) Figure 35) 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.



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



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

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

Figure 35 Measuring liquids

WARNING

When using toxic media, the transmitter 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 (see (5) Figure 36) 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

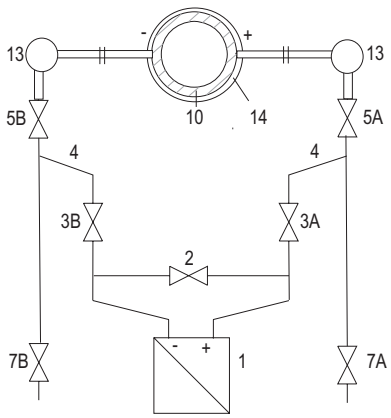


Figure 36 Measuring vapor

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 FF series, for	Pressure 7MF4035	Absolute pressure		Differential pressure and flow 7MF4435/ 7MF4535	Level 7MF4635
		Pressure transmitter series 7MF4235	Diff. pressure transm. series 7MF4335		
Application	See page 11				
Mode of operation Measuring principle	See page 16 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 100 bar (3.63 to 1450 psi)		250 mbar to 5 bar (3.63 to 72.5 psi)
• Nominal pressure PN 32 (MWP 464 psi) • Nominal pressure PN 160 (MWP 2320 psi) • Nominal pressure PN 420 (MWP 6092 psi)				20 mbar (0.29 psi) 60 mbar to 30 bar (0.87 to 435 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 FOUNDATION™ Fieldbus signal				
Physical bus	IEC 61158-2				
Independent of polarity	Yes				

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

SITRANS P, DS III FF series, for	Pressure 7MF4035	Absolute pressure Pressure transmitter series 7MF4235	Absolute pressure Diff. pressure transm. series 7MF4335	Differential pressure and flow 7MF4435/ 7MF4535	Level 7MF4635
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	≤ 0.075%				≤ 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)				

[1] Twice the value with 20-mbar (0.29 psi) nominal measuring range.

SITRANS P, DS III FF series, for	Pressure 7MF4035	Absolute pressure Pressure transmitter series 7MF4235	Absolute pressure Diff. pressure transm. series 7MF4335	Differential pressure and flow 7MF4435/ 7MF4535	Level 7MF4635
• 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: • $p_{abs} \geq 1$ bar: -40 to +175 °C (-40 to +347 °F) • $p_{abs} < 1$ bar: -40 to +80 °C (-40 to +176 °F) 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 7MF4535)			
- 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 150			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 Figure 37		See Figure 38	See Figure 39	See Figure 40
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, 316L, 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 EN 1092-1, Form B1, or ASME B16.5 RF 125 ... 250 AA for stainless steel 316L, EN 1092-1, Form B2, or ASME B16.5 RFSF for other materials
- Sealing material in the process flanges					
For standard applications					Viton
For vacuum application of mounting flange					Copper
- Low-pressure side					
Seal diaphragm					Stainless steel, 1.4404/316L

SITRANS P, DS III FF series, for	Pressure 7MF4035	Absolute pressure		Differential pressure and flow 7MF4435/ 7MF4535	Level 7MF4635
		Pressure transmitter series 7MF4235	Diff. pressure transm. series 7MF4335		
Process flanges and sealing screw					Stainless steel, mat. No. 1.4408
O-ring					FPM (Viton)
• Non-wetted parts materials					
- Electronics housing	Die-cast aluminum, low in copper, GD-ALSi 12, or stainless steel precision casting, mat. no 1.4408, 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				
Displays and controls					
Input keys	3 for local programming directly on transmitter				
Digital display	Built-in, cover with window (option)				
Power supply (V_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				
Certificates and approvals					
Classification according to pressure equipment directive (DGRL 97/23/EC):	**7MF4035, 7MF4235, 7MF4335, 7MF4435, 7MF4635** For gases of fluid group 1 and liquids of fluid 1; complies with requirements of article 3, paragraph 3 (sound engineering practice) **7MF4535** 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 TÜV Nord				
Explosion protection					
• Intrinsic safety "i"	PTB 99 ATEX 2122				
- Identification	Ⓔx II 1/2 G EEx ia IIC T6				
- Permissible ambient temperature	-40 °C to +85 °C (-40 °F to +185 °F) temperature class T4, +60 °C (+140 °F) temperature class T6				
- Connection	FISCO				
- Effective internal inductance/capacitance	$L_i \leq 7\ \mu H$ / $C_i \leq 1.1$ nF				
• Explosion-proof "d"	Planned				
- Identification					
- Permissible ambient temperature					

SITRANS P, DS III FF series, for	Pressure 7MF4035	Absolute pressure Pressure transmitter series 7MF4235	Absolute pressure Diff. pressure transm. series 7MF4335	Differential pressure and flow 7MF4435/ 7MF4535	Level 7MF4635
Certificates and approvals (continued)	Planned				
• Type of protection "n" (zone 2)					
- Identification					
- Permissible ambient temperature					
- Connection					
• Explosion protection to FM	Planned:				
- Identification (XP/DIP) or (IS); (NI)	CL I, DIV 1, GP ABCD T4...T6; CL II, DIV 1, GP EFG; CL III; (planned) 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 (planned)				
- Permissible ambient temperature	Ta = T4: -40 to +85 °C (-40 to +185 °F); T5: -40 to +70 °F (-40 to +158 °F); (planned) T6: -40 to +60 °C (-40 to +140 °F) (planned)				
- Entity parameters	According to control drawing A5E00118127A: (planned) FISCO or FNICO parameters or (planned) V_i = 24 V, I_i = 250 mA, P_i = 1.2 W, L_i = 7 µH, C_i = 2.2 nF (planned)				
• Explosion protection to CSA	Planned				
- Identification (XP/DIP) or (IS); (NI)					
- Permissible ambient temperature					
- Entity parameters					
Communication					
Function Blocks	3 Analog Input Function Block 1 PID Function Block				
• Analog input (AI)					
- Adaptation to application-specific process variable	Yes, linear rising or falling characteristic				
- Electric damping T_{63} adjustable	0 s to 100 s				
- Simulation function	Output/input. Can be locked with a jumper inside the device.				
- Failure response	Parameterizable (last correct value, default value, faulty value)				
- Limit monitoring	Yes, upper and lower warning limits, upper and lower alarm limits				
- Square-root characteristic for flow measurement	Yes				
• PID	Standard FF Function Block				
• Physical block	1 Resource Block				
Transducer blocks	1 Pressure Transducer Block with Calibration 1 LCD Transducer Block				
• Pressure transducer block					
- Calibration by application of two pressures	Yes				
- Monitoring of sensor limits	Yes				
- Simulation function					
Pressure value	Constant value or using parameterizable ramp function				
Sensor temperature	Constant value or using parameterizable ramp function				
Electronic 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	(14.5 psi)	= 100 kPa	4 bar	6 bar (87 psi)
4 bar	(58 psi)	= 400 kPa	7 bar	10 bar (145 psi)
16 bar	(232 psi)	= 1.6 MPa	21 bar	32 bar (464 psi)
63 bar	(913 psi)	= 6.3 MPa	67 bar	100 bar (1450 psi)
160 bar	(2320 psi)	= 16 MPa	167 bar[1)]	250 bar[1)] (3626 psi)
400 bar[1)]	(5802 psi)	= 40 MPa[1)]	400 bar[1)]	500 bar[1)] (7252 psi)

[1)] for oxygen measurement max. 160 bar (2320 psi)
*) according to 97/23/EG pressure transmitter regulation
**) according to DIN 16086

9.1.2 Differential pressure and flow

Nominal measuring range			Nominal pressure
20 mbar	(0.29 psi)	= 2 kPa	PN 32[3)]
60 mbar	(0.87 psi)	= 6 kPa	PN 160
250 mbar	(3.6 psi)	= 25 kPa	PN 160
600 mbar	(8.7 psi)	= 60 kPa	or
1,600 mbar	(23.2 psi)	= 160 kPa	PN 420[1)2)]
5,000 mbar	(72.5 psi)	= 500 kPa	
30,000 mbar	(435 psi)	= 3,000 kPa	

[1)] for oxygen measurement max. 160 bar (2320 psi)
[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	(3.6 psi)	= 250 kPa	1.5 bar	6 bar (87 psi)
1,300 mbar	(18.9 psi)	= 130 kPa	2.6 bar	10 bar (145 psi)
5,000 mbar	(72.5 psi)	= 500 kPa	10 bar	30 bar (435 psi)
30,000 mbar	(435 psi)	= 3,000 kPa	45 bar	100 bar (1450 psi)

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

NOTE on 250 mbar (3.6 psi) cell

See below.

9.1.4 Absolute pressure from the differential pressure series

Nominal measuring range			Overload limits
250 mbar	(3.6 psi)	= 25 kPa	32 bar (464 psi)
1,300 mbar	(18.9 psi)	= 130 kPa	32 bar (464 psi)
5000 mbar	(72.5 psi)	= 500 kPa	32 bar (464 psi)
30.000 mbar	(435 psi)	= 3,000 kPa	160 bar (2320 psi)
100,000 mbar	(1450 psi)	= 10,000 kPa	160 bar (2320 psi)

NOTE on 250 mbar (3.6 psi) cell

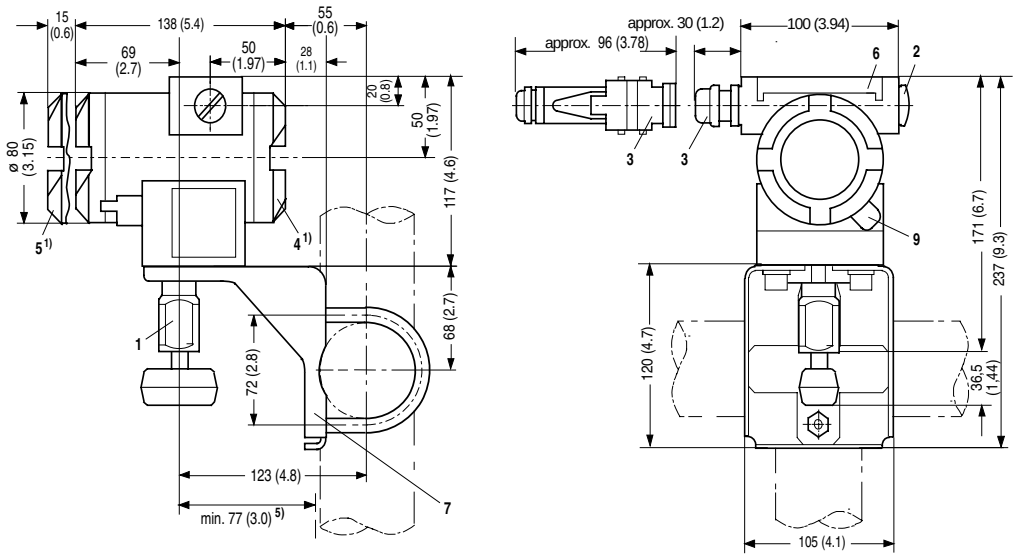
This measuring cell is designed for operation within the measuring limits 0 mbar (0 psi) (absolute) to 250 mbar (3.6 psi) (absolute). When stored under normal ambient pressure of around 1000 mbar (14.5 psi) (absolute) the measuring cell is in the overload state. An overload error may occur as a result. 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 (18.9 psi) should be selected to avoid overloading.

9.1.5 Level

Nominal measuring range			Nominal pressure
250 mbar	(3.6 psi)	= 25 kPa	PN 16 or PN 40
600 mbar	(8.7 psi)	= 60 kPa	
1600 mbar	(23.2 psi)	= 160 kPa	
5000 mbar	(72.5 psi)	= 500 kPa	

9.2 Dimensions

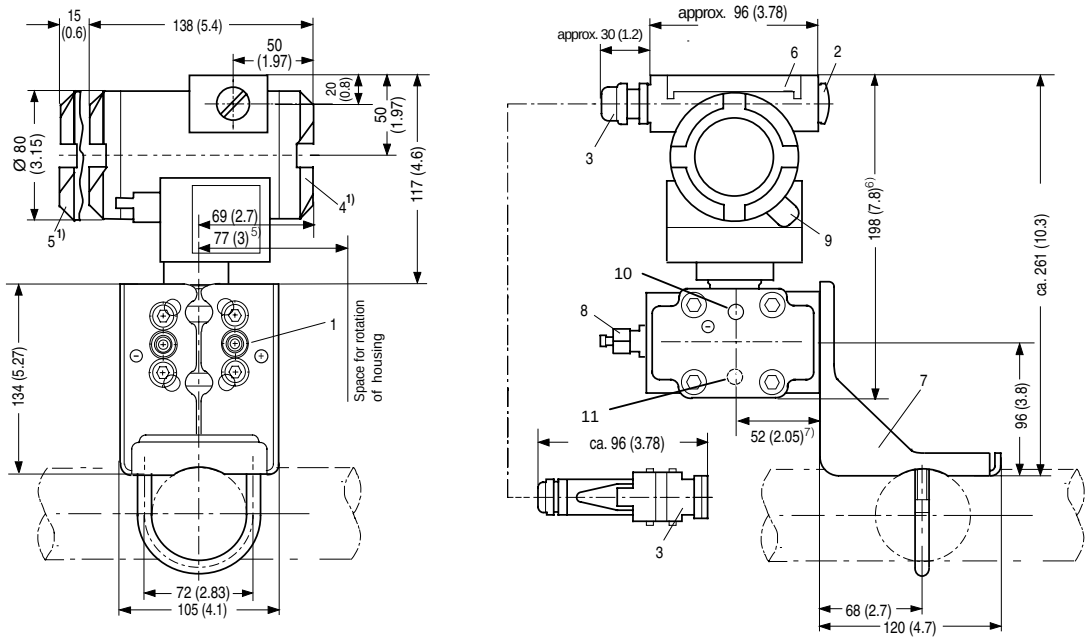


1 Process connection:
½ – 14 NPT (63 bar (914 psi) and above, wrench size 36)
connection shank G½A or
oval flange
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5,
screwed gland ½ – 14 NPT
4 Terminal side
5 Electronics side, digital display
(longer overall length for cover with window)
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) thread length in addition

5) Minimum distance for rotating

Figure 37 Dimensions of SITRANS P, DS III FF series for pressure and absolute pressure from pressure transmitters series, dimensions in mm (inches)

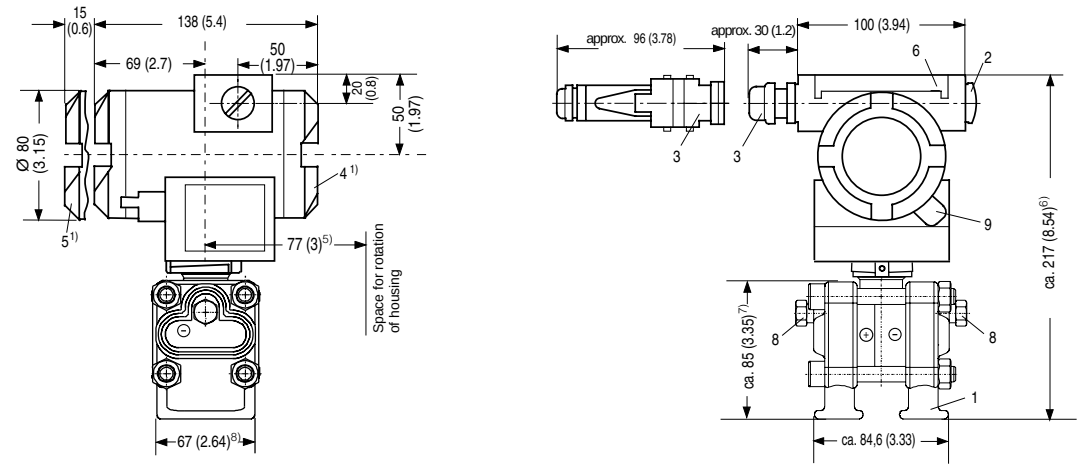


1 Process connection ¼-18 NPT (DIN 19 213)
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5
screwed gland ½ - 14 NPT
4 Terminal side
5 Electronics side, digital display
(longer overall length for cover with window)
6 Protective cover over keys
7 Mounting bracket (option)
8 Sealing screw 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

5) 92 mm (3.62 inch) for minimum distance to permit rotation with indicator
6) 201.5 mm (79.3 inch) for PN ≥ 420 (MWP ≥ 6092 psi)
7) 54 mm (2.12 inch) for PN ≥ 420 (MWP ≥ 6092 psi)

Figure 38 Dimensions of SITRANS P, DS III FF series for differential pressure and flow as well as absolute pressure from differential pressure transmitter series, dimensions in mm (inches)

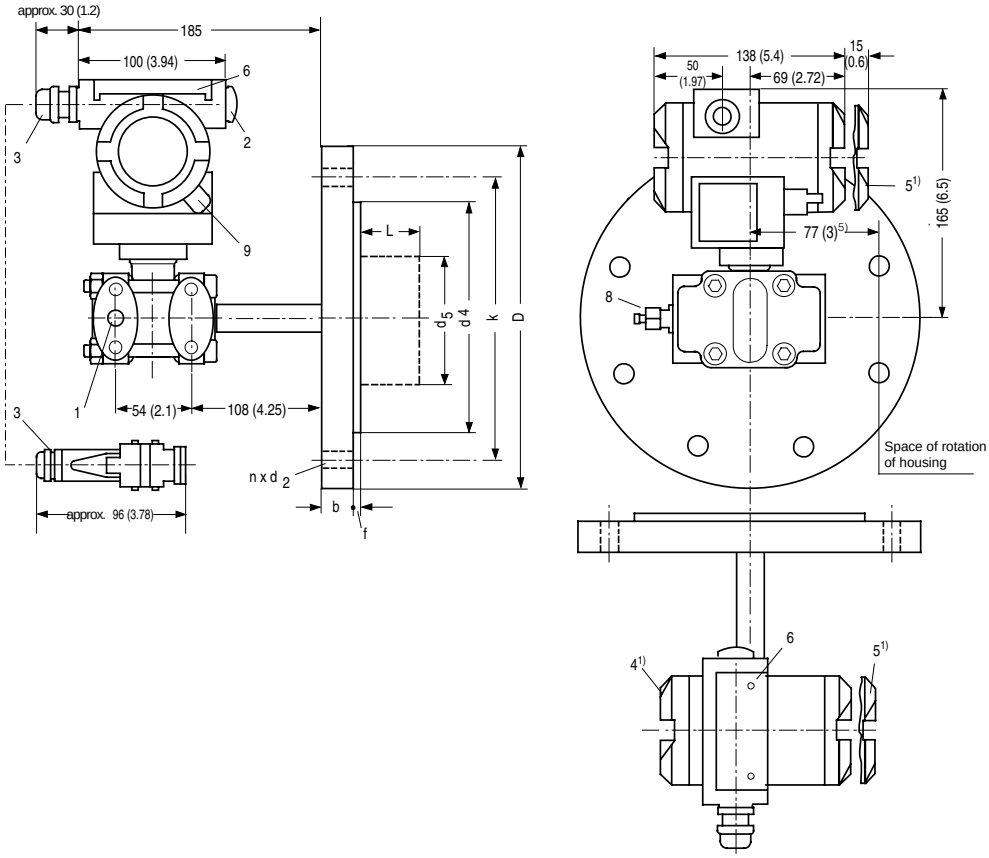


1 Process connection ¼-18 NPT (DIN 19213)
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5 or
screwed gland ½ - 14 NPT
4 Terminal side
5 Electronics side, digital display
(longer overall length for cover with window)
6 Protective cover over keys
7 Mounting bracket (option)
8 Sealing screw 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
5) 92 mm (3.62 inch) for minimum distance to permit rotation with indicator
6) 219 mm (8.62 inch) for PN ≥ 420 (MWP ≥ 6092 psi)
7) 91 mm (3.6 inch) for PN ≥ 420 (MWP ≥ 6092 psi)
8) 74 mm (2.9 inch) for PN ≥ 420 (MWP ≥ 6092 psi)

Figure 39 Dimensions of SITRANS P, DS III FF 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, DS III FF series transmitter's digital display. It is a particular advantage when mounting the transmitter on a valve manifold with vertical active pressure lines.

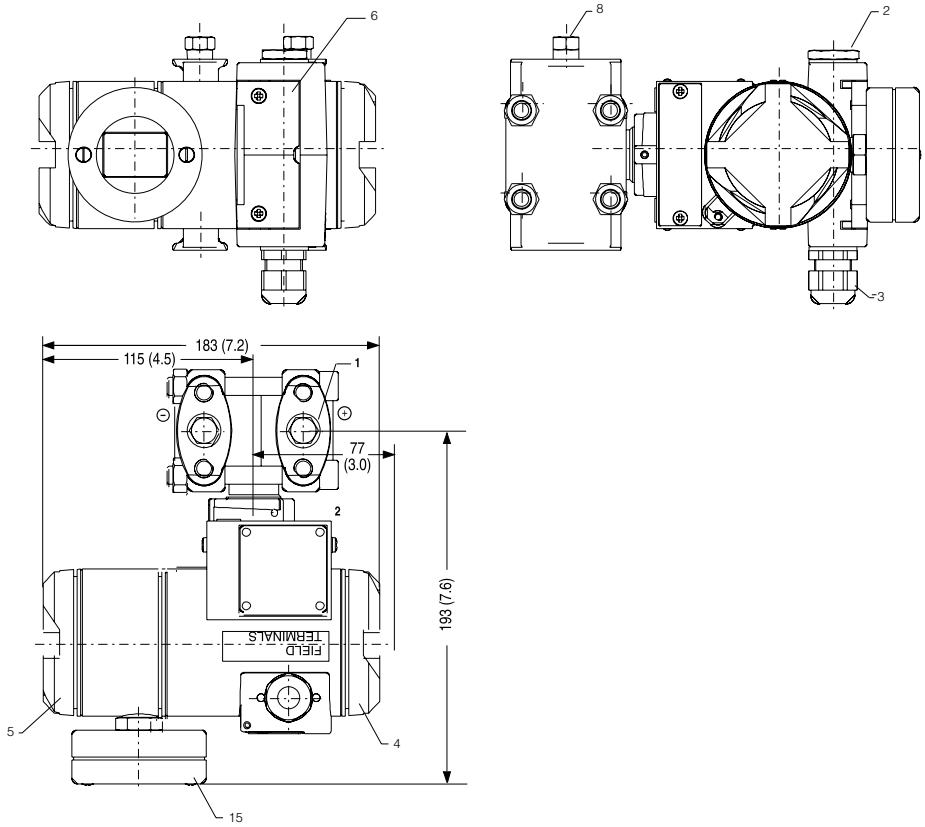


1 Process connection ¼-18 NPT (DIN 19213)
2 Blanking plug
3 Electrical connection:
screwed gland M20 x 1.5 or
screwed gland ½ - 14 NPT
4 Terminal side
5 Electronics side, digital display
(longer overall length for cover with window)
6 Protective cover over keys
8 Sealing screw with valve (option)
9 Screw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

5) 92 mm (3.62 inch) for minimum distance to permit rotation with indicator

Figure 40 Dimensions of SITRANS P, DS III FF 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
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)

Figure 41 Dimensions of SITRANS P, DS III FF 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”
  - Fieldbus: B_004: Sensor error
    Diagnosis: Measured value recording error
- serious hardware error the processor is not working
  Displays:
  digital display: no defined display
  - Fieldbus: Slave not available

In the event of a fault you can exchange the electronics as described in chapter 6, page 123 under consideration of the warnings.

FOUNDATION™ Fieldbus

11

The FOUNDATION™ Fieldbus is an open communication system for automation engineering.

11.1 Transmission method

The FOUNDATION™ Fieldbus (FF) 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 FOUNDATION™ Fieldbus enables bi-directional communication between 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.

11.2 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 transmitters, actuators, analyzers, etc. can be connected to the FOUNDATION™ Fieldbus.

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
- the possibility of control in the field

In an automation system, several FOUNDATION™ Fieldbus channels are usually connected to the fast FOUNDATION™ Fieldbus High Speed Ethernet (FF HSE) with coupling units. The process control system is also linked to this.

Both bus systems use a uniform protocol layer. This makes the FOUNDATION™ Fieldbus a communication-compatible extension of the FF HSE into the field.

Further information available on the internet (www.fieldbus.org).

11.3 Interfacing

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

As a rule the signal conversion FF, bus feeding and bus termination functions are combined in a coupling module. Depending on the number of FOUNDATION™ Fieldbus field devices to be operated in the automation system and the required timing, a FF-power supply/conditioners or, in the case of higher requirements, a more powerful FF-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 m. In addition, the voltage drop over the lines supplying the field devices must be taken into account in the planning.

FF-power supply/conditioner or FF-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 power supplies/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 (Fieldbus Intrinsic Safety Concept). In particular, supply devices 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, 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 (FF-power supplies/conditioners or FF-links) certified according to the FISCO model may be used to supply inherently safe fieldbuses. 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, 3rd supplement.

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.

Ordering Data

12

see following page

12.1 Ordering data for basic device

Ordering data		Order No.
SITRANS P transmitter for pressure		7MF4035-
DS III FF series		■■■■■-■■■■
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		Y0
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 aluminum		0
• Housing stainless steel precision casting		3
Design		
• Standard version		1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD (planned)		2
Explosion protection		
• Without explosion protection		A
• With explosion protection (CENELEC) Type of protection:		
- "Intrinsic safety" (EEx ia)		B
- "Explosion-proof" (EEx d) (planned)		D
- "Intrinsic safety and explosion-proof" (EEx ia and EEx d) (planned)		P
- "n" (zone 2) (planned)		E
• With explosion protection (FM + CSA)		
- Intrinsic safe and explosion-proof (is + xp) (planned)		NC
Electrical connection/cable inlet		
• Screwed gland M20x1,5		B
• Screwed gland ½-14 NPT		C
Indicator		
• Without indicator (digital display hidden)		1
• With indicator		
- digital display visible		6
- digital display visible (setting as specified, Order code Y21 required)		7

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	A01
• Stainless steel	A02
Type plate inscription (instead of German)	
• English (planned)	B11
• French (planned)	B12
• Spanish (planned)	B13
• Italian (planned)	B14
English rating plate pressure units in in$H_2$0 or psi	B21
Manufacturer's test certificate M (Calibration certificate) to DIN 55 350, Part 18, and to ISO 8402	C11
Acceptance test certificate B to EN 10 204-3.1B	C12
Factory certificate to EN 10 204-2.2	C14
Sour gas version to NACE (only together with seal diaphragm made of Hastelloy)	D07
IP68 (Nominal measuring range > 63 bar (> 914 psi))	D12
Digital indicator beside control keys (only with transmitter 7MF4035 - ■■■■ 0 - ■ A ■ 6 or 7MF4035 - ■■■■■ - ■ A ■ 7 - Z, Y21)	D27
Use in or at zone 1D/2D (only together with explosion protection EEx ia)	E01
Use at zone 0 (only together with explosion protection 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).	
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 below) can be selected.	Y21

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

Scope of delivery:
Transmitter as ordered (Operating instructions are extra ordering item)

Pressure dimensions:
Pa, MPa, kPa, hPa, bar, mbar, torr, atm, psi, g/cm2, kg/cm2, inH2O, inH2O (4 °C), mmH2O, mmH2O (4 °C), ftH2O, inHg, mmHg

Example for ordering:
tem line: 7MF4035-1EA00-1AA7-Z
B line: A01 + Y21
C line: Y21: .... mbar

Ordering data		Order No.
SITRANS P transmitter for absolute pressure, from pressure transmitter series		7MF4235-
DS III FF series		■■■■■-■■■■
Meas. cell filling	**Meas. cell cleaning**	
Silicone oil	Normal	1
Inert liquid	Grease-free	3
Nominal measuring range		
250 mbar	(3.63 psi)	D
1.3 bar	(18.9 psi)	F
5 bar	(72.5 psi)	G
30 bar	(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]		Y0
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 aluminum		0
• Housing stainless steel precision casting		3
Design		
• Standard version		1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD (planned)		2
Explosion protection		
• Without explosion protection		A
• With explosion protection (CENELEC) Type of protection:		
- "Intrinsic safety" (EEx ia)		B
- "Explosion-proof" (EEx d) (planned)		D
- "Intrinsic safety and explosion-proof" (EEx ia and EEx d) (planned)		P
- "n" (zone 2) (planned)		E
• With explosion protection (FM + CSA)		
- Intrinsic safe and explosion-proof (is + xp) (planned)		NC
Electrical connection/cable inlet		
• Screwed gland M20x1,5		B
• Screwed gland ½-14 NPT		C
Indicator		
• Without indicator (digital display hidden)		1
• With indicator		
- digital display visible		6
- digital display visible (setting as specified, Order code Y21 required)		7

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	A01
• Stainless steel	A02
Type plate inscription (instead of German)	
• English (planned)	B11
• French (planned)	B12
• Spanish (planned)	B13
• Italian (planned)	B14
English rating plate pressure units in in$H_2$0 or psi	B21
Manufacturer's test certificate M (Calibration certificate) to DIN 55 350, Part 18, and to ISO 8402	C11
Acceptance test certificate B to EN 10 204-3.1B	C12
Factory certificate to EN 10 204-2.2	C14
Sour gas version to NACE (only together with seal diaphragm made of Hastelloy)	D07
IP68	D12
Digital indicator beside control keys (only with transmitter 7MF4035 - ■■■■ 0 - ■A ■6 or 7MF4035 - ■■■■■ - ■A ■7 - Z, Y21)	D27
Use in or at zone 1D/2D (only together with explosion protection EEx ia)	E01
Use at zone 0 (only together with explosion protection EEx ia)	E02
Oxygen application	E10

Additional information	
Please add "Z" to Order No. and specify Order code(s).	
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 164) can be selected.	Y21

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

Scope of delivery:
Transmitter as ordered (Operating instructions are extra ordering item)

Example for ordering: see page 164

[1] Version 7MF4235-1DY... only up to max. span 200 mbar (2.9 psi).

Ordering data		Order No.
SITRANS P transmitter for absolute pressure, from differential pressure transmitter series		7MF4335-
DS III FF series		■■■■■-■■■■
Meas. cell filling	**Meas. cell cleaning**	
Silicone oil	Normal	1
Inert liquid	Grease-free	3
Nominal measuring range		
250 mbar	(3.63 psi)	D
1.3 bar	(18.9 psi)	F
5 bar	(72.5 psi)	G
30 bar	(435 psi)	H
100 bar	(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 aluminum	2
Stainless steel	Stainl. steel prec. cast	3
Design		
• Standard version		1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD (planned)		2
Explosion protection		
• Without explosion protection		A
• With explosion protection (CENELEC) Type of protection:		
- "Intrinsic safety" (EEx ia)		B
- "Explosion-proof" (EEx d) (planned)		D
- "Intrinsic safety and explosion-proof" (EEx ia and EEx d) (planned)		P
- "n" (zone 2) (planned)		E
• With explosion protection (FM + CSA)		
- Intrinsic safe and explosion-proof (is + xp) (planned)		NC
Electrical connection/cable inlet		
• Screwed gland M20x1,5		B
• Screwed gland ½-14 NPT		C
Indicator		
• Without indicator (digital display hidden)		1
• With indicator		
- digital display visible		6
- digital display visible (setting as specified, Order code Y21 required)		7

[1] Version 7MF4335-1DY... only up to max. span 200 mbar (2.9 psi).

[2] Not for nominal measuring range 100 bar (1450 psi).

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	A01
• Stainless steel	A02
Process flange O-ring made of: (instead of FPM (Viton))	
• 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
Type plate inscription (instead of German)	
• English (planned)	B11
• French (planned)	B12
• Spanish (planned)	B13
• Italian (planned)	B14
English rating plate pressure units in in$H_2$0 or psi	B21
Manufacturer's test certificate M (Calibration certificate) to DIN 55 350, Part 18, and to ISO 8402	C11
Acceptance test certificate B to EN 10 204-3.1B	C12
Factory certificate to EN 10 204-2.2	C14
Sour gas version to NACE (only together with seal diaphragm made of Hastelloy)	D07
IP68	D12
Digital indicator beside control keys (only with transmitter 7MF4035 - ■■■■ 0 - ■ A ■ 6 or 7MF4035 - ■■■■■ - ■ A ■ 7 - Z, Y21)	D27
Use in or at zone 1D/2D (only together with explosion protection EEx ia)	E01
Use at zone 0 (only together with explosion protection 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).	
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 164) can be selected.	Y21

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

Scope of delivery:
Transmitter as ordered (Operating instructions are extra ordering item)

Example for ordering: see page 164

Ordering data		Order No.
SITRANS P transmitter for differential pressure and flow		7MF4435-
DS III FF series, PN 32/160 (MWP 464/2320 psi)		■■■■■-■■■■
Meas. cell filling	**Meas. cell cleaning**	
Silicone oil	Normal	1
Inert liquid	Grease-free	3
Nominal measuring range		
PN 32 (MWP 464 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	(8.70 psi)	E
1.6 bar	(23.2 psi)	F
5 bar	(72.5 psi)	G
30 bar	(435 psi)	H
Wetted parts materials		
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		
• With 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 aluminum	2
Stainless steel	Stainl. steel prec. cast	3
Design		
• Standard version		1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD (planned)		2
Explosion protection		
• Without explosion protection		A
• With explosion protection (CENELEC) Type of protection:		
- "Intrinsic safety" (EEx ia)		B
- "Explosion-proof" (EEx d) (planned)		D
- "Intrinsic safety and explosion-proof" (EEx ia and EEx d) (planned)		P
- "n" (zone 2) (planned)		E
• With explosion protection (FM + CSA)		
- Intrinsic safe und explosion-proof (is + xp) (planned)		NC
Electrical connection/cable inlet		
• Screwed gland M20x1,5		B
• Screwed gland ½-14 NPT		C
Indicator		
• Without indicator (digital display hidden)		1
• With indicator		
- digital display visible		6
- digital display visible (setting as specified, Order code Y21 required)		7

[1] Not suitable for connection of remote seal.

[2] Only together with nominal measuring range 250 mbar, 1.6 bar, 5 bar and 30 bar (3.63 psi, 23.2 psi, 72.5 psi and 435 psi).

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	A01
• Stainless steel	A02
Process flange O-ring made of: (instead of FPM (Viton))	
• 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
Type plate inscription (instead of German)	
• English (planned)	B11
• French (planned)	B12
• Spanish (planned)	B13
• Italian (planned)	B14
English rating plate pressure units in in$H_2$0 or psi	B21
Manufacturer's test certificate M (Calibration certificate) to DIN 55 350, Part 18, and to ISO 8402	C11
Acceptance test certificate B to EN 10 204-3.1B	C12
Factory certificate to EN 10 204-2.2	C14
Sour gas version to NACE (only together with seal diaphragm made of Hastelloy)	D07
IP68	D12
Digital indicator beside control keys (only with transmitter 7MF4035 - ■■■■ 0 - ■ A ■ 6 or 7MF4035 - ■■■■■ - ■ A ■ 7 - Z, Y21)	D27
Use in or at zone 1D/2D (only together with explosion protection EEx ia)	E01
Use at zone 0 (only together with explosion protection 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
Stainless steel process flanges for vertical differential pressure lines (not together with K01, K02 and K04)	H03
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	Order Code
Please add "Z" to Order No. and specify Order code(s).	
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 164) can be selected.	Y21

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

Ordering data		Order No.
SITRANS P transmitter for differential pressure and flow		7MF4535-
DS III FF series, PN 420 (MWP 6092 psi)		1 ■■■■ - ■■■■
Nominal measuring range		
250 mbar	(3.63 psi)	D
600 mbar	(8.70 psi)	E
1.6 bar	(23.2 psi)	F
5 bar	(72.5 psi)	G
30 bar	(435 psi)	H
Wetted parts materials		
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 19 213		
• With sealing screw opposite process conn.		
- 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 aluminum	2
Stainless steel	Stainl. steel prec. cast	3
Design		
• Standard version		1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD (planned)		2
Explosion protection		
• Without explosion protection		A
• With explosion protection (CENELEC) Type of protection:		
- "Intrinsic safety" (EEx ia)		B
- "Explosion-proof" (EEx d) (planned)		D
- "Intrinsic safety and explosion-proof" (EEx ia and EEx d) (planned)		P
- "n" (zone 2) (planned)		E
• With explosion protection (FM + CSA)		
- Intrinsic safe and explosion-proof (is + xp) (planned)		NC
Electrical connection/cable inlet		
• Screwed gland M20x1,5		B
• Screwed gland ½-14 NPT		C
Indicator		
• Without indicator (digital display hidden)		1
• With indicator		
- digital display visible		6
- digital display visible (setting as specified, Order code Y21 required)		7

1) Only together with nominal measuring range 250 mbar, 1.6 bar, 5 bar and 30 bar (3.63 psi, 23.2 psi, 72.5 psi and 435 psi).

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Transmitter with mounting bracket made of	
• Steel	A01
• Stainless steel	A02
Process flange O-ring made of: (instead of FPM (Viton))	
• 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
Type plate inscription (instead of German)	
• English (planned)	B11
• French (planned)	B12
• Spanish (planned)	B13
• Italian (planned)	B14
English rating plate pressure units in in$H_2$0 or psi	B21
Manufacturer's test certificate M (Calibration certificate) to DIN 55 350, Part 18, and to ISO 8402	C11
Acceptance test certificate B to EN 10 204-3.1B	C12
Factory certificate to EN 10 204-2.2	C14
Sour gas version to NACE (only together with seal diaphragm made of Hastelloy)	D07
IP68	D12
Digital indicator beside control keys (only with transmitter 7MF4035 - ■■■■ 0 - ■ A ■ 6 or 7MF4035 - ■■■■■ - ■ A ■ 7 - Z, Y21)	D27
Use in or at zone 1D/2D (only together with explosion protection EEx ia)	E01
Use at zone 0 (only together with explosion protection 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).	
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 164) can be selected.	Y21

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

Scope of delivery:
Transmitter as ordered (Operating instructions are extra ordering item)

Example for ordering: see page 164

Ordering data		Order No.
SITRANS P transmitter flow		7MF4635-
DS III FF series		1 ■ Y ■■ - ■■■■
Nominal measuring range		
250 mbar	(3.63 psi)	D
600 mbar	(8.70 psi)	E
1.6 bar	(23.2 psi)	F
5 bar	(72.5 psi)	G
Process connection of low-pressure side		
Female thread ¼ - 18 NPT and flange connection to DIN 19 213		
• With mounting thread M10		0
• With mounting thread $^{7}/_{16}$-20 UNF		2
Non-wetted parts materials		
Process flange screws	Electronics housing	
Stainless steel	Die-cast aluminum	2
Stainless steel	Stainl. steel prec. cast	3
Design		
• Standard version		1
• International version (available soon), English label inscriptions, documentation in 5 languages on CD (planned)		2
Explosion protection		
• Without explosion protection		A
• With explosion protection (CENELEC) Type of protection:		
- "Intrinsic safety" (EEx ia)		B
- "Explosion-proof" (EEx d) (planned)		D
- "Intrinsic safety and explosion-proof" (EEx ia and EEx d) (planned)		P
- "n" (zone 2) (planned)		E
Electrical connection/cable inlet		
• Screwed gland M20x1,5		B
• Screwed gland ½-14 NPT		C
Indicator		
• Without indicator (digital display hidden)		1
• With indicator		
- digital display visible		6
- digital display visible (setting as specified, Order code Y21 required)		7

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Process flange O-ring made of: (instead of FPM (Viton))	
• 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
Type plate inscription (instead of German)	
• English (planned)	B11
• French (planned)	B12
• Spanish (planned)	B13
• Italian (planned)	B14
English rating plate pressure units in in$H_2$0 or psi	B21
Manufacturer's test certificate M (Calibration certificate) to DIN 55 350, Part 18, and to ISO 8402	C11
Acceptance test certificate B to EN 10 204-3.1B	C12
Factory certificate to EN 10 204-2.2	C14
IP68	D12
Use in or at zone 1D/2D (only together with explosion protection EEx ia)	E01
Use at zone 0 (only together with explosion protection EEx ia)	E02
Interchanging of process connection side	H01

Additional information	
Please add "Z" to Order No. and specify Order code(s).	
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 164) can be selected.	Y21

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

Scope of delivery:
Transmitter as ordered (Operating instructions are extra ordering item)

Ordering note:
Item line: Transmitter 7MF4635-...
B line: Flanch 7MF4912-3...
C line: Further designs

Example for ordering:
Item line: 7MF4635-1EY22-1AB1-Z
B line: 7MF4912-3GE01
C line: Y21: .... mbar

Ordering data		Order No.
Mounting flange		7MF4912-
Directly fitted onto SITRAS P transmitter for level, for		3 ■■■■ - ■■■
DS III FF series		
Connection to EN1092-1/DIN 2501		
Nominal diameter	Nominal pressure	
DN 80	PN 40	D
DN 100	PN 16	G
DN 100	PN 40	H
Connection to ASME/ANSI B16.5		
Nominal diameter	Nominal pressure	
3"	class 150	Q
3"	class 300	R
4"	class 150	T
4"	class 300	U
Other version Add Order code and plain text: Nominal diameter: ...; Nominal pressure: ...		Z J1Y
Wetted parts materials		
• Stainless steel, mat. No. 1.4571/316Ti[1)]		A
- Coated with PFA		D
- Coated with PTFE		E0
- 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: ... Sealing face: see "Technical data"		Z K1Y
Tube length		
• Without tube		0
• 50 mm (1.97 ")		1
• 100 mm (3.94 ")		2
• 150 mm (5.90 ")		3
• 200 mm (7.87 ")		4
Non-wetted parts materials		
• 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

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

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

12.2 Ordering data for spare parts

Ordering data	Order Code
Spare parts	
Mounting brackets and mounting parts	
For pressure transmitters: MK II series (7MF4010-■■■■■-1■C■) MS series (7MF4013-■■■■■-1■C■) DS III, DS III PA and DS III FF series (7MF403■-■■■■■-1■C■) For absolute pressure transmitters: DS III, DS III PA and DS III FF series (7MF423■-■■■■■-1■C■)	
• Made of steel	7MF4997-1AB
• Made of stainless steel	7MF4997-1AH
Mounting brackets and mounting parts	
For pressure transmitters: MK II series (7MF4010-■■■■■-1■A■, -1■B■, -1■D■) MS series (7MF4013-■■■■■-1■A■, -1■B■, -1■D■) DS III, DS III PA and DS III FF series (7MF403■-■■■■■-1■A■, -1■B■, -1■D■) For absolute pressure transmitters: DS III, DS III PA and DS III FF series (7MF423■-■■■■■-1■A■, -1■B■, -1■D■)	
• Made of steel	7MF4997-1AC
• Made of stainless steel	7MF4997-1AJ
Mounting brackets and mounting parts	
For differential pressure transmitters with M10 flange thread: (7MF43■■-... and 7MF44■■-...)	
• Made of steel	7MF4997-1AD
• Made of stainless steel	7MF4997-1AK
Mounting brackets and mounting parts	
For differential pressure transmitters with M12 flange thread: (7MF45■■-...)	
• Made of steel	7MF4997-1AE
• Made of stainless steel	7MF4997-1AL
Mounting brackets and mounting parts	
For differential and absolute pressure transmitters with flange thread $^{7}/_{16}$-20 UNF: (7MF43■■-..., 7MF44■■-... and 7MF45■■-...)	
• Made of steel	7MF4997-1AF
• Made of stainless steel	7MF4997-1AM
Cover	
• die-cast aluminum without window, including gasket (MK II, MS, DS III, DS III PA and DS III FF series)	7MF4997-1BB
• stainless steel without window, including gasket (DS III, DS III PA and DS III FF series)	7MF4997-1BC
• die-cast aluminum with window, including gasket (MK II, MS, DS III, DS III PA and DS III FF series)	7MF4997-1BE
• stainless steel with window, including gasket (DS III, DS III PA and DS III FF series)	7MF4997-1BF
Analog indicator	
• scale 0 % to 100 %	7MF4997-1BN
• customer-specific scale divisions as specified in plain text	7MF4997-1BP-Z Y20:...
Digital indicator	
including mounting material (MS, DS III, DS III PA and DS III FF 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 page 164)	7MF4997-1CB-Z Y■■: ...

Ordering data	Order Code
Spare parts	
Mounting screws	
For measuring-point label for MK II, MS, DS III, DS III PA and DS III FF 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	
• SITRANS P, DS III FF series	7MF4997-1DM
Connection board	
• SITRANS P, DS III PA or DS III FF series	7MF4997-1DP
O-ring	
For process flanges made of:	
• FPM (Viton)	7MF4997-2DA
• PTFE (Teflon)	7MF4997-2DB
• FEP (with silicone core, approved for food)	7MF4997-2DC
• FFPM (Kalrez)	7MF4997-2DD
• NBR (Buna N)	7MF4997-2DE

Ordering data		Order No.
SITRANS P measuring cell for pressure		7MF4990 -
DS III, DS III PA and DS III FF series		0
Meas. cell filling	**Meas. cell cleaning**	
Silicone oil	Normal	1
Inert filling liquid	Grease-free	3
Rated 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	Connection Shank	
Stainless steel	Stainless steel	A
Hastelloy	Stainless steel	B
Hastelloy	Hastelloy	C
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

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Acceptance test certificate B to EN 10 204-3.1B	C12

Ordering data		Order No.
SITRANS P measuring cell for absolute pressure, from pressure transmitter series		7MF4992 -
DS III, DS III PA and DS III FF series		0
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
1.3 bar	(18.9 psi)	F
5 bar	(72.5 psi)	G
30 bar	(435 psi)	H
Wetted parts materials		
Seal diaphragm	Process connection	
Stainless steel	Stainless steel	A
Hastelloy	Stainless steel	B
Hastelloy	Hastelloy	C
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

Further designs	Order Code
Please add "Z" to Order No. and specify Order code(s).	
Acceptance test certificate B to EN 10 204-3.1B	C12

Ordering data		Order No.
SITRANS P measuring cell for absolute pressure, from differential pressure transmitter series		7MF4993-
DS III, DS III PA and DS III FF series		
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
1.3 bar	(18.9 psi)	F
5 bar	(72.5 psi)	G
30 bar	(435 psi)	H
100 bar	(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 connection		
- 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).	
Process flange O-ring made of:	
(instead of FPM (Viton))	
• PTFE (Teflon)	A20
• FEP (with silicone core, approved for food)	A21
• FFPM (Kalrez)	A22
• NBR (Buna N)	A23
Acceptance test certificate B to EN 10 204-3.1B	C12
Process connection G1/2A	D16
Remote seal connection (not together with K01, K02 and K04)	D20
Vent on side for gas measurements	H02
Process flange	
• Without	K00
• 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 flow		7MF4994-
DS III, DS III PA and DS III FF series, PN 32/160 (MWP 464/2320 psi)		
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[1]	(0.29 psi)	B
PN 160 (MWP 2320 psi)		
60 mbar	(0.87 psi)	C
250 mbar	(3.63 psi)	D
600 mbar	(8.70 psi)	E
1.6 bar	(23.2 psi)	F
5 bar	(72.5 psi)	G
30 bar	(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[2]	Tantalum	E
Monel[2]	Monel	H
Gold[2]	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 connection		
- 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).	
Process flange O-ring made of:	
(instead of FPM (Viton))	
• PTFE (Teflon)	A20
• FEP (with silicone core, approved for food)	A21
• FFPM (Kalrez)	A22
• NBR (Buna N)	A23
Acceptance test certificate B to EN 10 204-3.1B	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 and K04)	H03
Process flange	
• Without	K00
• 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) Not suitable for connection of remote seal.

2) Only together with nominal measuring range 250 mbar, 1.6 bar, 5 bar and 30 bar (3.63 psi, 23.2 psi, 72.5 psi and 435 psi).

Ordering data		Order No.
SITRANS P measuring cell for differential pressure and flow		7MF4995-
DS III, DS III PA and DS III FF series, PN 420 (MWP 6092 psi)		1
Rated measuring range		
250 mbar	(3.63 psi)	D
600 mbar	(8.70 psi)	E
1.6 bar	(23.2 psi)	F
5 bar	(72.5 psi)	G
30 bar	(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 M10		1
- Mounting thread $^{7}/_{16}$-20 UNF		3
• Vent on side of process connection		
- Mounting thread M10		5
- Mounting thread $^{7}/_{16}$-20 UNF		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).	
Process flange O-ring made of:	
(instead of FPM (Viton))	
• 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 10 204-3.1B	C12
Stainless steel process flanges for vertical differential pressure lines (not together with K01, K02 and K03)	H03
Without process flange	K00

1) Only together with nominal measuring range 250 mbar, 1.6 bar, 5 bar and 30 bar (3.63 psi, 23.2 psi, 72.5 psi and 435 psi) and process flange screws made of stainless steel.

Ordering data		Order No.
SITRANS P measuring cell flow		7MF4996-
DS III, DS III PA and DS III FF series		1
Rated measuring range		
250 mbar	(3.63 psi)	D
600 mbar	(8.70 psi)	E
1.6 bar	(23.2 psi)	F
5 bar	(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		
• With mounting thread M10		0
• With mounting thread $^{7}/_{16}$-20 UNF		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).	
Process flange O-ring made of:	
(instead of FPM (Viton))	
• 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 10 204-3.1B	C12
Without process flange	K00

12.3 Ordering data for accessories

Ordering data	Order Code
Operating Instructions	
For DS III SITRANS P, DS III FF series	
• German (planned)	A5E00279629
• English	A5E00279627
• French (planned)	A5E00279630
• Spanish (planned)	A5E00279631
• Italian (planned)	A5E00279632
Brief introductions (Leporello)	
For SITRANS P, DS III FF series	A5E00282355
CD with documentation	
For SITRANS P, DS III, DS III PA, DS III FF, MK II, MPS and Z • German, English, French, Spanish, Italian	A5E00090345
Note: You can download the above-mentioned Operating Instructions free-of-charge from the Internet site www.siemens.com/fieldinstrumentation	

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/	Catalog, ST 70 Components for Totally Integrated Automation	Siemens AG	E86060-K4670-A111-A7-7600
/2/	Catalog, ST 80 **Human Machine Interface Products/Systems**	Siemens AG	E86060-K4680-A101-A9-7600
/3/	FIELDBUS ONLINE **Information about FOUNDATION™** Fieldbus	Fieldbus Foundation	www.fieldbus.org

15.2 Summary of error messages and status codes

Display	Meaning
F_001	Key and function disable
F_004	Decimal point unfavorable
F_007	Measuring range limited
F_008	Local operation disabled
G_001, G_004	unreported block alarm
G_002, G_005	Lower or upper alarm limit reached
G_003, G_006	Lower or upper alarm limit reached
Gc001 Gc008	Initialized value of BKCAL_IN (cascade) Initiates fault state (cascade)
B_001	Configuration error
B_003	Value not calculated or device error
B_004	Sensor error (brake)
B_006	Value is not communicated
B_007	Out of Service
U_002	Substitute value
U_004	Lower overrange limit exceeded (<20 %) Upper overrange limit exceeded (>120 %) Inexact value

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).

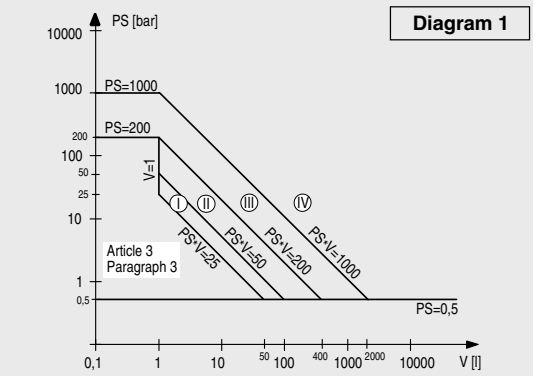
Siemens has carried out a conformity rating, assigned a CE symbol, and issued a declaration of conformity for its products (providing the equipment is not within the context of Article 3 Paragraph 3).

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.

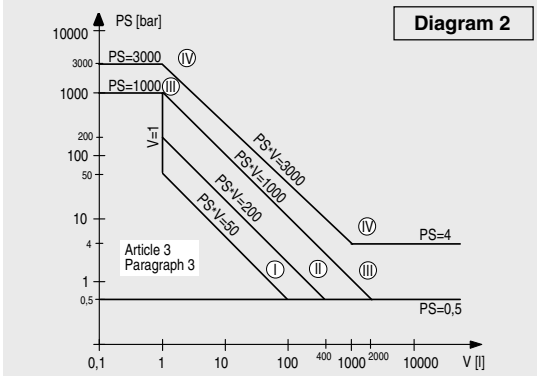
Notes:

- 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.

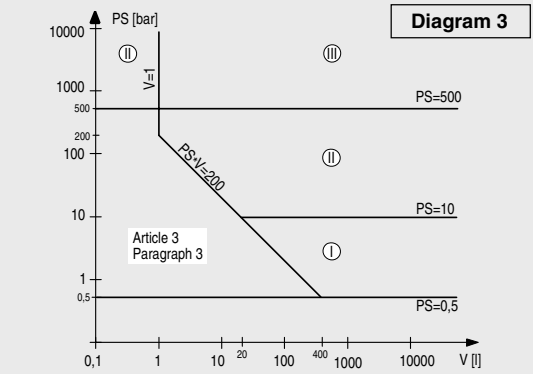
Diagrams



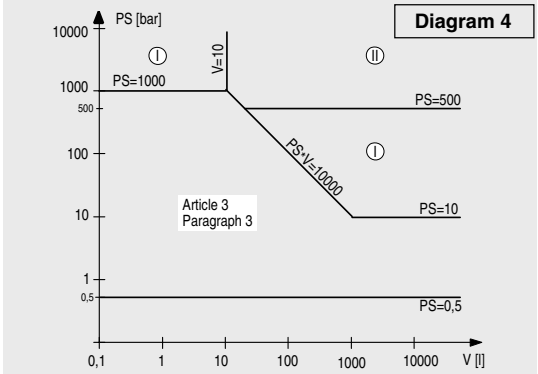
- Gases of fluid group 1
- Vessels according to Article 3 Number 1.1 Letter a) First dash
- Exception: unstable gases belonging to Categories I and II must be included in Category III.



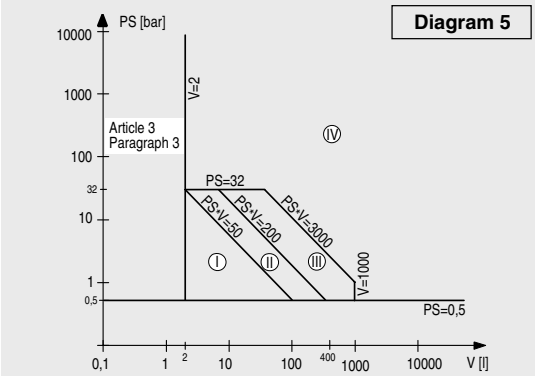
- Gases of fluid group 2
- Vessels according to Article 3 Number 1.1 Letter a) Second dash
- Exception: fire extinguishers and bottles for breathing apparatus: at least Category III.



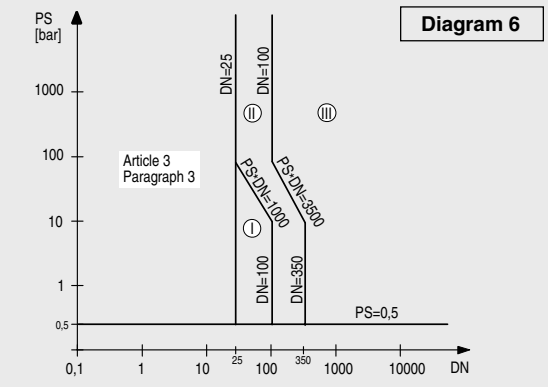
- Liquids of fluid group 1
- Vessels according to Article 3 Number 1.1 Letter b) First dash



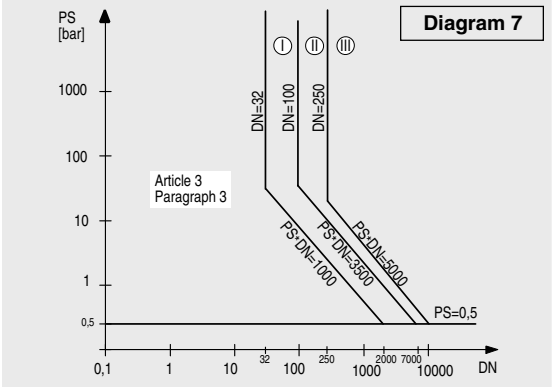
- Liquids of fluid group 2
- Vessels according to Article 3 Number 1.1 Letter b) Second dash
- Exception: modules for producing warm water



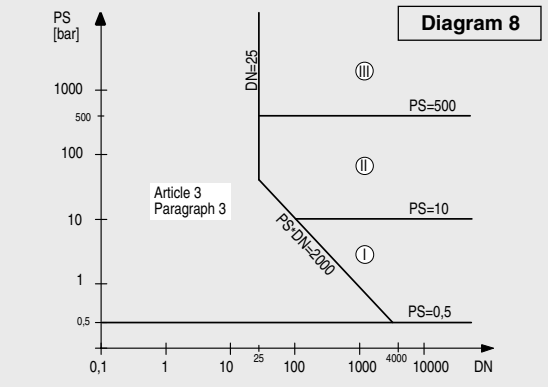
- Fuelled pressure equipment or equipment heated in another manner above 110 °C and liable to overheating.
- Vessel according to Article 3 Number 1.2
- Exception: pressure cooker, test procedure at least according to Category III.



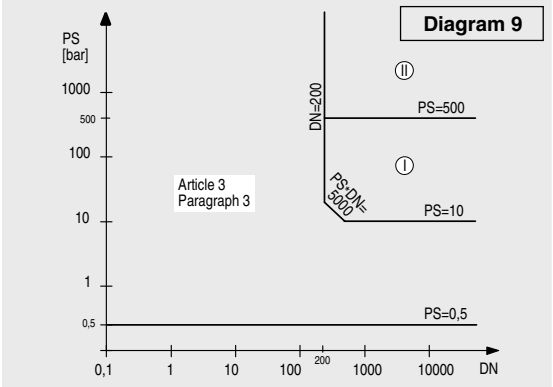
- Gases of fluid group 1
- Pipelines according to Article 3 Number 1.3 Letter a) First dash
- Exception: unstable gases belonging to Categories I and II must be included in Category III.



- 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

1P A5E00279627

Siemens AG

Bereich Automation and Drives
Geschaeftsgebiet Process Instrumentation and Analytics
D-76181 Karlsruhe

www.siemens.com/processinstrumentation

A5E00279627-01