SIEMENS

SITRANS

Pressure transmitter
SITRANS P DS III/P410 with FOUNDATION Fieldbus FF

Operating Instructions

Edition 12/2015

Answers for industry.

SIEMENS

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Pressure transmitter SITRANS P DS III/P410 with FOUNDATION™ Fieldbus FF

Operating Instructions

7MF4.35

12/2015
A5E00279627-02

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction 1

1.1 Purpose of this documentation

These instructions contain all information required to commission and use the device. Read the instructions carefully prior to installation and commissioning. In order to use the device correctly, first review its principle of operation.

The instructions are aimed at persons mechanically installing the device, connecting it electronically, configuring the parameters and commissioning it, as well as service and maintenance engineers.

1.2 Product information

The programming manual is an integral part of the CD, which is either supplied or can be ordered. The programming manual is also available on the Siemens homepage.

On the CD, you will also find the catalog extract with the ordering data, the Software Device Install for SIMATIC PDM for additional installation, and the required software.

See also

Process instrumentation catalog (http://www.siemens.com/processinstrumentation/catalogs)

Product information on SITRANS P in the Internet (http://www.siemens.com/sitransp)

1.3 History

This history establishes the correlation between the current documentation and the valid firmware of the device.

The documentation of this edition applies to the following firmware:

Edition	Firmware ID (FW) on the nameplate	System integration
12/2015	FW: FF11.01.02	Standard fieldbus-compatible control systems

The most important changes in the documentation as compared to the respective previous edition are given in the following table.

Edition	Note
07/2005	First edition
10/2014	Adjusted structure, content and layout to the standard Siemens guidelines
12/2015	Adaptation to current device version

1.4 Scope of the instructions

Table 1- 1 "7MF4.35.." stands for:

Order number	SITRANS P DS III for
7MF4035..	Gauge pressure
7MF4135..	Gauge pressure, flush mounted diaphragm
7MF4235..	Absolute pressure from the gauge pressure series
7MF4335..	Absolute pressure from the differential pressure series
7MF4435..	Differential pressure and flow rate, PN 32/160 (MAWP 464/2320 psi)
7MF4535..	Differential pressure and flow rate, PN 420 (MAWP 6092 psi)
7MF4635..	Level

1.5 Checking the consignment

1. Check the packaging and the delivered items for visible damage.
2. Report any claims for damages immediately to the shipping company.
3. Retain damaged parts for clarification.
4. Check the scope of delivery by comparing your order to the shipping documents for correctness and completeness.

⚠ WARNING

Using a damaged or incomplete device

Danger of explosion in hazardous areas.

- Do not use damaged or incomplete devices.

See also

Return procedure (Page 188)

1.6 Transportation and storage

To guarantee sufficient protection during transport and storage, observe the following:

- Keep the original packaging for subsequent transportation.
- Devices/replacement parts should be returned in their original packaging.
- If the original packaging is no longer available, ensure that all shipments are properly packaged to provide sufficient protection during transport. Siemens cannot assume liability for any costs associated with transportation damages.

⚠ CAUTION

Insufficient protection during storage

The packaging only provides limited protection against moisture and infiltration.

- Provide additional packaging as necessary.

Special conditions for storage and transportation of the device are listed in "Technical data" (Page 193).

1.7 Notes on warranty

The contents of this manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. The sales contract contains all obligations on the part of Siemens as well as the complete and solely applicable warranty conditions. Any statements regarding device versions described in the manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of publishing. Siemens reserves the right to make technical changes in the course of further development.

Safety instructions

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2.1 Precondition for use

This device left the factory in good working condition. In order to maintain this status and to ensure safe operation of the device, observe these instructions and all the specifications relevant to safety.

Observe the information and symbols on the device. Do not remove any information or symbols from the device. Always keep the information and symbols in a completely legible state.

Symbol	Explanation
	Consult operating instructions

2.1.1 Laws and directives

Observe the test certification, provisions and laws applicable in your country during connection, assembly and operation. These include, for example:

- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)

Further provisions for hazardous area applications are for example:

- IEC 60079-14 (international)
- EN 60079-14 (EC)

2.1.2 Conformity with European directives

The CE mark on the device is a sign of conformity with the following European directives:

Electromagnetic Compatibility EMC 2004/108/EC	Directive of the European Parliament and of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.
Atmosphère explosible ATEX 94/9/EC	Directive of the European Parliament and the Council on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.
Pressure Equipment Directive PED 97/23/EC	Directive of the European Parliament and of the Council on the approximation of the laws of the Member States concerning pressure equipment.

The standards applied can be found in the EC declaration of conformity for the device.

⚠ WARNING

Improper device modifications

Danger to personnel, system and environment can result from modifications to the device, particularly in hazardous areas.

- Only carry out modifications that are described in the instructions for the device. Failure to observe this requirement cancels the manufacturer's warranty and the product approvals.

2.2 Requirements for special applications

Due to the large number of possible applications, each detail of the described device versions for each possible scenario during commissioning, operation, maintenance or operation in systems cannot be considered in the instructions. If you need additional information not covered by these instructions, contact your local Siemens office or company representative.

Note

Operation under special ambient conditions

We highly recommend that you contact your Siemens representative or our application department before you operate the device under special ambient conditions as can be encountered in nuclear power plants or when the device is used for research and development purposes.

2.3 Use in hazardous areas

Qualified personnel for hazardous area applications

Persons who install, connect, commission, operate, and service the device in a hazardous area must have the following specific qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures, aggressive, and hazardous media.
- They are authorized, trained, or instructed in carrying out work on electrical circuits for hazardous systems.
- They are trained or instructed in maintenance and use of appropriate safety equipment according to the pertinent safety regulations.

WARNING

Unsuitable device for the hazardous area

Danger of explosion.

- Only use equipment that is approved for use in the intended hazardous area and labelled accordingly.

See also

Technical data (Page 193)

WARNING

Loss of safety of device with type of protection "Intrinsic safety Ex i"

If the device has already been operated in non-intrinsically safe circuits or the electrical specifications have not been observed, the safety of the device is no longer ensured for use in hazardous areas. There is a danger of explosion.

- Connect the device with type of protection "Intrinsic safety" solely to an intrinsically safe circuit.
- Observe the specifications for the electrical data on the certificate and/or in Chapter "Technical data (Page 193)".

WARNING

Use of incorrect device parts in potentially explosive environments

Devices and their associated device parts are either approved for different types of protection or they do not have explosion protection. There is a danger of explosion if device parts (such as covers) are used for devices with explosion protection that are not expressly suited for this type of protection. If you do not adhere to these guidelines, the test certificates and the manufacturer warranty will become null and void.

- Use only device parts that have been approved for the respective type of protection in the potentially explosive environment. Covers that are not suited for the "explosion-proof" type of protection are identified as such by a notice label attached to the inside of the cover with "Not Ex d Not SIL".
- Do not swap device parts unless the manufacturer specifically ensures compatibility of these parts.

⚠ WARNING

Risk of explosion due to electrostatic charge

To prevent the build-up of an electrostatic charge in a hazardous area, the key cover must be closed during operation and the screws tightened.

The key cover may be opened temporarily at any time for the purposes of operating the pressure transmitter, even during plant operation; the screws should then be tightened again.

NOTICE

Electrostatic-sensitive devices

The device contains electrostatic-sensitive devices (ESD). ESD can be destroyed by voltages far too low to be detected by humans. These voltages can occur if you simply touch a component part or the electrical connections of a module without being electrostatically discharged. The damage to a module caused by overvoltage cannot normally be detected immediately; it only becomes apparent after a longer period of operating time has elapsed.

Protective measures against the discharge of static electricity:

- Make sure that no power is applied.
- Before working with modules, make sure that you discharge static from your body, for example by touching a grounded object.
- Devices and tools used must be free of static charge.
- Hold modules only by their edges.
- Do not touch connector pins or conductor tracks on a module with the ESD notice.

Description

3

3.1 System configuration

Overview

The pressure transmitter can be used in a number of system configurations.

Use with the SIMATIC PCS 7 automation system is described below.

System communication

The operator station of the SIMATIC PCS 7 process control system allows easy and safe control of the process by the operating personnel.

The maintenance station assists the maintenance engineer in guaranteeing high plant availability, securing this long-term using optimization measures, and implementing the maintenance measures using a minimum of personnel, materials, energy, expenses, etc.

The field devices are integrated via FOUNDATION™ Fieldbus with:

- FF Link for the gateway from FOUNDATION™ Fieldbus to PROFIBUS DP
- Control system, e.g. SIMATIC PCS 7 Automation System, which communicates over PROFIBUS
- Engineering station, SIMATIC PDM (Process Device Manager), which communicates over Industrial Ethernet

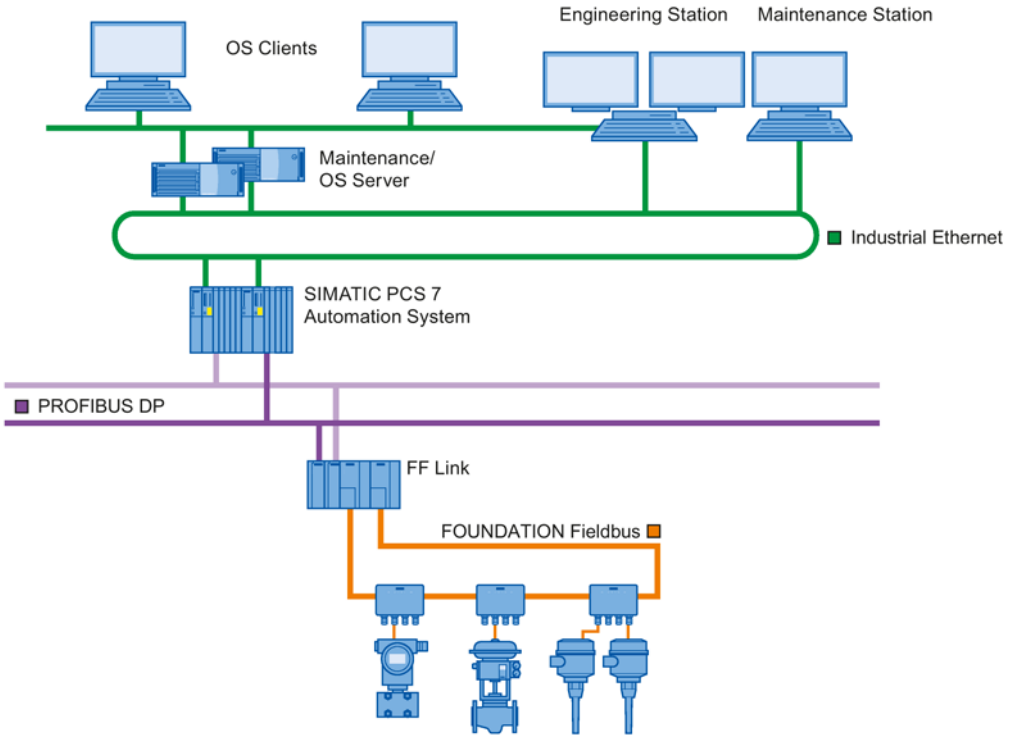


Image 3-1 Possible system configuration

3.2 Application

Overview

Depending on the variant, the pressure transmitter measures corrosive, non-corrosive and hazardous gases, vapors and liquids.

Depending on the device version, you can use the pressure transmitter for the following types of measurement:

- Gauge pressure
- Absolute pressure
- Differential pressure

With appropriate parameter settings and the necessary add-on parts (e.g. flow limiters and remote seals), the pressure transmitter can also be used for the following measurements:

- Level
- Volume
- Mass
- Volume flow
- Mass flow

The output signal is a process-based, digital FOUNDATION™ Fieldbus FF-signal.

You can install the "intrinsically-safe" or "flameproof enclosure" version of the pressure transmitter in hazardous areas. The devices have an EC-Type Examination Certificate, and comply with the corresponding harmonized European directives of the CENELEC.

The pressure transmitter is available with various designs of the remote seal for special applications. A special application, for example, is the measurement of highly viscous materials.

Gauge pressure

This version measures the gauge pressure of corrosive, non-corrosive and toxic gases, vapors and liquids.

The smallest nominal measuring range is 0.01 bar g/1kPa g/14.5 psi g, the largest is 700 bar g/70 MPa g/10153 psi g.

Absolute pressure

This version measures the absolute pressure of corrosive, non-corrosive and toxic gases, vapors and liquids.

There are two series: A "Differential pressure" series and a "Gauge pressure" series. The "Differential pressure" series features a high overload capacity.

The smallest nominal measuring range of the "Differential pressure" series is 8.3 mbar a/0.83kPa/3.63 psi a, the largest is 100 bar a/10 MPa a/1450 psi a.

The smallest nominal measuring range of the "Gauge pressure" series is 8.3 mbar a/0.83kPa/3.63 psi a, the largest is 30 bar a/3 MPa/435 psi a.

Differential pressure and flow rate

This version measures corrosive, non-corrosive and toxic gases, vapors and liquids. You can use it for the following types of measurement:

- Differential pressure
- Gauge pressure, suitable for small positive or negative pressure value
- In combination with a primary element: flow rate q ~ $\sqrt{\Delta p}$

The smallest nominal measuring range is 20 mbar (8.03 inH_2O), the largest is 30 bar (435 psi).

Level

This version with mounting flange measures the level of non-corrosive, corrosive and toxic liquids in open and closed containers. The smallest nominal measuring range is 250 mbar (3.63 psi), the largest is 5 bar (72.5 psi). The nominal diameter of the mounting flange is DN 80 or DN 100, or 3" or 4".

For the level measurement on open containers, the low-pressure side of the measuring cell remains open. This measurement is referred to as "Measurement against atmospheric pressure". For the measurement on closed containers, the low-pressure side is usually connected to the container. This balances out the static pressure.

The parts wetted by the medium are made of various materials according to the corrosion resistance required.

3.3 SITRANS P DS III and SITRANS P410

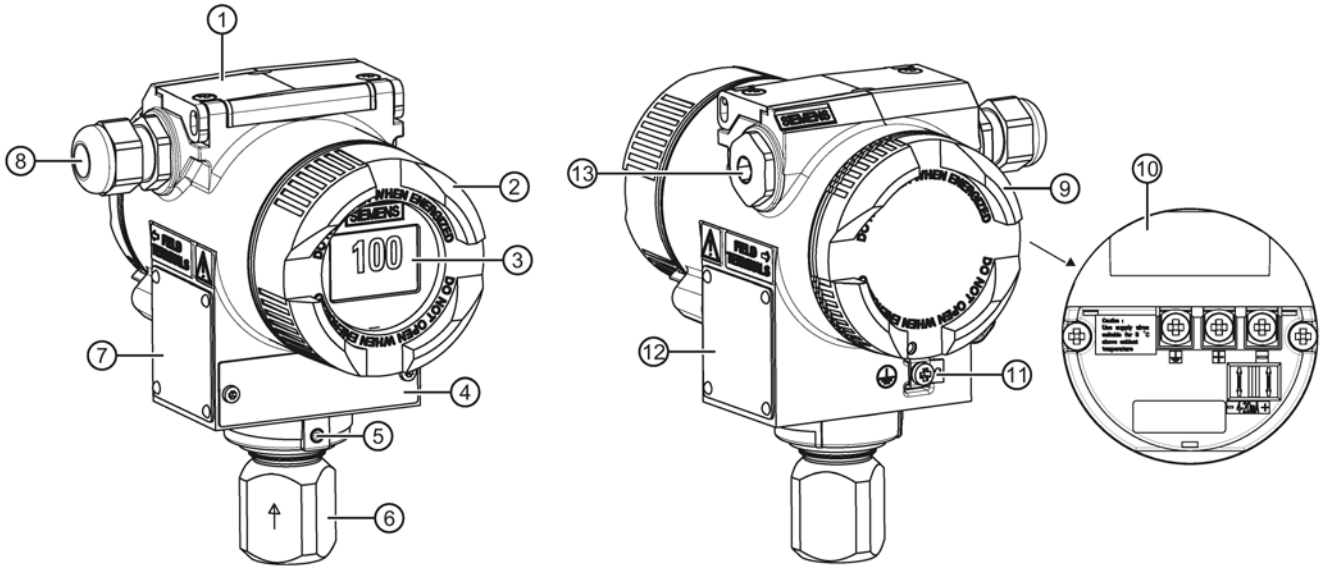
SITRANS P DS III and SITRANS P410

These instructions describe the pressure transmitters SITRANS P DS III and SITRANS P410. The main difference of the SITRANS P410 is the higher measuring precision compared to the SITRANS P DS III. Refer to the information in the section Technical data (Page 193).

You order SITRANS P410 using the order option C41 for specific device versions.

3.4 Structure

Depending on a customer-specific order, the device comprises different parts.



①	Key cover	⑧	Cable inlet, optionally with cable gland
②	Cover (front), optionally with inspection window	⑨	Cover (rear) for electrical terminal compartment
③	Display (optional)	⑩	Electrical terminal compartment
④	Measuring point label	⑪	Protective conductor connector/equipotential bonding terminal
⑤	Retaining screw; twist proofing of the measuring cell in relation to the electronics enclosure	⑫	Nameplate (approval information)
⑥	Process connection	⑬	Blanking plug
⑦	Nameplate (general information)		

Image 3-2 View of the pressure transmitter: Left: Front right: Rear view

- The electronics enclosure is made of die cast aluminum or precision cast stainless steel.
- The housing has a removable circular cover at the front and the back.
- Depending on the device version, the front cover ② may be designed as an inspection window. You can read the measured values straight off the digital display through this inspection window.
- The cable inlet ⑧ to the electrical terminal compartment is at the side; either the left or right-hand one can be used. The unused opening is closed with a blanking plug ⑬.
- The protective conductor terminal/equipotential bonding terminal ⑪ is located at the back of the enclosure.
- The electrical terminal compartment ⑩ for the auxiliary power and shield is accessible when you remove the back cover ⑨.

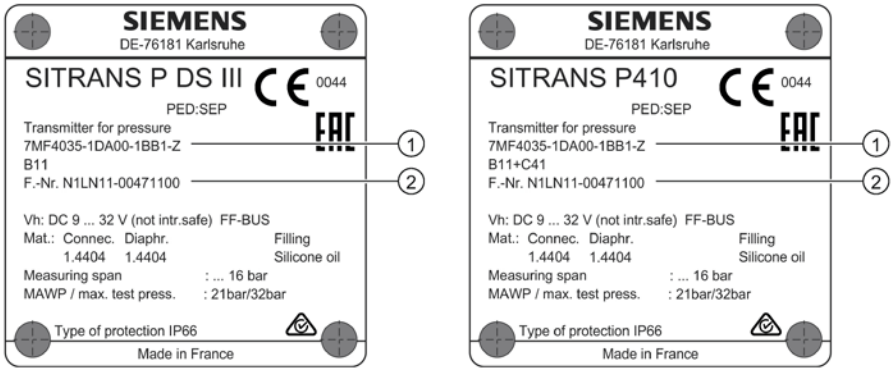
- The measuring cell with a process connection ⑥ is located in the lower section of the enclosure. This measuring cell is secured against twisting by a retaining screw ⑤. Thanks to the modular design of the pressure transmitter, the measuring cell and application electronics or connection board can be replaced if required.
- On the upper face of the enclosure you can see crosshead screws which secure the key cover ①, under which there are 3 keys for local operation.

3.5 Layout of the nameplate

Layout of nameplate with general information

The label which bears the order number and other important information such as design details or technical specifications is present on the side of the housing.

The following shows an example for SITRANS P DS III and SITRANS P410.

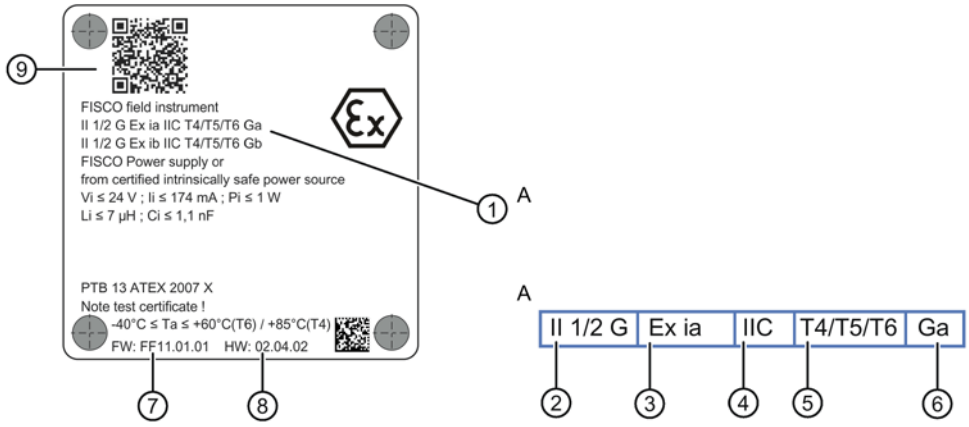


① Order number (machine-readable product code) ② Serial number

Layout of nameplate with approval information

The nameplate with approval information is on the opposite side. This nameplate shows the firmware and hardware versions, for example. You must also observe the information in the relevant certificate for a transmitter version for use in hazardous areas.

The following shows an example for SITRANS P DS III and SITRANS P410.



①	Characteristics of the hazardous area	⑤	Maximum surface temperature (temperature class)
②	Category for operating area	⑥	Device protection level
③	Type of protection	⑦	Firmware ID
④	Group (gas, dust)	⑧	Hardware identifier
A	More detailed information on the characteristics ①	⑨	QR code to the mobile website with device-specific information on the product

3.6 Measuring point label layout

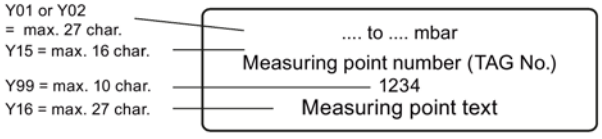


Image 3-3 Example of measuring point label

3.7 How it works

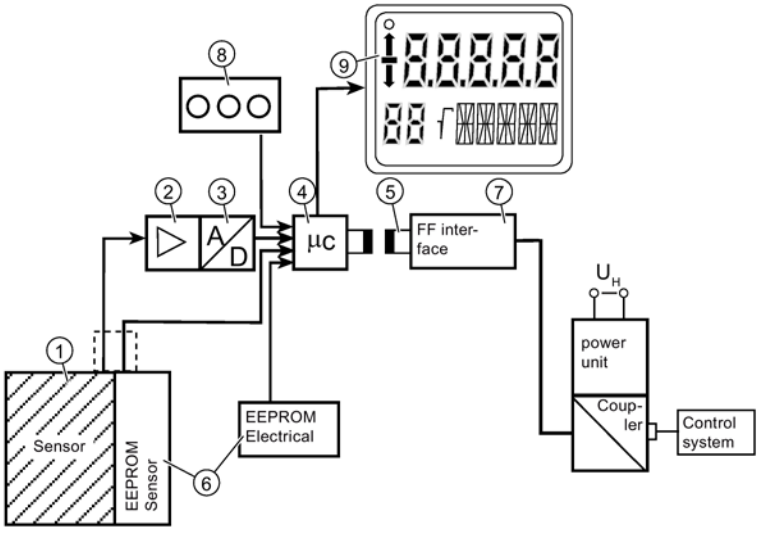
3.7.1 Overview of mode of operation

This chapter describes how the pressure transmitter works.

First the electronics are described, and then the physical principle of the sensors which are used with the various device versions for the individual measurement types.

3.7.2 Operation of the electronics

Description



① Measuring cell sensor
② Measuring amplifier
③ Analog-to-digital converter
④ Microcontroller
⑤ Electrical isolation
⑥ Each with an EEPROM in the measuring cell and in the application electronics
⑦ FIELDBUS interface
⑧ Buttons (local operation)
⑨ Display
U_H Auxiliary power

Image 3-4 How the electronics with FIELDBUS communication work

Function

- The input pressure is converted into an electrical signal by the sensor ①.
- This signal is amplified by the measuring amplifier ② and digitized in an analog-to-digital converter ③.

- The digital signal is analyzed in a microcontroller ④ and corrected with regard to linearity and thermal characteristics.
- Thereafter, the digital signal is made available via the isolated interface ⑤ on the FOUNDATION™ Fieldbus ⑦.
- The measuring cell-specific data, electronics data and parameter assignment data are saved in two EEPROMs ⑥. The first memory is linked to the measuring cell, the second to the electronics.

Operation

- The buttons ⑧ can be used to call up individual functions, so-called modes.
- If you have a device with a display ⑨, you can view the measurement results, error messages and the operating modes.
- The basic mode settings can be changed with a computer through the data transmission of the fieldbus ⑦ via PDM.

3.7.3 How the measuring cell works

⚠ WARNING

Destruction of the seal diaphragm

Danger of injury or damage to device

If the seal membrane is destroyed, the sensor may also be destroyed. If the seal membrane is destroyed, no reliable measured values can be output.

Hot, toxic and corrosive process media can be released.

- Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in Technical data (Page 193).
- Make sure that the device is suitable for the maximum operating pressure of your system. Refer to the information on the nameplate and/or in Technical data (Page 193).
- Define maintenance intervals for regular inspections in line with device use and empirical values. The maintenance intervals will vary from site to site depending on corrosion resistance.

In the following sections, the process variable to be measured is called general inlet pressure.

Overview

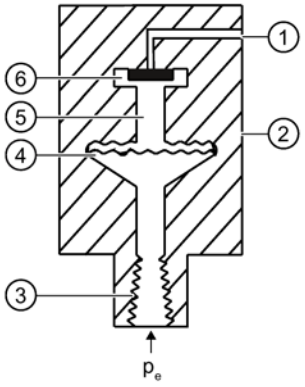
The following modes of operation are described:

- Gauge pressure
- Absolute pressure
- Differential pressure and flow rate
- Level

The following process connections are available, for example:

- G1/2 B, 1/2-14 NPT
- Male thread: M20
- Flange connection in accordance with EN 61518
- Flush-mounted process connections

3.7.3.1 Measuring cell for gauge pressure



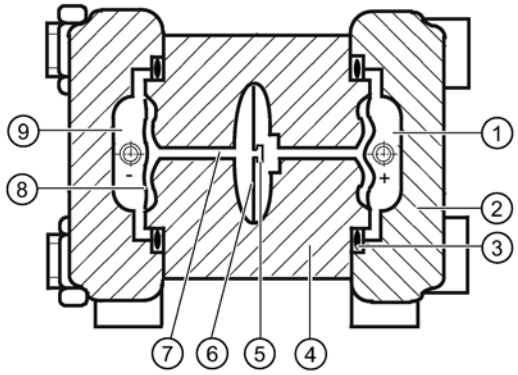
①	Reference pressure opening	⑤	Filling liquid
②	Measuring cell	⑥	Gauge pressure sensor
③	Process connection	p_e	Inlet pressure
④	Seal diaphragm		

Image 3-5 Function chart of measuring cell for gauge pressure

The inlet pressure (p_e) is transferred to the gauge pressure sensor ⑥ via the seal diaphragm ④ and the fill fluid ⑤, displacing its measuring diaphragm. The displacement changes the resistance of the four piezoresistors (bridge circuit) of the gauge pressure sensor. The change in the resistance causes a bridge output voltage proportional to the inlet pressure.

Pressure transmitters with measuring span ≤ 63 bar measure the inlet pressure against atmosphere, those with measuring spans ≥ 160 bar the inlet pressure against vacuum.

3.7.3.2 Measuring cell for differential pressure and flow rate

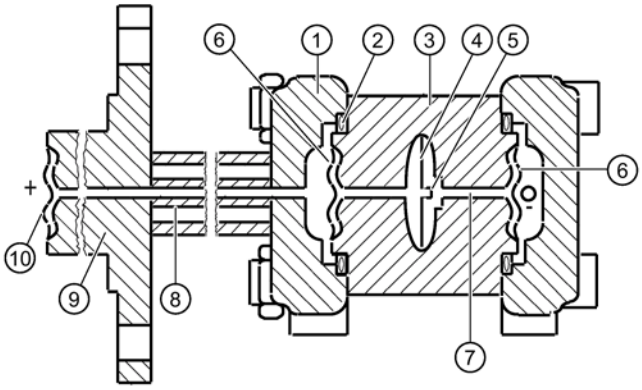


①	Inlet pressure P_+	⑥	Overload diaphragm
②	Pressure cap	⑦	Filling liquid
③	O-ring	⑧	Seal diaphragm
④	Measuring cell body	⑨	Inlet pressure P_-
⑤	Differential pressure sensor		

Image 3-6 Function chart of the measuring cell for differential pressure and flow rate

- Differential pressure is transmitted to the differential pressure sensor ⑤ through the seal diaphragms ⑧ and the filling liquid ⑦.
- When measuring limits are exceeded, the seal diaphragm ⑧ is displaced until the seal diaphragm rests on the measuring cell body ④. The differential pressure sensor ⑤ is thus protected against overloading since no further deflection of the overload diaphragm ⑥ is possible.
- The seal diaphragm ⑧ is displaced by the differential pressure. The displacement changes the resistance of the four piezoresistors (bridge circuit) of the differential pressure sensor.
- The change in the resistance causes a bridge output voltage proportional to the differential pressure.

3.7.3.3 Measuring cell for level

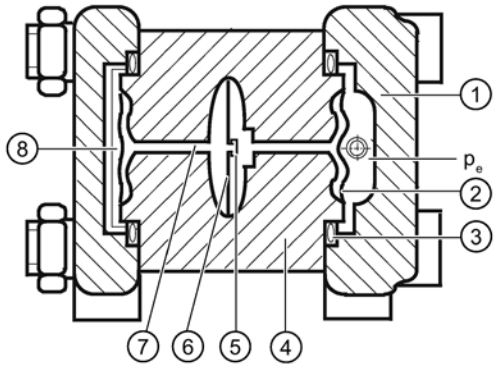


①	Pressure cap	⑥	Seal diaphragm on the measuring cell
②	O-ring	⑦	Filling liquid of the measuring cell
③	Measuring cell body	⑧	Capillary tube with the fill fluid of the mounting flange
④	Overload diaphragm	⑨	Flange with a tube
⑤	Differential pressure sensor	⑩	Seal diaphragm on the mounting flange

Image 3-7 Function chart of the measuring cell for level

- The inlet pressure (hydrostatic pressure) works hydraulically on the measuring cell through the seal diaphragm ⑩ on the mounting flange ⑩.
- Differential pressure at the measuring cell is transmitted to the differential pressure sensor ⑤ through the seal diaphragms ⑥ and the filling liquid ⑦.
- When measuring limits are exceeded, the overload diaphragm ④ is displaced until one of the seal diaphragms ⑥ or ⑩ rests on the measuring cell body ③. The seal diaphragms ⑥ thus protect the differential pressure sensor ⑤ from overload.
- The seal diaphragm ⑥ is displaced by the differential pressure. The displacement changes the resistance of the four doped piezoresistors in the bridge circuit.
- The change in the resistance causes a bridge output voltage proportional to the differential pressure.

3.7.3.4 Measuring cell for absolute pressure from the differential pressure series

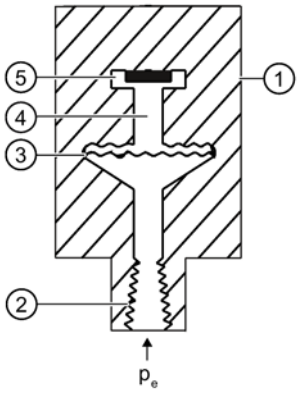


①	Pressure cap	⑥	Overload diaphragm
②	Seal diaphragm on the measuring cell	⑦	Measuring cell filling liquid
③	O-ring	⑧	Reference pressure
④	Measuring cell body	p_e	Pressure input variable
⑤	Absolute pressure sensor		

Image 3-8 Function chart of measuring cell for absolute pressure

- Absolute pressure is transmitted to the absolute pressure sensor ⑤ through the seal diaphragm ② and the filling liquid ⑦.
- When measuring limits are exceeded, the overload diaphragm ⑥ is displaced until the seal diaphragm ② rests on the measuring cell body ④. The seal diaphragm thus protects the absolute pressure sensor ⑤ from overload.
- The difference between the inlet pressure (p_e) and the reference pressure ⑧ on the negative side of the measuring cell displaces the seal diaphragm ②. The displacement changes the resistance of the four piezoresistors (bridge circuit) of the absolute pressure sensor.
- The change in the resistance causes a bridge output voltage proportional to the absolute pressure.

3.7.3.5 Measuring cell for absolute pressure from the gauge pressure series

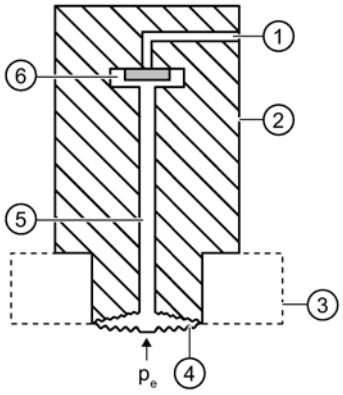


①	Measuring cell	④	Filling liquid
②	Process connection	⑤	Absolute pressure sensor
③	Seal diaphragm	P_e	Inlet pressure

Image 3-9 Function chart of measuring cell for absolute pressure

The inlet pressure (p_e) is transferred to the absolute pressure sensor ⑤ via the seal diaphragm ③ and the fill fluid ④, displacing its measuring diaphragm. The displacement changes the resistance of the four piezoresistors (bridge circuit) of the absolute pressure sensor. The change in the resistance causes a bridge output voltage proportional to the inlet pressure.

3.7.3.6 Measuring cell for gauge pressure, front-flush membrane



①	Reference pressure opening	⑤	Filling liquid
②	Measuring cell	⑥	Gauge pressure sensor
③	Process connection	p_e	Inlet pressure
④	Seal diaphragm		

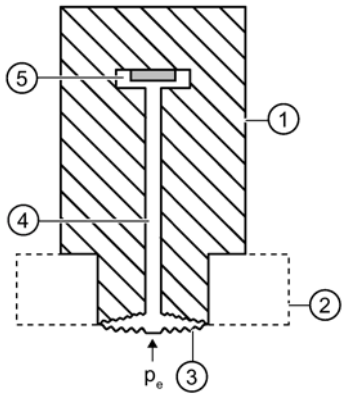
Image 3-10 Function chart of the measuring cell for gauge pressure, flush mounted diaphragm

The inlet pressure (p_e) is transferred to the gauge pressure sensor ⑥ via the seal diaphragm ④ and the filling liquid ⑤, displacing its measuring diaphragm. The displacement changes

the resistance of the four piezoresistors (bridge circuit) of the gauge pressure sensor. The change in the resistance causes a bridge output voltage proportional to the inlet pressure.

Pressure transmitters with measuring span ≤ 63 bar measure the inlet pressure against atmosphere, those with measuring spans ≥ 160 bar the inlet pressure against vacuum.

3.7.3.7 Measuring cell for absolute pressure, front-flush membrane



①	Measuring cell	④	Filling liquid
②	Process connection	⑤	Absolute pressure sensor
③	Seal diaphragm	p_e	Inlet pressure

Image 3-11 Function chart of the measuring cell for absolute pressure, flush mounted diaphragm

The inlet pressure (p_e) is transferred to the absolute pressure sensor ⑤ via the seal diaphragm ③ and the filling liquid ④, and displaces its measuring diaphragm. The displacement changes the resistance of the four piezoresistors (bridge circuit) of the absolute pressure sensor. The change in the resistance causes a bridge output voltage proportional to the inlet pressure.

3.8 Remote seal

Product description

- A remote seal measuring system comprises the following elements:
  - Remote seal
  - Transmission line, e.g. capillary line
  - Pressure transmitter.

  Note
  Malfunction of the remote seal measuring system

  If you separate the components of the remote seal measuring system, this results in malfunctioning of the system.

  Do not separate the components under any circumstances.

- The measuring system based on a hydraulic principle is used to transfer pressure.
- The capillary line and the remote seal diaphragm are the most sensitive components in the remote seal measuring system. The material thickness of the remote seal diaphragm is only ~ 0.1 mm.
- The smallest of leakages in the transmission system leads to the loss of transmission fluid.
- The loss of transmission fluid results in inaccuracies in the measurement and failure of the measuring system.
- In order to avoid leaks and measuring errors, please observe the installation and maintenance instructions in addition to the safety notes.

Installing/mounting

4

4.1 Basic safety instructions

⚠ WARNING

Wetted parts unsuitable for the process media

Danger of injury or damage to device.

Hot, toxic and corrosive media could be released if the process medium is unsuitable for the wetted parts.

- Ensure that the material of the device parts wetted by the process medium is suitable for the medium. Refer to the information in "Technical data" (Page 193).

⚠ WARNING

Incorrect material for the diaphragm in Zone 0

Danger of explosion in the hazardous area. If operated with intrinsically safe supply devices of category "ib" or devices of the flameproof enclosure version "Ex d" and simultaneous use in Zone 0, pressure transmitter explosion protection depends on the tightness of the diaphragm.

- Ensure that the material used for the diaphragm is suitable for the process medium. Refer to the information in the section "Technical data (Page 193)".

⚠ WARNING

Unsuitable connecting parts

Danger of injury or poisoning.

In case of improper mounting hot, toxic and corrosive process media could be released at the connections.

- Ensure that connecting parts (such as flange gaskets and bolts) are suitable for connection and process media.

Note

Material compatibility

Siemens can provide you with support concerning selection of sensor components wetted by process media. However, you are responsible for the selection of components. Siemens accepts no liability for faults or failures resulting from incompatible materials.

⚠ WARNING

Exceeded maximum permissible operating pressure

Danger of injury or poisoning.

The maximum permissible operating pressure depends on the device version. The device can be damaged if the operating pressure is exceeded. Hot, toxic and corrosive process media could be released.

- Make sure that the device is suitable for the maximum permissible operating pressure of your system. Refer to the information on the nameplate and/or in "Technical data (Page 193)".

⚠ WARNING

Exceeded maximum ambient or process media temperature

Danger of explosion in hazardous areas.

Device damage.

- Make sure that the maximum permissible ambient and process media temperatures of the device are not exceeded. Refer to the information in Chapter "Technical data (Page 193)".

⚠ WARNING

Open cable inlet or incorrect cable gland

Danger of explosion in hazardous areas.

- Close the cable inlets for the electrical connections. Only use cable glands or plugs which are approved for the relevant type of protection.

⚠ WARNING

Incorrect conduit system

Danger of explosion in hazardous areas as result of open cable inlet or incorrect conduit system.

- In the case of a conduit system, mount a spark barrier at a defined distance from the device input. Observe national regulations and the requirements stated in the relevant approvals.

See also

Technical data (Page 193)

WARNING

Incorrect mounting at Zone 0

Danger of explosion in hazardous areas.

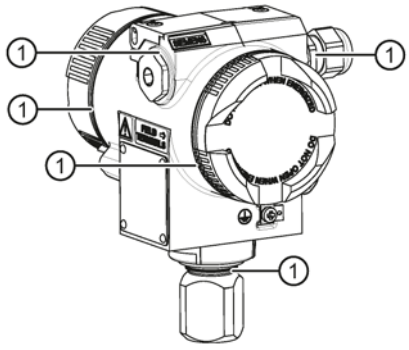
- Ensure sufficient tightness at the process connection.
- Observe the standard IEC/EN 60079-14.

WARNING

Danger with "flameproof enclosure" protection

Danger of explosion in hazardous areas. An explosion may be caused by hot gas escaping from the flameproof enclosure if there is too little space between it and the fixed parts.

- Ensure that there is a space of at least 40 mm between the flameproof joint and the fixed parts.



① Flameproof joint

WARNING

Loss of explosion protection

Danger of explosion in hazardous areas if the device is open or not properly closed.

- Close the device as described in Chapter "Technical data (Page 193)".

⚠ WARNING

Use of incorrect device parts in potentially explosive environments

Devices and their associated device parts are either approved for different types of protection or they do not have explosion protection. There is a danger of explosion if device parts (such as covers) are used for devices with explosion protection that are not expressly suited for this type of protection. If you do not adhere to these guidelines, the test certificates and the manufacturer warranty will become null and void.

- Use only device parts that have been approved for the respective type of protection in the potentially explosive environment. Covers that are not suited for the "explosion-proof" type of protection are identified as such by a notice label attached to the inside of the cover with "Not Ex d Not SIL".
- Do not swap device parts unless the manufacturer specifically ensures compatibility of these parts.

⚠ CAUTION

Hot surfaces resulting from hot process media

Danger of burns resulting from surface temperatures above 70 °C (155 °F).

- Take appropriate protective measures, for example contact protection.
- Make sure that protective measures do not cause the maximum permissible ambient temperature to be exceeded. Refer to the information in Chapter "Technical data (Page 193)".

⚠ CAUTION

External stresses and loads

Damage to device by severe external stresses and loads (e.g. thermal expansion or pipe tension). Process media can be released.

- Prevent severe external stresses and loads from acting on the device.

4.1.1 Installation location requirements

⚠ WARNING

Insufficient air supply

The device may overheat if there is an insufficient supply of air.

- Install the device so that there is sufficient air supply in the room.
- Observe the maximum permissible ambient temperature. Refer to the information in the section "Technical data (Page 193)".

⚠ CAUTION

Aggressive atmospheres

Damage to device through penetration of aggressive vapors.

- Ensure that the device is suitable for the application.

NOTICE

Direct sunlight

Increased measuring errors.

- Protect the device from direct sunlight.

Make sure that the maximum ambient temperature is not exceeded. Refer to the information in the section Technical data (Page 193).

4.1.2 Incorrect assembly

NOTICE

Incorrect assembly

The device can be damaged or destroyed or its functionality impaired through incorrect assembly.

- Make sure before installing the device that there is no visible damage.
- Check that the process connections are clean and the right seals and cable glands have been used.
- Assemble the device using suitable tools, observing the torques specified in the technical specifications.

CAUTION

Loss of degree of protection

Damage to device if the enclosure is open or not properly closed. The degree of protection specified on the nameplate or in Chapter "Technical data (Page 193)" is no longer guaranteed.

- Make sure that the device is securely closed.

See also

Connecting the device (Page 62)

4.2 Disassembly

WARNING

Incorrect disassembly

The following dangers may result through incorrect disassembly:

- Injury through electric shock

- Danger through emerging media when connected to the process

- Danger of explosion in hazardous area

In order to disassemble correctly, observe the following:

- Before starting work, make sure that you have switched off all physical variables such as pressure, temperature, electricity etc. or that they have a harmless value.
- If the device contains dangerous media, it must be emptied prior to disassembly. Make sure that no environmentally hazardous media are released.
- Secure the remaining connections so that no damage can result if the process is started unintentionally.

4.3 Installation (except level)

4.3.1 Installation mounting (except for level)

Requirements

Note

Compare the desired operating data with the data on the nameplate.

Please also refer to the information on the remote seal if this is fitted.

Note

Protect the pressure transmitter from:

- Direct heat radiation
- Rapid temperature fluctuations
- Heavy contamination
- Mechanical damage
- Direct sunlight

Note

The housing may only be opened for maintenance, local operation or to make electrical connections.

The installation location is to be as follows:

- Easily accessible
- As close as possible to the measuring point
- Vibration-free
- Within the permitted ambient temperature values

Installation configuration

The pressure transmitter may in principle be configured above or below the pressure tapping point. The recommended configuration depends on the medium.

Installation configuration for gases

Install the pressure transmitter above the pressure tapping point.

Lay the pressure tubing with a constant gradient to the pressure tapping point, so that any condensate produced can drain in the main line and thereby avoid corruption of the measured values.

Installation configuration for vapor and liquid

Install the pressure transmitter below the pressure tapping point.

Lay the pressure tubing with a constant gradient to the pressure tapping point so that any gas pockets can escape in the main line.

See also

Introduction to commissioning (Page 171)

4.3.2 Installation (except level)

Note

Damage to measuring cell

Pressure transmitter: To install the device, turn only on the key area above the process connection and not on the housing. Otherwise, the measuring cell may be damaged.

Procedure

Attach the pressure transmitter to the process connection with an appropriate tool. Otherwise, the measuring cell may be damaged.

4.3.3 Fastening

Fastening without the mounting bracket

You can fasten the pressure transmitter directly to the process connection.

Fastening with the mounting bracket

You can fasten the mounting bracket as follows:

- On a wall or a mounting frame using two screws
- On a vertical or horizontal mounting tube (Ø 50 to 60 mm) using a tube bracket

Fasten the pressure transmitter mounting bracket using the two screws provided.

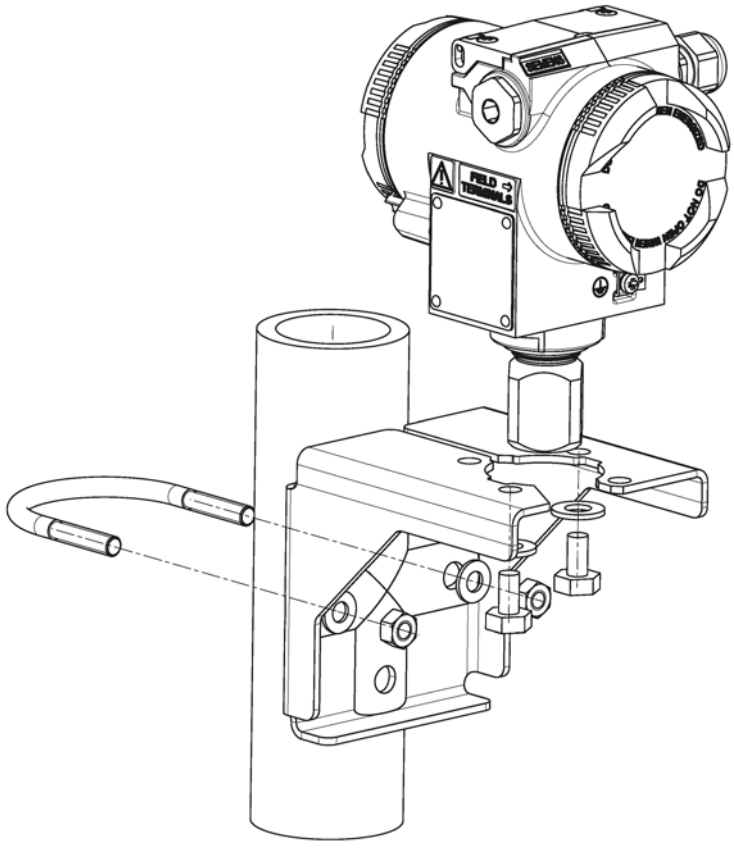


Image 4-1 Fastening the pressure transmitter on the mounting bracket

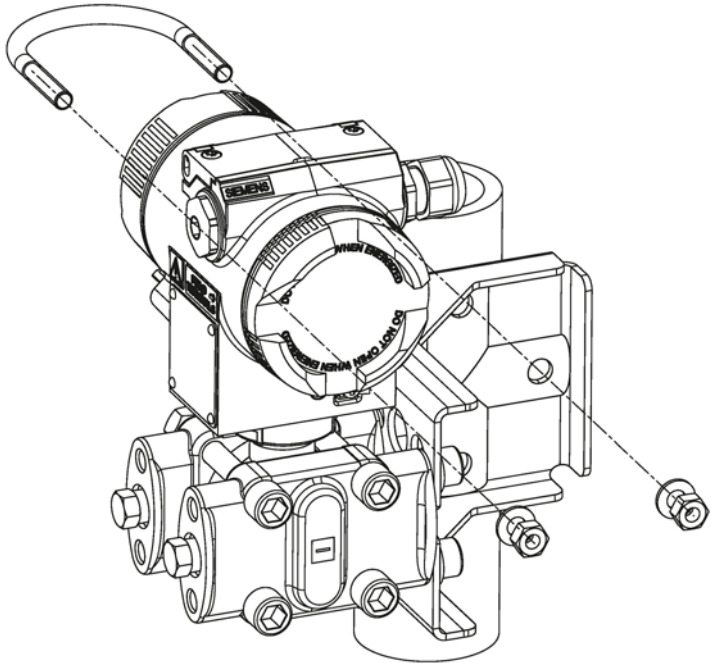


Image 4-2 An example of fastening the pressure transmitter on the mounting bracket in the case of differential pressure and horizontal differential pressure lines

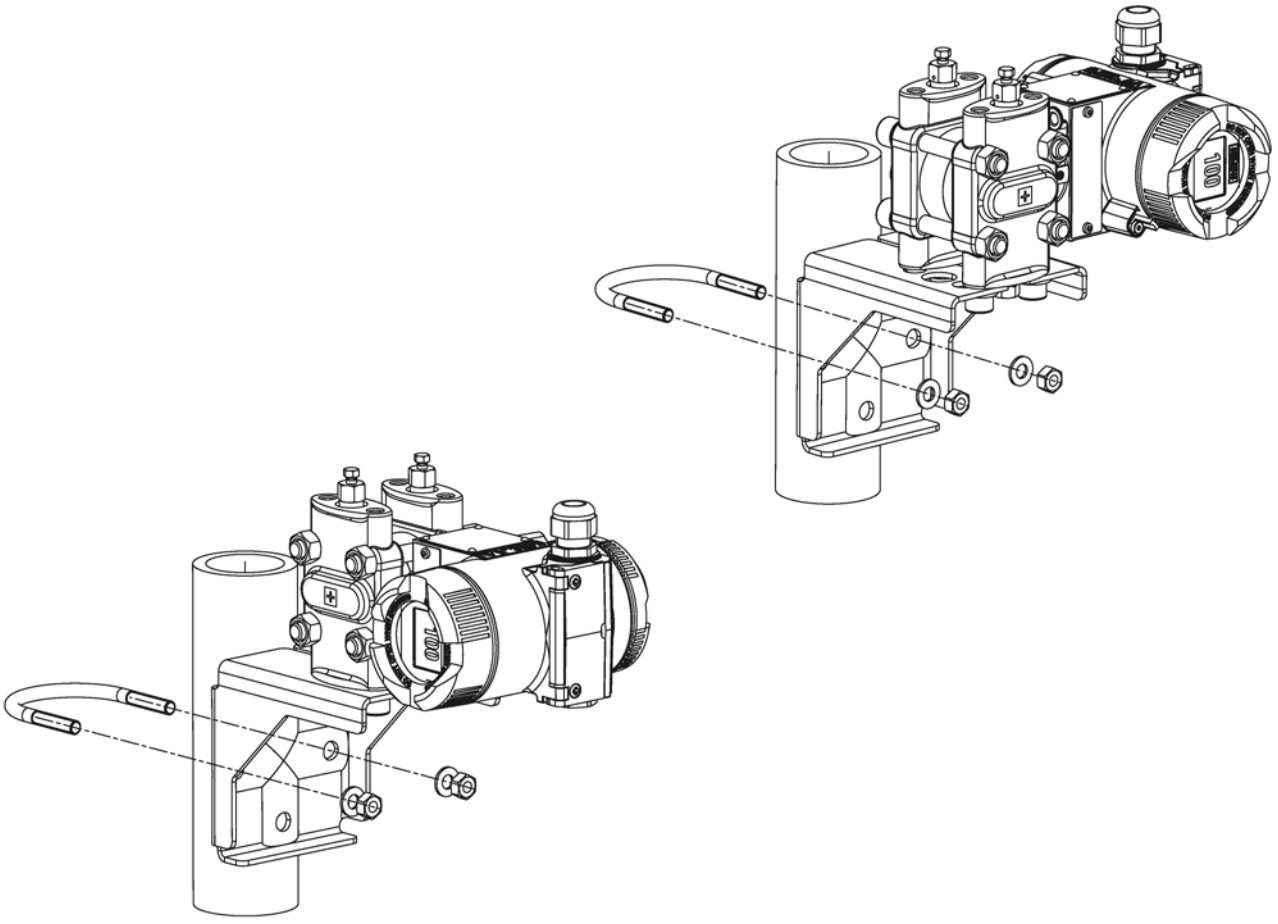


Image 4-3 An example of fastening on the mounting bracket in the case of differential pressure and vertical differential pressure lines

4.4 "Level" installation

4.4.1 Instructions for level installation

Requirements

Note

Compare the desired operating data with the data on the nameplate.

Please also refer to the information on the remote seal if this is fitted.

Note

Protect the pressure transmitter from:

- Direct thermal radiation
- Rapid temperature fluctuations
- Severe soiling
- Mechanical damage
- Direct sunlight

Note

Select the height of the mounting flange such that the pressure transmitter is always mounted below the lowest fill height to be measured.

The installation location is to be as follows:

- Easily accessible
- The measuring point must be as close as possible
- Vibration-free
- Within the permitted ambient temperature values

4.4.2 Installation for level

Note

Seals are required for the installation. The seals must be compatible with the medium to be measured.

Seals are not included in the delivery.

Procedure

To install the pressure transmitter for level, proceed as follows:

1. Attach the seal to the container's mating flange.

   Ensure that the seal is centrically positioned and that it does not restrict the movement of the flange's seal diaphragm in any way as otherwise the tightness of the process connection is not guaranteed.

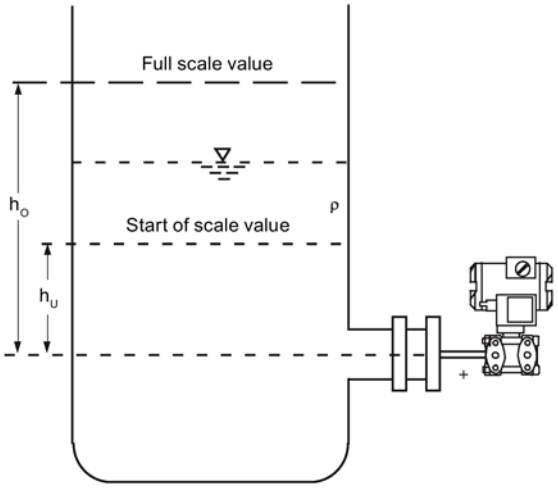
2. Screw on the pressure transmitter's flange.
3. Observe the installation position.

4.4.3 Connection of the negative pressure line

Assembly on an open container

A line is not required when taking measurements in an open container since the negative chamber is connected with the atmosphere.

Ensure that no dirt enters the open connection ports, for example by using connection screws with a 7MF4997-1CP bleed valve.



Measurement assembly on an open container

Formula:

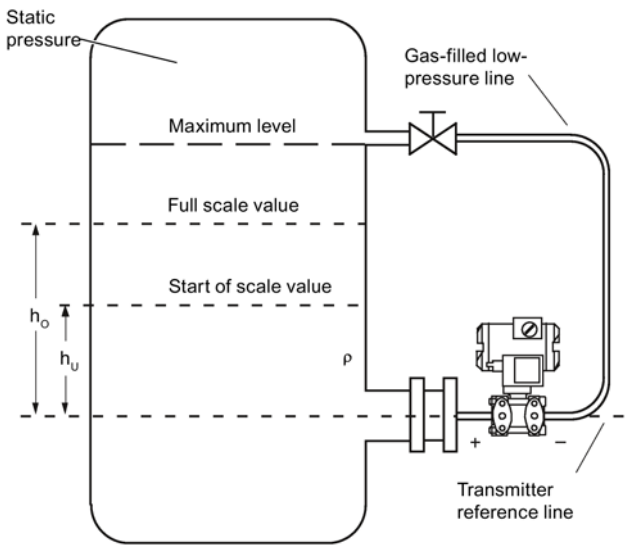
Start of scale value: $p_{MA} = \rho \cdot g \cdot h_U$

Full-scale value: $p_{ME} = \rho \cdot g \cdot h_O$

h_U	Lower filling level	Δp_{MA}	Start of scale value
h_O	Upper filling level	Δp_{ME}	Full-scale value
p	Pressure	ρ	Density of the measured medium in the container
		g	Acceleration due to gravity

Assembly on a closed container

When taking measurements in a closed container without or with little condensate formation, the negative pressure line is not filled. Lay the line in such a way that pockets of condensate do not form. Install a condensation container if required.



Measurement assembly on a closed container (no or little condensate separation)

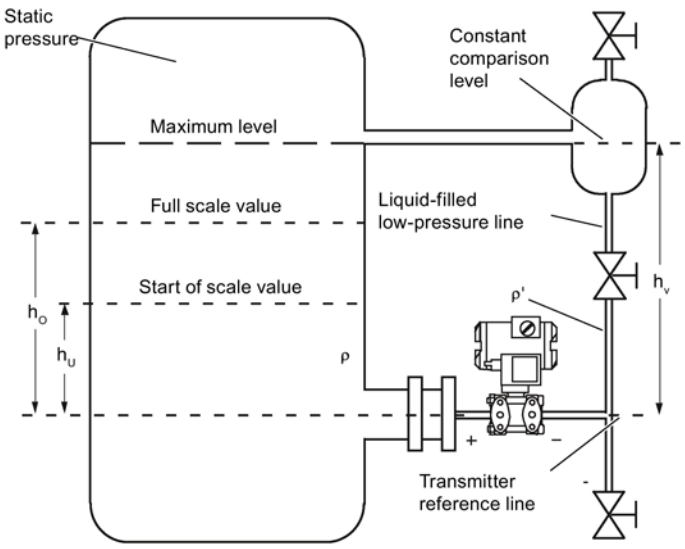
Formula:

Start-of-scale value: $\Delta p_{MA} = \rho \cdot g \cdot h_U$

Full-scale value: $\Delta p_{ME} = \rho \cdot g \cdot h_O$

h_U	Lower filling level	Δp_{MA}	Start of scale value
h_O	Upper filling level	Δp_{ME}	Full-scale value
p	Pressure	ρ	Density of the measured medium in the container
		g	Acceleration due to gravity

When taking measurements in a closed container with strong condensate formation, you must fill the negative pressure line (mostly with the condensate of the measured medium) and install a condensate pot. You can cut off the device using the dual pneumatic block 7MF9001-2.



Formula:

Start-of-scale value:
$\Delta p_{MA} = g \cdot (h_U \cdot \rho - h_V \cdot \rho')$

Full-scale value:
$\Delta p_{MA} = g \cdot (h_O \cdot \rho - h_V \cdot \rho')$

Measurement assembly on a closed container (strong condensate formation)

h_U	Lower filling level	Δp_{MA}	Start of scale value
h_O	Upper filling level	Δp_{ME}	Full-scale value
h_V	Gland distance	ρ	Density of the measured medium in the container
p	Pressure	ρ '	Density of fluid in the negative pressure line corresponds to the prevailing temperature there
		g	Acceleration due to gravity

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

Lay the line for the negative pressure using a seamless steel tube 12 mm x 1.5 mm.

4.5 "Remote seal" installation

4.5.1 Remote seal installation

General installation instructions

- Keep the measuring system in the factory packing until it is installed in order to protect it from mechanical damage.
- When removing from the factory packing and installing: ensure that damage to and mechanical deformations in the membrane are prevented.
- Never loosen the sealed filling screws on the remote seal and the measuring instrument.
- Do not cause damage to the remote separating membrane; scratches on the remote separating membrane, e.g. due to sharp-edged objects, are the main starting points for corrosion.
- Select suitable gaskets for sealing.
- Use a gasket having an adequately large inner diameter for flanging. Insert the gasket concentrically; contact with the membrane leads to deviations in measurements.
- When using gaskets made of soft materials or PTFE: follow the guidelines of the gasket manufacturer, especially regarding the tightening torque and setting cycles.
- At the time of installation, use suitable fastening components such as screws and nuts that are compliant with fitting and flange standards.
- Excessive tightening of screwed joints on the process connection may displace the zero point on the pressure transmitter.

Note

Commissioning

If a shut-off valve exists, open the shut-off valve slowly when commissioning in order to avoid pressure surges.

Note

Permissible ambient and operating temperatures

Install the pressure measuring device such that the permissible limits of ambient and measured medium temperatures are not overshot or undershot even with the consideration of the effect of convection and heat radiation.

- Note the effect of temperature on the measuring accuracy.
- When selecting the remote seals, ensure that fittings and flange components have adequate pressure-temperature resistance by selecting suitable materials and pressure ratings. The pressure rating specified on the remote seal applies to reference conditions according to IEC 60770.
- For the maximum permissible pressure at higher temperatures, please refer to the standard specified on the remote seal.

Using remote seals with pressure measuring device for hazardous areas:

- When using remote seals with pressure measuring device for hazardous areas, the permissible limits of ambient temperatures for the pressure transmitter must not be exceeded. Hot surfaces on the cooling section (capillaries or cooling elements) are a possible source of ignition. Initiate suitable measures.
- When remote seals with a flame arrestor are used, the pressure measuring instrument determines the permissible ambient temperature. In the case of potentially explosive gaseous atmosphere, the temperature around the flame arrestor must not exceed +60 °C.

4.5.2 Installation of the remote seal with the capillary line

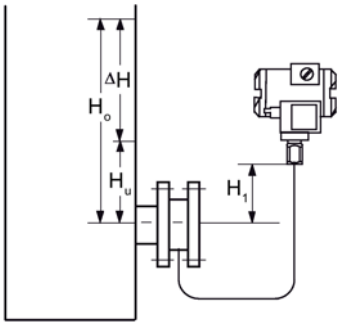
Notes

- Do not transport the measuring assembly (pressure transmitters, flange and capillary) using the capillary line.
- Do not bend capillary lines; risk of leakages and/or risk of considerable increase in the setting time of the measuring system.
- Owing to the risk of bending and breakages, pay attention to mechanical overloads at the joints such as capillary line-remote seal and capillary line-measuring device.
- Unwinding the excess capillary lines with a radius of at least 150 mm.
- Fasten the capillary line such that there are no vibrations.
- Permissible height differences:
  - When installing the pressure measuring device above the measuring point, keep the following in mind: In the case of remote seal measuring systems with silicon, glycerin or paraffin oil filling, the height difference of $H_{1max.}$ = 7 m must not be exceeded.
  - If halocarbon oil is used as a fill fluid, this maximum height difference is only $H_{1max.}$ = 4 m; see installation type A and installation type B.

If negative overpressure is observed during measurements, reduce the permissible height difference accordingly.

Installation type for gauge pressure and level measurements (open containers)

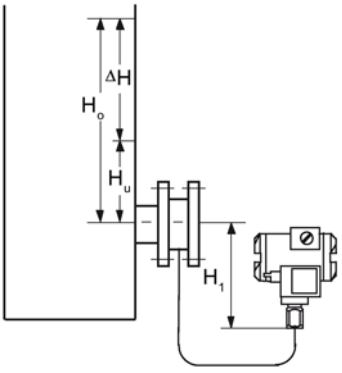
Installation type A



Pressure transmitter above the measuring point

Start of scale value:
$p_{MA} = \rho_{FL} * g * H_U + \rho_{oil} * g * H_1$
Full-scale value:
$p_{ME} = \rho_{FL} * g * H_O + \rho_{oil} * g * H_1$

Installation type B



Pressure transmitter below the measuring point

Start of scale value:
$p_{MA} = \rho_{FL} * g * H_U - \rho_{oil} * g * H_1$
Full-scale value:
$p_{ME} = \rho_{FL} * g * H_O - \rho_{oil} * g * H_1$

$H_1 \leq 7$ m (23 ft); with halocarbon oil as the filling liquid, only $H_1 \leq 4$ m(13.1 ft)

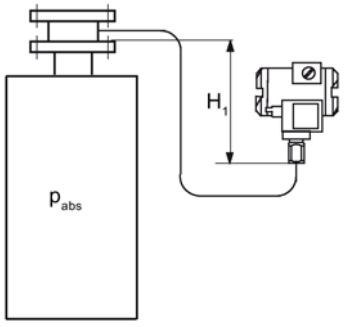
Key

p_{MA}	Start of scale value
p_{ME}	Full-scale value
ρ_{FL}	Density of the process medium in the container
ρ_{oil}	Density of the filling oil in the capillary line of the remote seal
g	Acceleration due to gravity
H_U	Lower filling level
H_O	Upper filling level
H_1	Distance between the container flange and the pressure transmitter

For absolute pressure measurements (vacuum), install the measuring device at least at the height of the remote seal or below it (see installation types C).

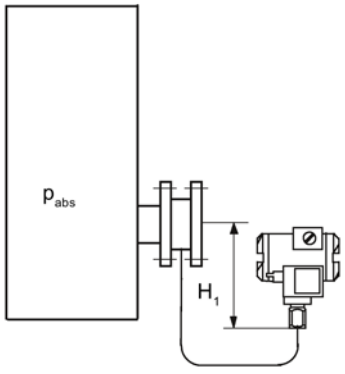
Installation types for absolute pressure measurements (closed containers)

Installation type C_1



Start of scale value:
$p_{MA} = p_{start} + \rho_{oil} * g * H_1$
Full-scale value:
$p_{ME} = p_{end} + \rho_{oil} * g * H_1$

Installation type C_2



Pressure transmitter for absolute pressure always below the measuring point: $H_1 \geq 200$ mm (7.9 inch)

Key

p_{MA}	Start of scale value
p_{ME}	Full-scale value
p_{start}	Start of scale pressure
p_{end}	Full scale pressure
ρ_{oil}	Density of the filling oil in the capillary line of the remote seal
g	Acceleration due to gravity
H_1	Distance between the container flange and the pressure transmitter

Note

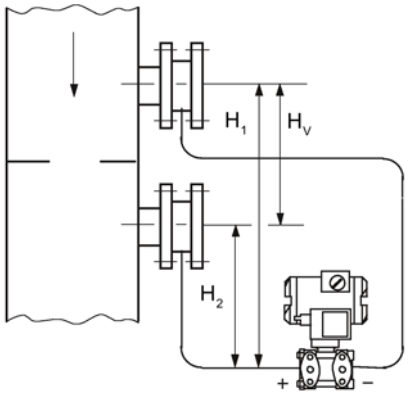
Effects of temperature

Keep the following instructions in mind in order to minimize keep the effects of temperature in remote seal measuring systems with the differential pressure measuring device:

Install the device such that the positive and negative sides are symmetrical as far as ambient effects, especially ambient temperatures, are concerned.

Installation type for differential pressure and flow rate measurements

Installation type D



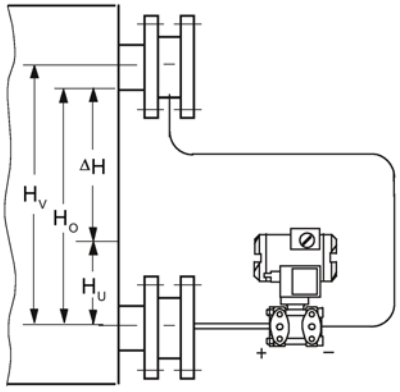
Start of scale value:
$p_{MA} = p_{start} - \rho_{oil} * g * H_V$
Full-scale value:
$p_{ME} = p_{end} - \rho_{oil} * g * H_V$

Key

p_{MA}	Start of scale value
p_{ME}	Full-scale value
p_{start}	Start of scale pressure
p_{end}	Full scale pressure
ρ_{oil}	Density of the filling oil in the capillary line of the remote seal
g	Acceleration due to gravity
H_V	Gland distance

Installation types for level measurements (closed containers)

Installation type E

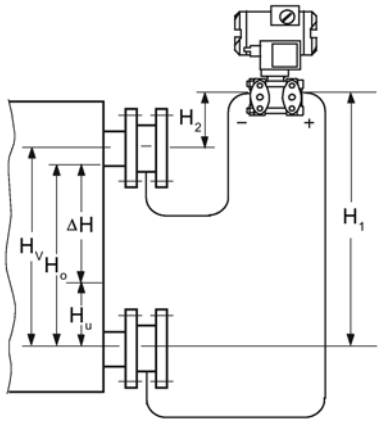


Start of scale value:
$p_{MA} = \rho_{FL} * g * H_U - \rho_{oil} * g * H_V$
Full-scale value:
$p_{ME} = \rho_{FL} * g * H_U - \rho_{oil} * g * H_V$

Key

p_{MA}	Start of scale value
p_{ME}	Full-scale value
ρ_{FL}	Density of the process medium in the container
ρ_{oil}	Density of the filling oil in the capillary line of the remote seal
g	Acceleration due to gravity
H_U	Lower filling level
H_O	Upper filling level
H_V	Gland distance

Installation type G



Pressure transmitter for differential pressure above the upper measuring point, no vacuum

$H_1 \leq 7$ m (23 ft), for halocarbon oil, however only H1 ≤ 4 m (13.1 ft)

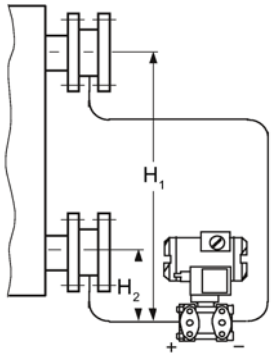
Start of scale value:

$p_{MA} = \rho_{FL} * g * H_U - \rho_{oil} * g * H_V$

Full-scale value:

$p_{ME} = \rho_{FL} * g * H_O - \rho_{oil} * g * H_V$

Installation type H



Below the lower measuring point

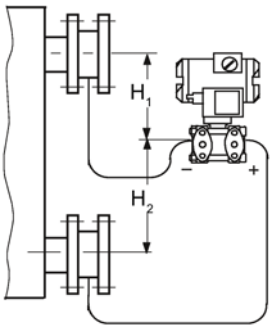
Start of scale value:

$p_{MA} = \rho_{FL} * g * H_U - \rho_{oil} * g * H_V$

Full-scale value:

$p_{ME} = \rho_{FL} * g * H_O - \rho_{oil} * g * H_V$

Installation type J



Between the measuring points, no vacuum

$H_2 \leq 7$ m (23 ft); with halocarbon oil as the filling liquid, only $H_2 \leq 4$ m(13.1 ft)

Start of scale value:

$p_{MA} = \rho_{FL} * g * H_U - \rho_{oil} * g * H_V$

Full-scale value:

$p_{ME} = \rho_{FL} * g * H_O - \rho_{oil} * g * H_V$

Key

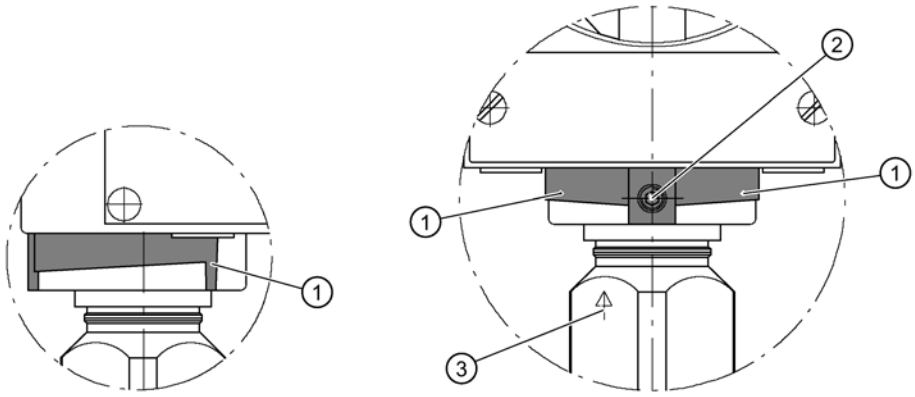
p_{MA}	Start of scale value
p_{ME}	Full-scale value
ρ_{FL}	Density of the process medium in the container
ρ_{oil}	Density of the filling oil in the capillary line of the remote seal
g	Acceleration due to gravity
H_U	Lower filling level
H_O	Upper filling level
H_V	Gland distance

4.6 Turing the measuring cell against housing

Description

You can turn the measuring cell against the housing. Rotating the pressure transmitter facilitates its operation when it is installed at an angle, for example. The buttons and the current connection can thus also be operated for an external measuring device. The display also remains visible in enclosure covers with an inspection window.

Only limited turning is permissible! The turning range ① is marked at the foot of the electronic housing. An orientation mark ③ is provided at the throat of the measuring cell. This mark must remain in the marked section when turning.



① Turning range
② Retaining screw
③ Orientation mark

Image 4-4 Example: Turning range of pressure transmitters for pressure and absolute pressure from the gauge pressure series

The turning range for pressure transmitters for differential pressure and flow rate, absolute pressure from the differential pressure series and level is identified in a similar manner.

Procedure

NOTICE
Damage to the ribbon cable If the pressure transmitter enclosure is rotated against the measuring cell, this can damage the ribbon cable (sensor connection to the electronics). • Comply with the specified range of rotation ① as detailed.

1. Loosen the retaining screw ② (Allen screw 2.5 mm).
2. Turn the electronic housing against the measuring cell. Follow the marked turning range ① while doing so.
3. Tighten the retaining screw (torque: 3.4 to 3.6 Nm).

4.7 Rotating the display

You can rotate the display in the electronics enclosure. This makes it easier to read the display if the device is not being operated in a vertical position.

Procedure

1. Unscrew the cover of the electrical cable compartment. See section Connecting the device (Page 62). An identification text "FIELD TERMINAL" is provided at the side of the housing.
2. Unscrew the display. Depending on the application position of the pressure transmitter, you can reinstall it at four different positions. You can turn it by ±90° or ±180°.
3. Screw the covers back on as far as they will go.
4. Secure the covers with the cover catch.

Connecting

5

5.1 Basic safety instructions

WARNING

Unsuitable cables and/or cable glands

Danger of explosion in hazardous areas.

- Only use suitable cables and cable glands complying with the requirements specified in Chapter "Technical data (Page 193)".
- Tighten the cable glands in accordance with the torques specified in Chapter "Technical data (Page 193)".
- When replacing cable glands use only cable glands of the same type.
- After installation check that the cables are seated firmly.

WARNING

Hazardous contact voltage in versions with 4-conductor extension

Danger of electrocution in case of incorrect connection.

- Observe the instructions in the 4-conductor extension operating manual for the electrical connection.

See also

Technical data (Page 193)

WARNING

Improper power supply

Danger of explosion in hazardous areas as result of incorrect power supply, e.g. using direct current instead of alternating current.

- Connect the device in accordance with the specified power supply and signal circuits. The relevant specifications can be found in the certificates, in Chapter "Technical data (Page 193)" or on the nameplate.

⚠ WARNING

Unsafe extra-low voltage

Danger of explosion in hazardous areas due to voltage flashover.

- Connect the device to an extra-low voltage with safe isolation (SELV).

⚠ WARNING

Lack of equipotential bonding

Danger of explosion through compensating currents or ignition currents through lack of equipotential bonding.

- Ensure that the device is potentially equalized.

Exception: It may be permissible to omit connection of the equipotential bonding for devices with type of protection "Intrinsic safety Ex i".

⚠ WARNING

Unprotected cable ends

Danger of explosion through unprotected cable ends in hazardous areas.

- Protect unused cable ends in accordance with IEC/EN 60079-14.

⚠ WARNING

Improper laying of shielded cables

Danger of explosion through compensating currents between hazardous area and the non-hazardous area.

- Only ground shielded cables that run into the hazardous area at one end.
- If grounding is required at both ends, use an equipotential bonding conductor.

⚠ WARNING

Connecting device in energized state

Danger of explosion in hazardous areas.

- Connect devices in hazardous areas only in a de-energized state.

Exceptions:

- Circuits of limited energy may also be connected in the energized state in hazardous areas.
- Exceptions for type of protection "Non-sparking nA" (Zone 2) are regulated in the relevant certificate

⚠ WARNING

Incorrect selection of type of protection

Danger of explosion in areas subject to explosion hazard.

This device is approved for several types of protection.

1. Decide in favor of one type of protection.
2. Connect the device in accordance with the selected type of protection.
3. In order to avoid incorrect use at a later point, make the types of protection that are not used permanently unrecognizable on the nameplate.

NOTICE

Ambient temperature too high

Damage to cable sheath.

- At an ambient temperature ≥ 60 °C (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20 °C (36 °F) higher.

NOTICE

Incorrect measured values with incorrect grounding

The device must not be grounded via the "+" or "-" connection. It may otherwise malfunction and be permanently damaged.

- If necessary, ground the device using the earthing connection.

Note

Electromagnetic compatibility (EMC)

You can use this device in industrial environments, households and small businesses.

For metal housings there is an increased electromagnetic compatibility compared to high-frequency radiation. This protection can be increased by grounding the housing, see Chapter "Connecting the device (Page 62)".

Note

Improvement of interference immunity

- Lay signal cables separate from cables with voltages > 60 V.
- Use cables with twisted wires.
- Keep the device and the cables at a distance from strong electromagnetic fields.
- Refer to the information on FF communication in the section "Communication FOUNDATION™ Fieldbus (Page 226)".

5.2 Connecting the device

Opening the device

1. Use a 3 mm Allen key to loosen the cover (if present).
2. Unscrew the cover of the electrical cable compartment. An identification text "FIELD TERMINALS" is provided at the side of the housing.

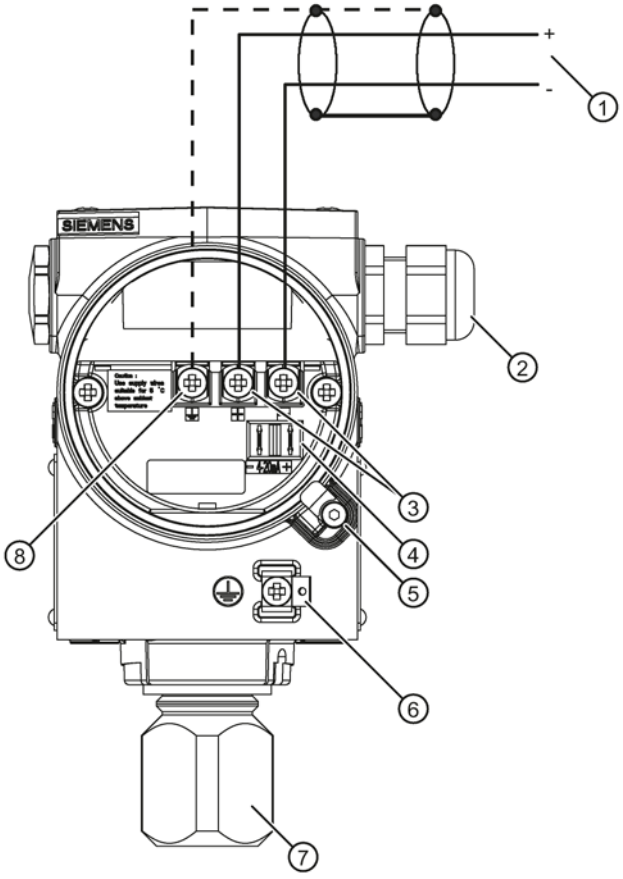
Procedure

1. Insert the connecting cable through the cable gland ②.
2. Connect the device to the plant with the protective conductor connection ⑥.

3. Connect the wires to the terminals "+" and "-" ③.

   The device is not polarity sensitive.

4. If necessary, ground the shield to the screw of the ground terminal ⑧. The ground terminal is electrically connected to the external protective conductor connection.

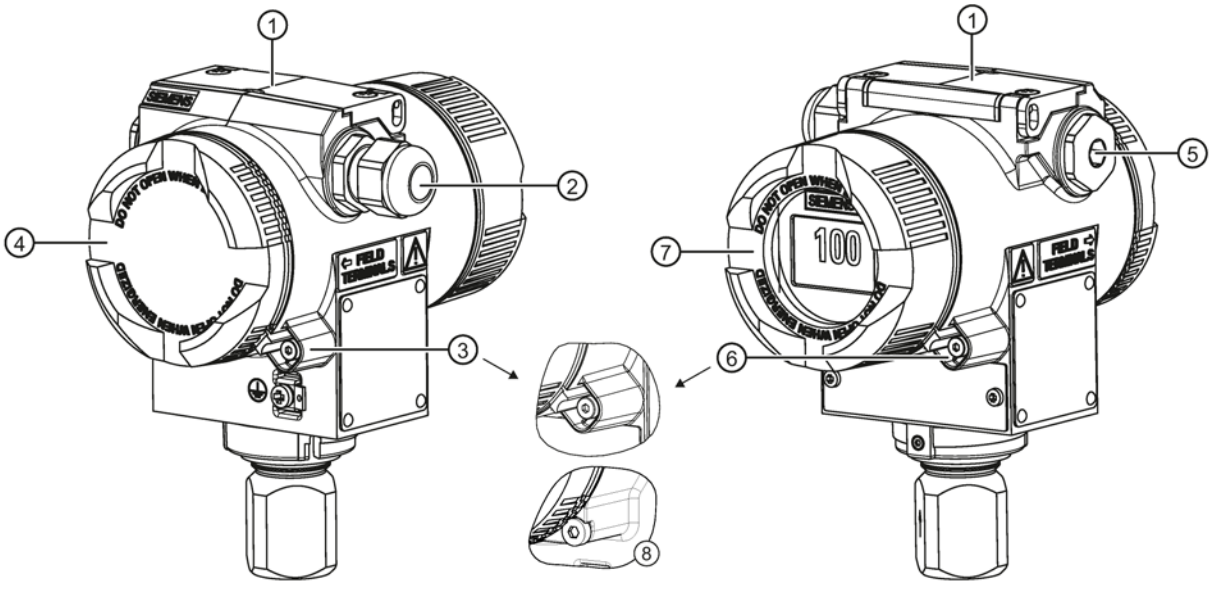


① PROFIBUS PA/FOUNDATION™ Fieldbus FF
② Cable entry
③ Connecting terminals
④ Test connector
⑤ Cover safety catch
⑥ Protective conductor connector/equipotential bonding terminal
⑦ Process connection
⑧ Grounding terminal

Image 5-1 Electrical connection, power supply

Closing the device

1. Screw the covers ④⑦ back on as far as they will go.
2. Secure each cover with the cover catch ③⑥.
3. Close the key cover ①.
4. Tighten the screws in the key cover.
5. Check the tightness of the blanking plugs ⑤ and cable gland ② in accordance with the degree of protection.



①	Key cover	⑤	Blanking plug
②	Cable gland	⑥	Safety catch (front)
③	Safety catch (back)	⑦	Cover (front), optionally with inspection window
④	Cover (rear) for electrical terminal compartment	⑧	Safety catch for stainless steel enclosure

Image 5-2 View of the pressure transmitter: Left: Back right: Front view

See also

Structure (Page 23)

Operation

6

6.1 Overview of operation

Introduction

The following description provides an overview of the operating functions which can be executed with the pressure transmitter and the safety information which is to be observed when doing so. You can operate the pressure transmitter at the device and via the FOUNDATION™ Fieldbus. Local operation at the device will be described first, and then the operating functions over FOUNDATION™ Fieldbus.

Contents of the section

- Safety information for operation (Page 66)
- Display (Page 67)
- Local operation (Page 73)
- Operation via FOUNDATION™ Fieldbus (Page 78)

Overview of operating functions

You can configure basic settings of the pressure transmitter using the buttons on the device. The entire range of settings can be operated via FOUNDATION™ Fieldbus.

Note

SITRANS P410 FF in the control system

A SITRANS P410 FF connected to a process control system (PDM, AMS, etc.) always registers as a DS III just like a connected SITRANS P DS III.

The following table describes the basic operating functions offered by a device with display.

Table 6- 1 Operating functions

Function	Using buttons	Via FOUNDATION™ Fieldbus
Electrical damping	No	Yes
Zero point calibration (position correction) / Zero point adjustment	Yes	Yes
Key lock and write protection	Yes	Yes
Measured value display	Yes	Yes
Unit	No	Yes
Device operating mode	No	Yes
Decimal point of the measured value display	No	Yes
LO calibration	No	Yes
HI calibration	No	Yes
Diagnostics function	No	Yes
Measuring mode	No	Yes

Further operating functions are accessible via FOUNDATION™ Fieldbus for special applications.

6.2 Safety information for operation

Note

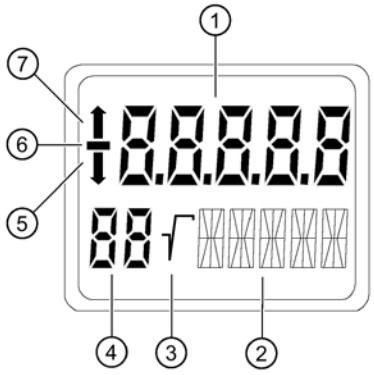
If you have set the basic functions of the pressure transmitter as user defined, the display and measurement output terminal can be adjusted such that the true process pressure is not reproduced.

The basic variables should therefore be checked prior to commissioning.

6.3 Display

6.3.1 Display elements

Structure



① Measured value
② Unit / error code
③ Root display
④ Mode/button lock
⑤ Violation of lower limit
⑥ Symbol for measured value
⑦ Violation of higher limit

Image 6-1 Display layout

Description

The display is used for the local display of the measured value with:

- Unit
- Mode
- Sign
- Status

The *Violation of low limit* ⑤ and *Violation of high limit* ⑦ displays indicate that the configured high or low limit has been exceeded. They also show a high or low violation of the sensor limits.

6.3.2 Measured value display

Description

The representation of up to four measured values can be configured in the display via FOUNDATION ™ Fieldbus. The parameters are set as described under the parameter name LOCAL_DISPLAY* in the section Transducer block LCD (Page 154).

Display

Factory setting: dSP 4

If more than one measured value is configured for display in the display, the "DSP" measured values are displayed in sequence in the display.

Before the value is displayed, the characters "dSP *" appear in the measured value field, whereby the asterisk "*" is replaced by a number 1 to 4. This shows what is displayed next. Then the actual value appears in the measurement field of the indicator. The respective display tag (LOCAL_DISPLAY_*_TAG) and the unit are shown in the "Unit/error code" field.

Principle

Depending on the customer setting, the displayed measured value represents the following:

- The value output by the pressure transmitter.
- The measurement value of the adjusted measurement type, e.g. level, related to the adjusted measurement range.
- The measurement value in a selectable physical unit

6.3.3 Units display

Description

The unit display consists of five 14-segment fields for representing the physical unit.

Display

Image 6-2 Example of a display

Table 6- 2 Unit for pressure (P)

Unit	ID	Display		Unit	ID	Display
Pa	1130	Pa		kg/cm²	1145	kGcm2
MPa	1132	MPa		inH_2O (4°C)	1147	i4H2O
kPa	1133	kPa		inH_2O (68°F)	1148	inH2O
bar	1137	bar		mmH_2O (4°C)	1150	m4H2O
mbar	1138	mbar		mmH_2O (68°F)	1151	m2H2O
torr	1139	TORR		ftH_2O (68°F)	1154	FTH2O
atm	1140	ATM		inHg (0°C)	1156	in_HG
psi	1141	PSI		mmHg (0°C)	1158	mm_HG
g/cm²	1144	G/cm2				

Table 6- 3 Unit for volume (V)

Unit	ID	Display		Unit	ID	Display
Liter (l)	1030	L		Cubic foot (ft^3)	1043	FT3
Standard liter (norml)	1030	L		Cubic yard (yd^3)	1044	yd3
Cubic meter (m^3)	1034	m3		US gallon	1048	Gal
Standard cubic meter ($normm^3$)	1034	m3		Imp. gallon	1049	imGal
Hectoliter (Hl)	1041	HL		Bushel	1050	buShl
Cubic inch ($inch^3$)	1042	in3		Barrel	1051	bbl
Standard cubic foot ($stdft^3$)	1043	FT3		Barrel liquid	1052	bblli

Table 6- 4 Unit for volume flow (F)

Unit	ID	Display	Unit	ID	Display
m^3 / second	1347	m3/S	ft^3 / day	1359	FT3/d
m^3 / minute	1348	m3/m	Gallons / second	1362	Gal/S
m^3 / hour	1349	m3/h	Gallons / minute	1363	Gal/m
Standard m3 / hour	1349	m3/h	Gallons / hour	1364	Gal/h
m^3 / day	1350	m3/d	Gallons / day	1365	Gal/d
Liters / second	1351	L/S	Million gallons / day	1366	MGl/d
Liters / minute	1352	L/m	Imperial gallons / second	1367	iGl/S
Standard liter / hour	1353	L/h	Imperial gallons / minute	1368	iGl/m
Liters / hour	1353	L/h	Imperial gallons / hour	1369	iGl/h
Million liters / day	1355	ML/d	Imperial gallons / day	1370	iGl/d
ft^3 / second	1356	FT3/S	Imperial barrels liquid / second	1371	bbl/S
ft^3 / minute	1357	FT3/m	Imperial barrels liquid / minute	1372	bbl/m
Standard foot ^{3} / minute	1357	FT3/m	Imperial barrels liquid / hour	1373	bbl/h
ft^3 / hour	1358	FT3/h	Imperial barrels liquid / day	1374	bbl/d

Table 6- 5 Unit for mass flow (M)

Unit	ID	Display		Unit	ID	Display
g/s	1318	G/S		Pound/s	1330	lb/S
g/min	1319	G/m		Pounds/min	1331	lb/m
g/h	1320	G/h		Pounds/h	1332	lb/h
Kg/s	1322	kG/S		Pounds/d	1333	lb/d
Kg/min	1323	kG/m		Short tons/min	1335	ShT/m
Kg/h	1324	kG/h		Short tons/h	1336	ShT/h
Kg/d	1325	kG/d		Short tons/d	1337	ShT/d
T/min	1327	T/m		Long tons/h	1340	LT/h
T/h	1328	T/h		Long tons/d	1341	LT/d
T/d	1329	T/d				

Table 6- 6 Unit for level (L)

Unit	ID	Display		Unit	ID	Display
Meter (m)	1010	m (ft)		Feet	1018	FT
Centimeter (cm)	1012	cm		Inch	1019	inch
Millimeter (mm)	1013	mm (in)				

Table 6- 7 Unit for mass (M)

Unit	ID	Display		Unit	ID	Display
Kilogram (kg)	1088	kG		lb	1094	lb
Gram (g)	1089	G		sht	1095	STon
Ton (t)	1092	T		lt	1096	LTon
Ounce (oz)	1039	OZ				

Table 6- 8 Unit for temperature (T)

Unit	ID	Display		Unit	ID	Display
Kelvin (K)	1000	K		Fahrenheit (°F)	1002	°F
degrees Celsius (°C)	1001	°C		Rankine (°R)	1003	°R

6.3.4 Error display

Description

If hardware faults, software errors or diagnostic interrupts occur in the pressure transmitter, the message "Error" appears in the measured value display.

A status code indicating the type of error appears at the bottom line of the display. This diagnostic information is also available via FOUNDATION™ Fieldbus FF.

Display

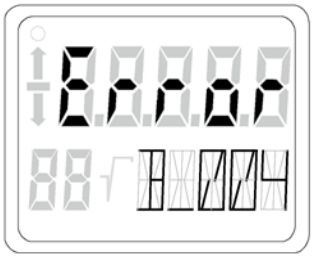


Image 6-3 Example of an error message: "Sensor fault"

Display	Meaning
F_XXX	Errors, type of error is XXX

You can find a description of the possible error messages in the section Error messages (Page 191).

6.3.5 Status display

Description

The following status messages can appear on the display.

Table 6- 9 Available status codes

Display	Meaning
B_xxx	Bad, substatus xxx
U_xxx	Uncertain, substatus xxx
G_xxx	Good, substatus xxx
Gcxxx	Good cascade, substatus xxx

You can find a description of the available status codes in the sectionStatus messages (Page 191).

See also

Display elements (Page 67)

6.3.6 Mode display

Description

The selected active mode is displayed in the mode display.

Display

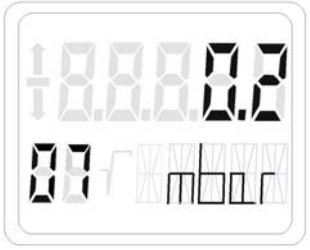


Image 6-4 Example of mode display: "Zero point calibration"

In the example, a current measured value of 0.2 mbar is displayed. This can be set to 0 mbar in the 07 mode.

If no mode is selected, the digital display is in the "Measured value display" mode.

6.4 Local operation

6.4.1 Information on operation

Violations of the measured value limits are output on the display by ⬆ or ⬇.

- If you wish to operate the device using the buttons, the lock must be canceled.
- If you are operating the pressure transmitter locally, write access through FOUNDATION™ Fieldbus is denied during this time.

  It is possible to read data at any time, e.g. measured values.

Note

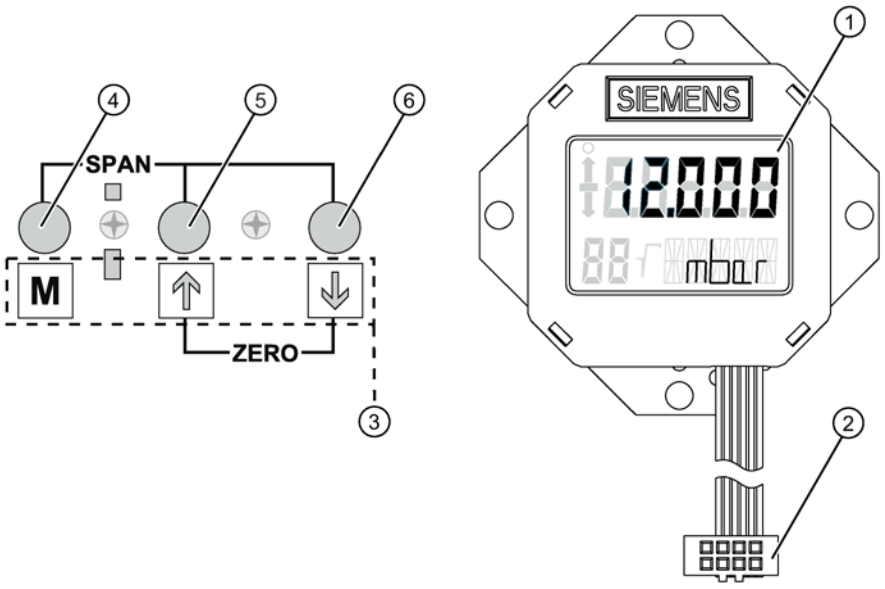
If you allow more than 2 minutes to pass following the pressing of a button, the setting is saved and the measured-value display is returned to automatically.

6.4.2 Operator controls

Introduction

The pressure transmitter can be operated on-site using the keys [M], [↑] and [↓]. You can select and execute the functions described in the table using adjustable modes. Operation by buttons is not available for devices without display.

Operator controls



①	Display	④	Mode key
②	Connecting plug for the display	⑤	Increment button
③	Button symbols (see cap)	⑥	Decrement button

Image 6-5 Position of keys and display

Operating functions

Note

Locking of buttons and functions

If you are in the measuring mode and "L" does not appear in the mode display, you can operate the device using the buttons.

If operations are disabled, parameters can still be read. An error message is output if you try to change parameters.

Table 6- 10 Operating functions using buttons

Function	Mode	Button function			Display, explanations	
	[M]	[↑]	[↓]	[↑] and [↓]		
Measured value					The current measured value is displayed.	
Error display					Error	A fault exists.
Zero point calibration (position correction)	7			Apply	Pressurize the pressure transmitter for gauge pressure, differential pressure, flow rate or level. Evacuate pressure transmitter for absolute pressure (< 0.1 ‰ of the measuring span). Measured value in pressure unit	
Locking of buttons and functions	10	Change			L	Locking of buttons and functions (hardware write protection); local operation and operation via FF disabled
	Press 5 s					Key and function lock disabled

6.4.3 Operation using buttons

Introduction

This overview informs you about the most important safety notes to be observed when operating the pressure transmitter. Furthermore, the overview guides you in adjusting the operating functions on site.

Requirement

The keyboard must have been unlocked in order to operate the device using the buttons.

Procedure

In the default setting, the device is in the measured value display.

To adjust the operating functions, proceed as follows:

1. Loosen both the screws of the keyboard cover and lift it upwards.
2. Press the [M] button until the desired mode is displayed.
3. Keep pressing the [↑] or [↓] button until the desired value is displayed.

4. Press the [M] button.

   Now you have saved the values and the device goes to the next mode.

5. Close the keyboard cover using the two screws.

Note

If you allow more than 2 minutes to pass after pressing a button, the setting is saved and the measured value display is returned to automatically.

6.4.4 Calibrate zero point

Introduction

You can calibrate the zero point in mode 7. A zero point calibration is used to correct zero errors resulting from the mounting position of the transmitter. You must proceed differently depending on the device version.

Requirement

You are familiar with the correct operation of the pressure transmitter and the associated safety information.

Note

Undo zero point calibration

This function can only be reset through FF communication (see section Device description (Page 100)).

Zero point calibration for gauge pressure transmitter

To calibrate the zero point, proceed as follows:

1. Pressurize the pressure transmitter.
2. Set mode 7 ([M] key).

   "7" is shown in the mode display.

   The pressure of the pressure transducer block appears in the measurement display.

   The calibration unit is shown in the "Unit / Error code" field.

3. Press the [↑] and [↓] keys simultaneously for about 2 seconds.

   After 2 seconds, "F_007" or "OK" is displayed.

   "F_007" means that the measuring range limits would be violated by the zero point calibration. The calibration was not performed.

   "OK" means that the error has been corrected.

4. Exit the mode by pressing [M].

Zero point calibration for absolute pressure transmitter

Note

Zero point calibration

For absolute pressure transmitters, the start of scale value is at vacuum.

A zero point calibration with pressure transmitters which do not measure absolute pressure leads to faulty settings.

Note

You need a reference pressure known to you which lies within the measuring limits.

To calibrate the zero point, proceed as follows:

1. Create the reference pressure.
2. Set mode 7 ([M] key).

   "07" is shown in the mode display.

   The pressure of the pressure transducer block appears in the measurement display.

   The calibration unit is shown in the "Unit / Error code" field.

3. Press the [↑] and [↓] keys simultaneously for about 2 seconds.

   After 2 seconds, "F_007" or "OK" is displayed.

   "F_007" means that the error has not been corrected.

   "OK" means that the error has been corrected.

4. Exit the mode by pressing [M].

6.4.5 Locking of buttons and functions

Introduction

You enable complete write protection in mode 10. This write protection includes disabling the functions on the keyboard and the functions through FF communication.

Requirement

Note

Check the measured value display to establish that this indicates the desired setting.

The bit: "Hard W Lock" in parameter: "Feature Selection" in the resource block must be set through FF communication.

Activation of locking of buttons and functions

To activate the full write protection, follow these steps:

1. Set mode 10.
2. Activate the locking of buttons and functions with the keys [↑] or [↓].
3. Save with the [M] button.

"L" is output in the mode display.

Deactivate the locking of buttons and functions

To deactivate the full write protection, follow these steps:

1. Press the [M] button for 5 seconds.

Locking of the buttons and functions is now deactivated.

"- -" is output in the mode display.

6.5 Operation via FOUNDATION™ Fieldbus

6.5.1 Overview

PC software such as National Instruments' NI-FBUS Configurator or a handheld computer with FF communication is required to operate via the FOUNDATION ™ Fieldbus. It is also possible to operate the device with SIMATIC PDM 8.2 in connection with STEP 7.

You can find detailed information on the operation in the accompanying operating manuals. The full functionality of the pressure transmitter is available over fieldbus communication.

Introduction

The device functions are subdivided into blocks of different task areas. Parameters can be assigned for the data transfer. The pressure transmitter is designed in accordance with the Fieldbus specification as a basic field device with link master function. It consists of the following blocks:

- Resource block
- 3 analog input function blocks (AI)
- PID function block
- Pressure transducer block with calibration
- LCD transducer block

Full write protection (Hard Write Lock)

The LCD transducer bock includes a separate LCD controller. Full write-protection can only be activated locally via the control keys. If this write protection is set, the device does not accept changes over communication. To prevent accidental activation of the complete write protection on site, you need to block access to the control buttons. Bolts with special heads are available as spare parts for these purposes.

Simulations

The SITRANS P DS III FF supports the standard simulation of the Fieldbus protocol for the function blocks. In addition, the pressure transducer block includes a simulation method that can be configured with fixed values or ramps.

Activation of the simulations requires the simulation jumper to be inserted. You can find additional information in the section Enable/disable simulation (Page 169).

6.5.2 NI-FBUS Configurator

With the NI-FBUS Configurator, you do the following with device data:

- Display
- Set
- Change
- Compare
- Checked for plausibility
- Manage
- Simulate

See also

Software downloads (http://www.siemens.com/processinstrumentation/downloads)

6.5.3 FOUNDATION™ Fieldbus

6.5.3.1 Overview

The FOUNDATION™ Fieldbus is an open communication system for automation technology and is specified in the international standard IEC 61158.

6.5.3.2 Transmission technology

FOUNDATION™ Fieldbus uses a special transmission technology, enabling it to fulfill the requirements of process automation and process technology. This transmission technology is defined in the international standard IEC 61158-2.

The FOUNDATION ™ Fieldbus enables bi-directional communication between the field devices via a shielded two-wire cable. The power for the two-wire field devices is supplied over the same lines.

6.5.3.3 Bus topology

The bus topology can be largely freely selected. Line, star and tree structures, and mixed forms are therefore possible. All types of field devices such as sensors, actuators, analysis devices, etc. can be connected to the FOUNDATION™ Fieldbus.

The main benefit lies in:

- Savings in installation costs
- The possibility of more extensive diagnostics, leading to increased availability of installation sections
- The option to automatically track the system documentation
- The option of optimizing the system during operation
- The possibility of management in the field

In an automation system, multiple FOUNDATION™ Fieldbus strands are generally connected to fast FOUNDATION™ Fieldbus High Speed Ethernet (FF HSE) via coupler units. The process control system is also connected to the same Ethernet.

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

You can find additional information in the Internet at: FOUNDATION™ Fieldbus High Speed Ethernet (www.fieldbus.org).

6.5.3.4 Interfacing

Operation is performed by the central process control system (PCS) or by a PC for lower performance requirements.

Functions such as FF signal conversion, bus feed and bus terminator are normally combined in a coupling module. Depending on the number of the FOUNDATION™ Fieldbus field devices to be operated in the automation system and the required time response, an FF

power supply / stabilizer or, if higher requirements are needed, a high-performance FF link is used.

For reasons of transmission technology, the bus must be additionally equipped with a terminating resistor T at the remote end. If the recommended bus cable is used, the theoretically possible cable length (sum of all cable segments) is a maximum of 1900 m. The voltage drop across the cables that feed the field devices must also be taken into account when planning.

FF voltage supply / stabilizer or FF link are supplied from a power supply with safety extra low voltage (SELV, **S**afety **E**xtra **L**ow **V**oltage). This power supply must have sufficient reserves to bridge temporary power failures.

The maximum number of devices which can be connected to a bus line depends on their power consumption and the conditions of use. When operated in the safe range, the power supplies / links can feed up to 400 mA into the bus.

When operated in explosive atmospheres, intrinsic safety is only guaranteed if all devices, components, etc. connected to the bus (e.g. bus terminator) are certified as intrinsically safe equipment and fulfill the basic requirements of the FISCO model (Fieldbus Intrinsic Safety Concept). Power supply devices in particular must be certified as "FISCO" power supplies. Always adhere to the safety-relevant maximum values and other specifications of the EC type-examination certificate.

Power supplies, which are not explosion-proof and certified, must be connected to intermediary, EX-certified Zener barriers. Always adhere to the specifications of the EC type-examination certificate.

⚠ WARNING

Device deployment in hazardous area

Only power supplies certified according to the FISCO model (FF power supplies / stabilizers or Fieldbus links may be used to power the intrinsically safe FF. Zener barriers must be interposed for power supplies that are not explosion-protected . The requirements are in the EC type-examination certificate PTB 99 ATEX 2122, 2. supplement. See section Certificate (Page 251).

The number of devices that can be connected to a bus line can be determined from the sum of maximum current consumptions of the connected devices (as per the standard - 10 mA per device) and the available current. A current reserve must be planned due to safety reasons. Otherwise, there is a risk of a defective device overloading the bus due to high current consumption and interrupting the power supply and communication with all non-defective participants. The amount of power reserved is based on the nominal power increase given by the manufacturer in case of failure.

Each device has its own address to enable the connected process devices to be distinguished from one another. The address setting is described in the Addressing (Page 165) section.

You can find additional information on components, installation guidelines and project configuration in the system description for field technology (see Order data (Page 247)).

6.5.4 Resource block

Overview

The resource block contains data specific to the hardware associated with this block. These include in particular the device type with modification index, the manufacturer number, the serial number and resource status. All data is limited to this block so that there are no connections whatsoever to this block. The data is not processed as it is in a function block. This block provides a timer for the service interval based on the operating hours of the electronics. It can be used to trigger the "Device must be serviced soon" and "Device must be serviced now" alarms.

Note

The resource block must be in automatic mode for the function blocks contained in the device to be executed.

Parameter description

The resource bock contains all standard parameters as in [FF-891-1.5] as well as a number of vendor-specific parameters. These include additional static information about the device and multiple operating hours counters.

You can find detailed information in the following table.

Table 6- 11 Resource block

Label/parameter name/ access	Index (rel.)	Description/format
ACK_OPTION Acknowledge Option Read & Write	38	Selection whether alarms assigned to the function block are to be acknowledged automatically. Bit not set (0): Automatic acknowledgment deactivated Bit set (1): Automatic acknowledgment activated • Bit 0: Write function has been deactivated • Bit 7: Block alarm Data format: Bit string with 16 bits (2 bytes) Factory setting: 0
ALARM_SUM (Record) Alarm Summary	37	The current alarm status, unacknowledged states and deactivated states of the alarms assigned to the function block. Data format: Record with 4 parameters (8 bytes)
1. CURRENT Current Read only	37.1	The active status of each alarm. Meaning of the bits: see ACK_OPTION Data format: Bit string with 16 bits (2 bytes)
2. UNACKNOWLED Unacknowledged Read only	37.2	The unacknowledged status of every alarm. Meaning of the bits: see ACK_OPTION Data format: Bit string with 16 bits (2 bytes)

Label/parameter name/ access	Index (rel.)	Description/format
3. UNREPORTED Unreported Read only	37.3	The unreported status of every alarm. Meaning of the bits: see ACK_OPTION Data format: Bit string with 16 bits (2 bytes)°
4. DISABLED Disabled Read & Write	37.4	The deactivated status of every 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 can be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Factory setting: 0
BLOCK_ALM (Record) Block alarm	36	The block alarm is used for all configuration, hardware and connection faults or system problems in the block. The cause of the alarm is entered in the subcode field. The first alarm which becomes active sets the active status in the status attribute. As soon as the Unreported status is cleared by the alarm message task, another block alarm 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	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	36.2	Indicates whether the alarm is active and has been reported. • 0: Not initialized • 1: Not active, but reported • 2: Not active, not reported • 3: Active and reported • 4: Active, but not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	36.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
4. SUB_CODE Subcode Read only	36.4	A selected value that indicates the cause of the alarm to be reported. Values: see BLOCK_ERR Data format: Unsigned 16

Label/parameter name/ access	Index (rel.)	Description/format
5. Value Value Read only	36.5	The value of the assigned parameter at the time when the alarm was detected. Data format: Unsigned 8
BLOCK_ERR Block Error Read only	6	This parameter indicates the error status which is assigned to the hardware or software components that are associated with a block. Several errors may be indicated since this is a bit string. The following bits are supported: • Bit 3: Simulation Active – *The simulation jumper is set, the simulation can be enabled.* • Bit 6: Device Needs Service Soon – *A warning about a pending service was output.* • Bit 9: Memory Failure – *A checksum error was detected in the ROM.* • Bit 10: Lost Static Data – *A checksum error was detected in the FF static data.* • Bit 11: Lost NV Data – *A checksum error was detected in the application data.* • Bit 13: Device Needs Service Now – *A warning about the required service was output.* • Bit 15: Out of Service – *The current operating mode is "Out of Service"* Data format: Bit string with 16 bits (2 bytes)
CLR_FSTATE Clear Fault State Read & Write	30	If this parameter is set to Clear, it ends the safety response of the device when the fault condition in the field (if any) has been eliminated. • 0: Not initialized • 1: Off – *Normal operating position* • 2: Clear – *The fault status conditions of the block are deleted.* Data format: Unsigned 8 Factory setting: 1 Note: *This parameter defaults to the values "Off" and "Read Only" because there are no output blocks in this device.*
COMPATIBILITY (Record) Compatibility	76	Compatibility numbers are used to check whether the sensor and the electronics are compatible. The actual compatibility number must be between the lowest and the highest compatibility number. Data format: Record with 3 parameters (3 bytes)
1. MINIMUM Minimum Read only	76.1	The lowest compatibility number Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
2. MAXIMUM Maximum Read only	76.2	The highest 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 minimum time between repeated attempts to report faults. If CONFIRM_TIME is assigned the value 0, no further attempts are made. Data format: Unsigned 32 Factory setting: 64000 (2000 ms)
CYCLE_SEL Cycle Selection Read & Write	20	Selection of block execution methods for the device • Bit 0: Scheduled • Bit 1: Block Execution • Bit 2: Manufacturer Specific • Data format: Bit string with 16 bits (2 bytes) Factory setting: 0XC000 (Scheduled | Block Execution)
CYCLE_TYPE Cycle Type Read only	19	Function block execution methods supported by the device: • Bit 0: Scheduled • Bit 1: Block Execution • Bit 2: Manufacturer Specific Data format: Bit string with 16 bits (2 bytes) Factory setting: 0XC000 (Scheduled | Block Execution)
DD_RESOURCE DD Resource Read only	9	Source for the device description. Data format: Visible String (32 bytes)
DD_REV DD Revision Read only	13	Version number of the associated device description. Data format: Unsigned 8
DEV_REV Device Revision Read only	12	Version number of the manufacturer of the device. Used by an interface to determine the DD file for this device. Data format: Unsigned 8
DEV_TYPE Device Type Read only	11	Model number of the manufacturer for this device. Used by an interface to determine the DD file for this device. 11: SITRANS P, Series DS III FF Data format: Unsigned 16
DEVICE_CERTIFICATION Device Certification Read only	47	Equipment certifications (regulatory approvals) Data format: Visible String (32 bytes)
DEVICE_DESCRIPTOR Device Descriptor Read & Write	44	A text describing the device that the user can store in the device. Data format: Visible String (32 bytes)

Label/parameter name/ access	Index (rel.)	Description/format
DEVICE_DESIGNATION Device Designation Read only	46	Product description of the manufacturer for this device. Data format: Visible String (16 bytes) Factory setting: SITRANS_P_DS3_FF
DEVICE_INSTAL_DATE Device Installation Date Read & Write	48	The date (ASCII text) on which the unit 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 the user can store in the device. Data format: Visible String (32 bytes)
DEVICE_OP_HOURS Device Operating Hours Read only	51	Total operating hours of the electronics of this unit. Data format: Unsigned 32
DEVICE_PRODUCT_CODE Device Product Code Read only	50	Order number (MLFB) of the manufacturer for this device. Data format: Visible String (48 bytes)
DEVICE_SER_NUM Device Serial Number Read only	49	Unique serial number of the manufacturer for this device. Data format: Visible String (32 bytes)
DIAG_ERR Diagnostic Errors Read only	53	This parameter shows the diagnostics error associated with this device. Several errors may be indicated since this is a bit string. This parameter is reserved for future use. Data format: Bit string with 16 bits (2 bytes)
DIAG_ERR_ENABLE Diagnostic Errors Enabled Read & Write	52	Option to enable notification of individual diagnostic errors associated with this device. This parameter is reserved for future use. Bit not set (0): Reporting of diagnostic errors deactivated Bit set (1): Reporting of diagnostic errors activated Data format: Bit string with 16 bits (2 bytes) Factory setting: 0
DIAGNOSIS_SIMULATION Diagnostics Simulation	75	Enables you to simulate the DIAG_ERR parameter. This parameter is reserved for future use. Data format: Record with 2 parameters (3 bytes)
1. VALUE Value Read & Write	75.1	This bit string replaces the DIAG_ERR parameter when the ENABLE parameter is activated. Data format: Bit string with 16 bits (2 bytes)
2. ENABLE Enable Read & Write	75.2	This parameter enables the VALUE parameter for the diagnostics simulation to replace the DIAG_ERR parameter. • 0: Deactivated • 1: Activated Data format: Unsigned 8 factory setting: 0

Label/parameter name/ access	Index (rel.)	Description/format
DRAIN_VENT_MTL Drain Vent Material Read & Write	61	This is the material used to make the removable plug on the flange, which can be opened from time to time to remove an undesirable 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
ELEC_HOUSING_CONN Electronic Housing Connec-tion Read & Write	67	This is the connector for the cable entry to the electronics housing. • 0: Cable gland Pg 13.5 • 1: Female thread M20 x 1.5 • 2: Female thread ½ - 14 NPT • 3: Han 7D plug, complete • 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 material of which the electronics housing is made. • 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

Label/parameter name/ access	Index (rel.)	Description/format
EXPLOSION_PROTECTIO N Explosion Protection Read only	68	Specifies the certification of the field device for use in hazardous areas. • 0: Intrinsically Safe Ex ia IIC T4/T5/T6 • 1: Flameproof Ex d IIC T5/T6 • 2: BASEEFA Ex N • 3: FM Intrinsically safe • 4: FM Flameproof • 5: CSA Intrinsically safe • 6: CSA Flameproof • 7: Ex tested Zone 2, BASEEFA • 8: Explosion protection FM intrinsically safe and flameproof • 9: CSA Intrinsically safe and flameproof • 10: FM and CSA Intrinsically safe and flameproof • 11: Ex tested Zone 2 (TUV) • 12: Ex ia and Ex d • 13: Intrinsically Safe Ex ib IIC T4 • 250: Not used • 251: None • 252: Unknown • 253: Special Data format: Unsigned 8
FAULT_STATE Fault State Read only	28	Current status of the safety response of the output block (AO). If the fault status condition has been set, the output function block executes its FSTATE actions. • 0: Not initialized • 1: Clear – *Normal operating position* • 2: Active – *Fault status active* • Data format: Unsigned 8 Factory setting: 1 Note: *This parameter defaults to the value "Clear" because there are no output blocks in this device.*

Label/parameter name/ access	Index (rel.)	Description/format
FEATURES Features Read only	17	Options supported by the resource block: • Bit 0: Unicode strings • Bit 1: Reports • Bit 2: Fault State • Bit 3: Soft Write Lock • Bit 4: Hard Write Lock • Bit 5: Output Readback • Bit 6: Direct Write to Output Hardware • Bit 7: Change to BYPASS in Auto Mode • Bit 8: MVC Report Distribution • Bit 9: MVC Publishing/Subscribing Data format: Bit string with 16 bits (2 bytes) Factory setting: Reports | Soft Write Lock | Hard Write Lock
FEATURE_SEL Feature Selection Read & Write	18	Selection of the resource block options (see FEATURES). Data format: Bit string with 16 bits (2 bytes) Factory setting: Reports | Soft Write Lock | Hard Write Lock
FREE_SPACE Free Space Read only	24	Specifies the available memory space in percent for the configuration of additional functional blocks. Since this is a preconfigured device, the value is fixed at 0%. Data format: Float Value (4 bytes) Value range: 0.0 % ….. 100.0 % Factory setting: 0.0 %
FREE_TIME Free Time Read only	25	Specifies the block processing time still available for processing additional blocks in percent. Since this is a preconfigured device, the value is fixed at 0%. Data format: Float Value (4 bytes) Value range: 0.0 % ….. 100.0 % Factory setting: 0.0 %
GRANT_DENY (Record) Grant Deny	14	Enable (Grant) or disable (Deny) access privileges of a host system to the field device. Data format: Record with 2 parameters (2 bytes)
1. GRANT Grant Read & Write	14.1	Depending on the philosophy in the respective factory, the operator or a higher level device (HLD or a local operator panel (LOP), if Local is set, can activate a point of the Grant attribute (Program, Tuning, Alarm or Local). • Bit 0: Program – changed by HLD • Bit 1: Tune – changed by HLD • Bit 2: Alarm – changed by HLD • Bit 3: Local – changed by LOP Data format: Bit string with 8 bits (1 byte) Factory setting: 0x00

Label/parameter name/ access	Index (rel.)	Description/format
2. DENY Deny Read & Write	14.2	The Denied attribute is provided for use by a monitoring application in an interface device and cannot be changed by the operator. • 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) Factory setting: 0x00
HARD_TYPES Hardware Types Read only	15	The hardware types that are available as channel numbers. • 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) Factory setting: 0x0000 (Scalar input)
HARDWARE_REVISION Hardware Revision Read only	42	The revision status of the hardware (electronics) of the field device. Data format: Visible String (16 bytes)
HART_COMMAND (Record) HART Command	77	These parameters are used only by Siemens for the manufacture of the pressure transmitter. It provides specific commands for calibrating and loading of factory setting data to the pressure 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 bye number Data format: Unsigned 8
3. RESPONSE_CODE Response Code Read & Write	77.3	The HART activation 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: 8-bit string (36 bytes)
ITK_VER ITK Version Read only	41	Main revision number of the Interoperability Test Case which was used to register this device. Data format: Unsigned 16

Label/parameter name/ access	Index (rel.)	Description/format
LIM_NOTIFY Limit Notify Read & Write	32	Maximum permitted number of unacknowledged alarms. If you set the value 0, no messages are sent. Data format: Unsigned 8 Value range: 0 …. MAX_NOTIFY Factory setting: 8
MANUFAC_ID Manufacturer ID Read only	10	Manufacturer number Used by an interface to determine the DD file for the resource. Data format: Unsigned 32 Factory setting: 0x00534147 (Siemens AG)
MAX_NOTIFY Maximum Notify Read only	31	Maximum number of unconfirmed messages that this device can send without receiving acknowledgment. Data format: Unsigned 8 Factory setting: 8
MEMORY SIZE Memory Size Read only	22	Specifies the available memory space in kilobytes for the configuration of additional functional blocks. Since this is a pre-configured device, there is no additional space available. Data format: Unsigned 16 Factory setting: 0
MIN_CYCLE_T Minimum Cycle Time Read only	21	Duration of the shortest cycle which the device can execute. Data format: Unsigned 32 Factory setting: 1280 (40 ms)
MODE_BLK (Record) Block Mode	5	The actual, target, permitted, and normal operating modes of the block. Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the operating mode requested by the operator. The target operating mode is limited to the values defined by the "Permitted operating 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 actual operating mode of the block and may deviate from the target mode depending on the operating conditions. Its value is calculated during block execution. • Bit 3: Auto • Bit 7: OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Specifies the operating modes which are permitted for the block at a specific point in time. The permitted operating mode is configured starting with the requirements of the application. • Bit 3: Auto • Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Factory setting: 0x11 (Auto | OOS)

Label/parameter name/ access	Index (rel.)	Description/format
4.NORMAL Normal Read & Write	5.4	The block should be set to this operating mode for normal operating conditions. Bit 3: Auto data format: Bit string with 8 bits (1 byte) factory setting: 0x10 (Auto | OOS)
NV_CYCLE_T Non-volatile Cycle Time Read only	23	Minimum time interval is which non-volatile data is stored in the device. A value 0 means that no data can be written to the volatile memory. The time unit is 1/32 ms. Data format: Unsigned 32
O_RING_MTL "O" Ring Material Read & Write	60	The material of which the seal between the sensor module and the process connection is made. • 10: PTFE (Teflon) • 11: FPM (Viton) • 12: NBR (Buna N) • 13: Ethylene-propylene • 16: Tefzel • 21: Nitrile rubber • 22: FFPM (Kalrez) • 27: FEP/VMQ (perfluoro-ethylene-propylene) • 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 which the process flange screws are made. • 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

Label/parameter name/ access	Index (rel.)	Description/format
PROCESS_CONN_TYPE Process Connection Type Read & Write	59	Hardware in the vicinity of the sensor which physically connects the process to the sensor. • 0: Shaft G1/2 A DIN 16288 • 1: Female thread ½ -14 NPTF • 2: Shaft 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: Male thread ½ -14 NPT • 250: Not used • 251: None • 252: Unknown • 253: Special Data format: Unsigned 8
PROCESS_FLANGE_MTL Process Flange Material Read & Write	65	Material of which the flange is made. • 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

Label/parameter name/ access	Index (rel.)	Description/format
PROCESS_FLANGE_TYPE Process Flange Type Read & Write	64	Hardware in the vicinity of the sensor which physically connects the process to the sensor. • 5: Oval flange • 12: Normal • 14: Remote seal • 15: Fill level 3" — ANSI 150 • 16: Fill level 4" — ANSI 150 • 17: Fill level 3" — ANSI 300 • 18: Fill level 4" — ANSI 300 • 19: Fill level DN 80 — PN 40 • 20: Fill level DN 100 — PN 25/40 • 21: Fill level DN 100 — PN 10/16 • 22: Fill level 2" — ANSI 150 • 23: Fill level 2" — ANSI 300 • 25: Fill level DN 50 — PN 40 • 250: Not used • 251: None • 252: Unknown • 253: Special Data format: Unsigned 8
REM_SEAL_DIA_MTL Remote Seal Diaphragm Material Read & Write	56	The material of which the wetted parts of the remote seal is made. • 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

Label/parameter name/ access	Index (rel.)	Description/format
REM_SEAL_FILL Remote Seal Fill Read & Write	57	Filling liquid of the remote seal. • 1: Silicone oil M5 • 2: Silicone oil M50 • 3: High-temperature oil • 4: Inert • 5: Glycerine/H_2O • 6: Vegetable oil • 7: Halocarbon 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 remote seal • 2: Two remote 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 the hoses on the pressure 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

Label/parameter name/ access	Index (rel.)	Description/format
REM_SEAL_TYPE Remote Seal Type Read & Write	55	A device that can recognize and process the process pressure at the module. • 3: Flange with a 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	Permits a manual restart. (Changing this parameter can seriously affect communication.) • 0: Not initialized • 1: Operation – *normal state* • 2: Restart of the resource • 3: Restart with default values • 4: Restart of the processor – *Communication may be lost during the process start.* Data format: Unsigned 8
RS_STATE Resource State Read only	7	Operating state of resource block • 0: Uninitialized – *Invalid state* • 1: Start/Restart – *Initial state after power is restored* • 2: Initialization – *state after start/restart or failure* • 3: On-Line Linking – *state after on-line or initialization* • 4: On-line – *state after on-line linking* • 5: Standby – *state after changing the operating mode to OOS (Out of Service)* • 6: Failure – *state after detecting an error. Not after standby* Data format: Unsigned 8
SERVICE_ALARM_SET Service Alarm Setting Read & Write	73	Sets how long to wait (in hours) after a service warning before a service alarm is generated. Data format: Float Value (4 bytes) Value range: 0.0 h to 596000 h Factory setting: 720 h

Label/parameter name/ access	Index (rel.)	Description/format
SERVICE_ALARM_TIME Service Alarm Time Read only	72	Time (in hours) since the output of the service alarm. The value is 0.0 prior to the warning. When this time reaches the value of SERVICE_ALARM_SET, bit 13 is set in BLOCK_ERR and SERVICE_INTERVAL has the value 4. Data format: Float Value (4 bytes)
SERVICE_INTERVAL Service Interval Read & Write	69	Enables you to set options for the warnings relating to the service interval as well as alarm options. • 1: OFF • 2: ON (timer block only) • 3: ON (warning) • 4: ON (warning and alarm) Data format: Unsigned 8
SERVICE_TIMER_RESET Service Timer Reset Read & Write	74	Enables you to reset the timer to 0. • 0: Timer block not reset • 1: Timer block reset – *Parameter returns to 0 after initialization* Data format: Unsigned 8
SERVICE_WARN_SET Service Warning Setting Read & Write	71	The waiting time (in hours) before the service warning is output. Data format: Float Value (4 bytes) Value range: 0.0 h to 596000 h Factory setting: 8760 h
SERVICE_WARN_TIME Service Warning Time Read only	70	Time (in hours) since the reset of SERVICE_TIMER_RESET. When this time reaches the value of SERVICE_WARN_SET, bit 6 is set in the BLOCK_ERR parameter, if the SERVICE_INTERVAL parameter has the value 3 or 4. Data format: Float Value (4 bytes)
SET_FSTATE Set Fault State Read & Write	29	Enables you to start the safety response manually by selecting Set. • 0: Not initialized • 1: OFF – *Normal operating state* • 2: SET – *Activates the safety response* Data format: Unsigned 8 Note: *This parameter is read-only by default in the state 1 because this device has no output blocks.*
SHED_RCAS Shed Remote Cascade Read & Write	26	Monitoring time for the connection between host and device in RCAS mode of the AO and PID blocks. Shed of RCAS will not occur if SHED_RCAS is set to 0. Data format: Unsigned 32 Factory setting: 640000 (20 s)
SHED_ROUT Shed Remote Output Read & Write	27	Monitoring time for the connection between host and device in ROUT mode of the PID block. Shed of ROUT will not occur if SHED_ROUT is set to 0. Data format: Unsigned 32 Factory setting: 640000 (20 s)

Label/parameter name/ access	Index (rel.)	Description/format
SOFTWARE_REVISION Software Revision Read only	43	The revision of the software/hardware of the field device. Data format: Visible String 16
ST_REV Static Revision Read only	1	The revision level of the static data assigned to the function block. The revision number increases by 1 when a static parameter value changes in the block. Data format: Unsigned 16
STRATEGY Strategy Read & Write	3	The strategy field can be used to define block groups. This data is not checked or processed by the block. Data format: Unsigned 16 Factory setting: 0
TAG_DESC Tag Description Read & Write	2	A text entered by user as a description for the resource function block. Data format: 8-bit string (32 bytes)
TEST_RW (Record) Test Read Write Read & Write	8	Read/Write test parameters. Exclusively reserved for the conformity test. Data format: Record with 15 parameters (112 bytes)
UPDATE_EVT (Record) Update Event	35	This alarm is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	35.1	This parameter is set to "Unacknowledged" when an update occurs and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. UPDATE_STATE Update State Read only	35.2	Indicates whether the alarm has been reported. • 0: Not initialized • 1: Update Reported • 2: Update Not Reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	35.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
4. STATIC_REVISION Static Revision Read only	35.4	The value of ST_REV at the point in time of the warning. It may be that the current value of the static change is greater than this value because the static parameter can change at any time. Data format: Unsigned 16

Label/parameter name/ access	Index (rel.)	Description/format
5. RELATIVE_INDEX Relative Index Read only	35.5	The relative index of the static parameter whose change triggered this alarm. If the updating event has been triggered in that several parameters were written simultaneously, the attribute is set to 0. Data format: Unsigned 16
VENT_VALVE_POS Vent Valve Position Read & Write	62	Mounting position of the vent valve. • 0: Compared to the process connection • 1: On the side of the pressure cap • 250: Not used • 251: None • 252: Unknown • 253: Special Data format: Unsigned 8
WRITE_ALM (Record) Block alarm	40	This alarm is triggered when the WRITE_LOCK parameter is deleted (set to "Not Locked"). Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	40.1	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	40.2	Indicates whether the alarm is active and has been reported. • 0: Not initialized • 1: Alarm not active but reported • 2: Alarm not active and not reported • 3: Alarm active and reported • 4: Alarm active but not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	40.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
4. SUB_CODE Subcode Read only	40.4	A selected value that indicates the cause of the alarm to be reported. Data format: Unsigned 16
5. Value Value Read only	40.5	The value of the assigned parameter at the time the alarm was detected (see WRITE_LOCK). Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
WRITE_LOCK Write Lock Read & Write	34	When "Hard Write Lock" is set in FEATURES_SEL, this parameter specifies the position of hardware jumper. When "Hard Write Lock" is not set in FEATURES_SEL, this parameter can be written to the lock or unlock write configuration parameter. The hardware jumper must be at the "Unlocked" position for this function. • 1: Unlocked • 2: Locked Data format: Unsigned 8
WRITE_PRI Write Priority Read & Write	39	Priority of the alarm triggered upon cancelation of the write lock. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0

6.5.4.1 Special functions and options

When you perform a warm restart with the factory settings, the material data that can be changed by the user is not reset. This must be done manually for parameters with read or write access.

When you start the new processor, the device needs some time before it is ready for operation. During this time, there is no communication with the device.

The service timer depends on the operating hours of the device. To activate it, first write the desired values initially to SERVICE_WARN_SET and SERVICE_ALARM_SET. When the device reaches the value of SENSOR_WARN_SET, the "Device needs maintenance soon" bit is set in BLOCK_ERR. When the device reaches the value of SENSOR_ALARM_SET, the "Device needs maintenance now" bit is set. The service timer must be activated in the SERVICE_INTERVAL parameter. If both bits are required, you must select the value "ON (warning + alarm)".

The timer and the bits are reset in the SERVICE_TIMER_RESET parameter.

6.5.4.2 Device description

The device description is based on the standard device description for resource block. 2 Manufacturer-specific parameters, hierarchical parameter menus and three methods have been added. With these methods, you can restart the processor in the current configuration or restart the processor and reset all configuration data to their default values. The last method resets the service timer.

If the host supports menus, the following menu structure is available. Sometimes the messages are abbreviated on the display.

Table 6- 12 Device description of the resource block

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
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		

The method "Restart: Default Values" allows a warm restart with factory settings. The values of the other blocks (function and transducer blocks) are also reset in the process.
With the method "Restart: Reset Processor", the processor is reset and the device is restarted. Under certain circumstances, the communication is interrupted during the startup phase until the processor is re-initialized.
The "Reset Service Timer" method resets the service timer. It provides an easy way to confirm the output of a warning or an alarm on the part of the service timer.

6.5.5 Analog input function block

Overview

The analog input function block (AI) is connected to one of the channels of the pressure transducer block. It is the source of the measurements for a function block application. The analog input is implemented according to the Fieldbus specification.
The following channels may be used as input: Pressure (primary value of the pressure transducer block), sensor temperature (secondary value of the pressure transducer block) and electronic temperature (tertiary value of pressure transducer block).
The SITRANS P, DS III FF series has three analog input function blocks. Therefore, all measurements of the pressure transducer block can be used in a fieldbus application.

Note

If multiple analog inputs have the same source, the input units of all analog input blocks must have the same value. Otherwise, a configuration error is output.

Parameter description

The analog input function block (AI) contains all standard parameters as in [FF-891-1.5]. You can find detailed information in the following table.

Table 6- 13 Analog Input Block

Label/parameter name/ access	Index (rel.)	Description/format
ACK_OPTION Acknowledge Option Read & Write	23	Selection whether alarms assigned to the function block are to be acknowledged automatically. Bit not set (0): Automatic acknowledgment deactivated Bit set (1): Automatic acknowledgment activated • 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 value within the alarm limits to which the PV must return before the alarm status is canceled. The hysteresis is configured as a percentage of the PV value range defined in OUT_SCALE. Data format: Float Value (4 bytes) Value range: 0.0 to 50.0 % Factory setting: 0.5 %
ALARM_SUM (Record) Alarm Summary	22	The current alarm status, unacknowledged states and deactivated states of the alarms assigned to the function block. 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 status of every 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)

Label/parameter name/ access		Index (rel.)	Description/format
	4. DISABLED Disabled Read & Write	22.4	The deactivated status of every 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 can be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Factory setting: 0
BLOCK_ALM (Record) Block alarm		21	The block alarm is used for all configuration, hardware and connection faults or system problems in the block. The cause of the alarm is entered in the subcode field. The first alarm which becomes active sets the active status in the status attribute. As soon as the Unreported status is cleared by the alarm message task, another block alarm 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	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • 0:Not initialized • 1:Acknowledged • 2:Unacknowledged Data format: Unsigned 8
	2. ALARM_STATE Alarm State Read only	8.2	Indicates whether the alarm is active and has been reported. • 0:Not initialized • 1:Not active, but reported • 2:Not active, not reported • 3:Active and reported • 4:Active, but not reported Data format: Unsigned 8
	3. TIME_STAMP Time Stamp Read only	8.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
	4. SUB_CODE Subcode Read only	8.4	A selected value that indicates the cause of the alarm to be reported. Values: see BLOCK_ERR Data format: Unsigned 16

Label/parameter name/ access		Index (rel.)	Description/format
	5. Value Value Read only	8.5	The value of the assigned parameter at the point in time at which the alarm was detected. Data format: Unsigned 8
BLOCK_ERR Block Error Read only		6	This parameter indicates the error status which is assigned to the hardware or software components that are associated with a block. Several errors may be indicated since this is a bit string. The following bits are supported: • Bit 15: Out of Service – *The current operating mode is "Out of Service"* Data format: Bit string with 16 bits (2 bytes)
CHANNEL Channel Read & Write		15	Used to select the transmitter output channel to be used as analog input on the block. • 1: Pressure • 2: Sensor Temperature • 3: Electronic Temperature Data format: Unsigned 16 Factory setting: Function block AI1: 1 Function block AI2: 2 Function block AI3: 3
FIELD_VAL (Record) Field Value		19	The value in % of the range and the status from the transducer block or from the simulated input when simulation is enabled. Data format: Record with 2 parameters (5 bytes)
	1. STATUS Status Read & Write	19.1	Status of the field value parameter. Includes the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8
	2. VALUE Value Read only	19.2	Field value in % of XD_SCALE range Data format: Float Value (4 bytes)
GRANT_DENY (Record) Grant Deny		12	Enable (Grant) or disable (Deny) access privileges of a host system to the field device. Data format: Record with 2 parameters (2 bytes)
	1. GRANT Grant Read & Write	12.1	Depending on the philosophy in the respective factory, the operator or a higher level device (HLD or a local operator panel (LOP), if Local is set, can activate a point of the Grant attribute (Program, Tuning, Alarm or Local). • Bit 0: Program – changed by HLD • Bit 1: Tune – changed by HLD • Bit 2: Alarm – changed by HLD • Bit 3: Local – changed by LOP Data format: Bit string with 8 bits (1 byte) Factory setting: 0x00

Label/parameter name/ access		Index (rel.)	Description/format
	2. DENY Deny Read & Write	12.2	The Denied attribute is provided for use by a monitoring application in an interface device and cannot be changed by the operator. • 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) Factory setting: 0x00
HI_HI_ALARM (Record) High High alarm		33	Status information, time, and associated value for an alarm which was triggered because the process value PV exceeded the high limit HI_HI_LIM. Data format: Record with 5 parameters (13 bytes)
	1. UNACKNOWLEDGED Unacknowledged Read only	33.1	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
	2. ALARM_STATE Alarm State Read only	33.2	Indicates whether the alarm is active and has been reported. • 0: Not initialized • 1: Not active, but reported • 2: Not active, not reported • 3: Active and reported • 4: Active, but not reported Data format: Unsigned 8
	3. TIME_STAMP Time Stamp Read only	33.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
	4. SUB_CODE Subcode Read only	33.4	A selected value that indicates the cause of the alarm to be reported. Data format: Unsigned 16
	5. Value Value Read only	33.5	The value of the assigned parameter at the point in time at which the alarm was detected. Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
HI_HI_LIM High High Limit Read & Write	26	The limit for the HI_HI_ALARM alarm. The setting is specified in the technical units of OUT_SCALE. Data format: Float Value (4 bytes) Factory setting: 1.# INF
HI_HI_PRI High High Alarm Priority Read & Write	25	Priority of the HI_HI_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
HI_ALARM (Record) High alarm	34	Status information, time, and associated value for an alarm which was triggered because the process value PV exceeded the high limit HI_LIM. 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 for the HI_ALARM alarm. The setting is specified in the technical units of OUT_SCALE. Data format: Float Value (4 bytes) Factory setting: 1.# INF
HI_PRI High Alarm Priority Read & Write	27	Priority of the HI_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
IO_OPTS I/O Options Read & Write	13	Enables you to select 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) Factory setting: 0x0000
L_TYPE Linearization Read & Write	16	The linearization type determines whether the value from the transducer block is used immediately (Direct), converted into other units (Indirect), or used with the square root of the input range defined by the transducer and the associated output range (Indirect Square Root). • 0: Not initialized • 1: Direct • 2: Indirect • 3: Indirect Square Root Data format: Unsigned 8 Factory setting: 0
LO_ALARM (Record) Low alarm	35	Status information, time, and associated value for an alarm which was triggered because the process value PV falls below the low limit LO_LIM. Data format: Record with 5 parameters (13 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	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 for the LO_ALARM alarm. The setting is specified in the technical units of OUT_SCALE. Data format: Float Value (4 bytes) Factory setting: -1.# INF
LO_PRI Low Alarm Priority Read & Write		29	Priority of the LO_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
LO_LO_ALARM (Record) Low Low alarm		36	Status information, time, and associated value for an alarm which was triggered because the process value PV falls below the low limit LO_LO_LIM. 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 for the LO_LO_ALARM alarm. The setting is specified in the technical units of OUT_SCALE. Data format: Float Value (4 bytes) Factory setting: -1.# INF
LO_LO_PRI Low Low Alarm Priority Read & Write		31	Priority of the LO_LO_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
LOW_CUT Low Cutoff Read & Write		17	When the scaled output signal falls below this value, the PV changes to the setting 0.0 according to the PV filter time constant. This function is active when the IO_OPTS bit 10 is set. The function is only suitable for 0-based signals such as flow. Data format: Float Value (4 bytes) – *must be a positive number* Factory setting: 0.0
MODE_BLK (Record) Block Mode		5	The current, intended, permitted and normal operating mode of the block. Data format: Record with 4 parameters (4 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	1. TARGET Target Read & Write	5.1	This is the operating mode requested by the operator. The target operating mode is limited to the values defined by the "Permitted operating 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 actual operating mode of the block, and may deviate from the target mode depending on the operating conditions. Its value is calculated during block execution. Bit 3: AutoBit 4: ManBit 7: OOS Data format: Bit string with 8 bits (1 byte)
	3. PERMITTED Permitted Read & Write	5.3	Specifies the operating modes which are permitted for the block at a specific point in time. The permitted operating mode is configured starting with the requirements of the application. • Bit 3: Auto • Bit 4: Man • Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Factory setting: 0x19 (Auto | Man | OOS)
	4.NORMAL Normal Read & Write	5.4	The block should be set to this operating mode for normal operating conditions. Bit 3: Auto data format: Bit string with 8 bits (1 byte) factory setting: 0x10 (Auto)
OUT (Record) Output		8	Status and value of the block output. Data format: Record with 2 parameters (5 bytes)
	1. STATUS Status Read & Write	8.1	Status of the OUT parameter. Includes the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8
	2. VALUE Value Read only	8.2	The OUT value is specified in the technical units of OUT_SCALE. Data format: Float Value (4 bytes)
OUT_SCALE (Record) Output Scale		11	The limits for the high and low range, the technical units and the number of digits right of the decimal point that should 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 value of the technical unit which specifies the high limit of the adjustment range for the associated block output. Data format: Float Value (4 bytes)
	2. EU_0 EU at 0% Read & Write	11.2	The value of the technical unit which specifies the low limit of the adjustment range for the associated block output. Data format: Float Value (4 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	3. UNITS_INDEX Units Index Read & Write	11.3	The device description index with the unit codes for the block output. Note: You can find a complete list of index codes for the units in the Foundation™ Fieldbus Specification Ff-131 FS 1.0. Section 3. Data format: Unsigned 16
	4. DECIMAL Decimal Read & Write	11.4	The number of digits 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	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 the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8
	2. VALUE Value Read only	7.2	The process variable is specified in the technical units of OUT_SCALE. Data format: Float Value (4 bytes)
PV_FTIME Process Variable Filter Time Read & Write		18	The time constant of the single-pole filter for the process variable. The time is specified in seconds. Data format: Float Value (4 bytes) – *must be a positive number* Factory setting: 0.0 s
SIMULATE (Record) Simulation Variable		9	Status and value of the simulation variable to be used as a block input if the simulation jumper has been 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 the attributes QUALITY, LIMITS and SUBSTATUS 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 block output. Data format: Unsigned 8
	4. TRANSDUCER_VALUE Transducer Value Read only	9.4	The actual value of transducer block output. Data format: Float Value (4 bytes)
	5. ENABLE_DISABLE Enable Disable Read & Write	9.5	Indicates whether the simulation is activated/deactivated. • 0: Not initialized • 1: Simulation deactivated • 2: Simulation active Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
ST_REV Static Revision Read only	1	The revision level of the static data assigned to the function block. The revision number increases by 1 when a static parameter value changes in the block. Data format: Unsigned 16
STATUS_OPTS Status Options Read & Write	14	Enables you to select 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) Factory setting: 0x0000
STRATEGY Strategy Read & Write	3	Groups of blocks can be specified using the Strategy field. This data is not checked or processed by the block. Data format: Unsigned 16 Factory setting: 0
TAG_DESC Tag Description Read & Write	2	A text entered by the user as a description for the sensor transducer function block. Data format: 8-bit string (32 bytes)
UPDATE_EVT (Record) Update Event	20	This alarm is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	20.1	This parameter is set to "Unacknowledged" when an update occurs and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. UPDATE_STATE Update State Read only	20.2	Indicates whether the alarm has been reported. • 0: Not initialized • 1: Update Reported • 2: Update Not Reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	20.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	4. STATIC_REVISION Static Revision Read only	20.4	The value of ST_REV at the point in time of the warning. The current value of the static change may 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 relative index of the static parameter whose change triggered this alarm. If the updating event has been triggered in that several parameters were written simultaneously, the attribute is set to 0. Data format: Unsigned 16
XD_SCALE (Record) Transducer Scale		10	The limits for the high and low range, the technical units and the number of digits right of the decimal point for the channel input. Data format: Record with 4 parameters (11 bytes)
	1. EU_100 EU at 100% Read & Write	10.1	The value of the technical unit which specifies the high limit of the adjustment range for the associated channel input. Data format: Float Value (4 bytes)
	2. EU_0 EU at 0% Read & Write	10.2	The value of the technical unit which specifies the low limit of the adjustment range for the associated channel input. Data format: Float Value (4 bytes)
	3. UNITS_INDEX Units Index Read & Write	10.3	The device description index with the unit codes for the channel input. This UNITS_INDEX must match the UNITS_INDEX of the transmitter because the block does not change from manual to automatic mode otherwise. Data format: Unsigned 16
	4. DECIMAL Decimal Read & Write	10.4	Number of decimal places to be used by an interface device to display the channel input. Data format: Unsigned 8

6.5.5.1 Special functions and options

The three analog input blocks are supplied pre-configured for measuring the pressure, the sensor temperature and the electronics temperature. If only these measurements are of interest, only L_TYPE must be selected. This is not initialized in the factory state. In most applications, the scaling of the input and output values of the analog input function block must be adjusted.

6.5.5.2 Device description

The device description is based on the standard device description for the analog input function block. Hierarchical parameter menus have been added.

If the host supports menus, the following menu structure is available. Sometimes the messages are abbreviated on the display.

Table 6- 14 Device description of the analog input block

Menu	Block properties	Identification	TAG_DESC
			STRATEGY
			ALERT_KEY
			ST_REV
Menu	Block properties	Scaling	XD_SCALE
			OUT_SCALE
		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	

6.5.6 PID function block

Overview

The PID function block (PID) implements a controller function. The information can be received over the bus or locally from the analog input function blocks. The output can be sent to devices that in turn have their own inputs, for example, the analog output function block of a positioner. The PID function block can be cascaded.

Parameter description

The PID function block contains all standard parameters in accordance with the specification [FF-891-1.5].

You can find detailed information in the following table.

Table 6- 15 PID block

Label/parameter name/ access	Index (rel.)	Description/format
ACK_OPTION Acknowledge Option Read & Write	46	Selection whether alarms assigned to the function block are to be acknowledged automatically. Bit not set (0): Automatic acknowledgment deactivated Bit set (1): Automatic acknowledgment activated • Bit 0: Write function has been deactivated • 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) Factory setting: 0x00
ALARM_HYS Alarm Hysteresis Read & Write	47	The current alarm status, unacknowledged states and deactivated states of the alarms assigned to the function block. Data format: Float Value (4 bytes) Value range: 0.0 to 50.0 % Factory setting: 0.5 %
ALARM_SUM (Record) Alarm Summary	45	The current alarm status, unacknowledged states and deactivated states of the alarms assigned to the function block. 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)

Label/parameter name/ access	Index (rel.)	Description/format
2. UNACKNOWLEDGED Unacknowledged Read only	45.2	The unacknowledged status of every 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 every 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 deactivated status of every 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 can be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Factory setting: 0
BAL_TIME Balance Time Read & Write	25	This parameter specifies the time (in seconds) for the internal bias or ratio working value as reply to the bias or ratio value set by the operator. This parameter can be used in the PID block to define the time constant at which the integral component moves such that equilibrium is established, provided the output has been limited and the "Auto", "Cas" or "RCas" mode is present. Data format: Float Value (4 bytes) Value range: ≥ 0.0 s Factory setting: 0.0 s
BKCAL_HYS Back Calculation Hysteresis Read & Write	30	The hysteresis value for reporting a limitation of the output value OUT. Specified as a percent of the output value range defined by OUT_SCALE. Data format: Float Value (4 bytes) Value range: 0.0 to 50.0 % Factory setting: 0.5 %
BKCAL_IN (Record) Back Calculation Input	27	The value and status of the analog input from the BKCAL_OUT parameter of a downstream function block. Used for tracking the output to allow a bumpless operating mode switching. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	27.1	The status of the back calculation variable. Includes the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
2. VALUE Value Read only	27.2	Back calculation value Data format: Float Value (4 bytes)
BKCAL_OUT (Record) Back Calculation Output	31	The analog value and status which is reported to the BKCAL_IN parameter of an upstream block when the loop is interrupted or restricted. Used for tracking the output based on the status bits to allow bumpless operating mode switching in applications with closed loop control. Data format: Record with 2 parameters (5 bytes)
1. STATUS	31.1	See PID block -> BKCAL_IN
2. VALUE	31.2	See PID block -> BKCAL_IN
BLOCK_ALM (Record) Block alarm	44	The block alarm is used for all configuration, hardware and connection faults or system problems in the block. The cause of the alarm is entered in the subcode field. The first alarm which becomes active sets the active status in the status attribute. As soon as the Unreported status is cleared by the alarm message task, another block alarm may be reported without clearing the Active status when the sub-code has changed. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	44.1	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	44.2	Indicates whether the alarm is active and has been reported. • 0: Not initialized • 1: Not active, but reported • 2: Not active, not reported • 3: Active and reported • 4: Active, but not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	44.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	4. SUB_CODE Subcode Read only	44.4	A selected value that indicates the cause of the alarm to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
	5. Value Value Read only	44.5	The value of the assigned parameter at the point in time at which the alarm was detected. Data format: Unsigned 8
BLOCK_ERR Block Error Read only		6	This parameter indicates the error status which is assigned to the hardware or software components that are associated with a block. Several errors may be indicated since this is a bit string. The following bits are supported: • Bit 1: Block Configuration • Bit 15: Out of Service – *The current operating mode is "Out of Service"* Data format: Bit string with 16 bits (2 bytes)
BYPASS Bypass Read & Write		17	Used to bypass the normal PID calculation. OUT is equal to SP, if this parameter is activated. In order to prevent unevenness in the transition from/to the bypass, the setpoint is automatically initialized at the respective output value and the flag "Path broken" is set for one transition. • 0: Not initialized • 1: Off • 2: On Data format: Unsigned 8 Factory setting: 0
CAS_IN (Record) Back Calculation Output		18	Analog setpoint and status in CAS mode. Applied from a preceding function block. 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

Label/parameter name/ access	Index (rel.)	Description/format
CONTROL_OPTS Control Options Read & Write	13	Options which can be used to change the calculations made 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) Factory setting: 0x0000
DV_HI_ALARM (Record) Deviation High alarm	64	Status information, time, and associated value for an alarm which was triggered because the process value PV exceeded the high limit DV_HI_LIM. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED Unacknowledged Read only	64.1	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	64.2	Indicates whether the alarm is active and has been reported. • 0: Not initialized • 1: Not active, but reported • 2: Not active, not reported • 3: Active and reported • 4: Active, but not reported Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
3. TIME_STAMP Time Stamp Read only	64.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
4. SUB_CODE Subcode Read only	64.4	A selected value that indicates the cause of the alarm to be reported. Data format: Unsigned 16
5. Value Value Read only	64.5	The value of the assigned parameter at the point in time at which the alarm was detected. Data format: Unsigned 8
DV_HI_LIM Deviation High Alarm Limit Read & Write	57	The limit for the DV_HI_ALARM alarm. The setting is specified in the technical units of PV_SCALE. Data format: Float Value (4 bytes) Factory setting: 1.# INF (not active)
DV_HI_PRI Deviation High Alarm Priority Read & Write	56	Priority of the DV_HI_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
DV_LO_ALARM (Record) Deviation Low alarm	65	Status information, time, and associated value for an alarm which was triggered because the process value PV falls below the low limit DV_LO_LIM. 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 for the DV_LO_ALARM alarm. The setting is specified in the technical units of PV_SCALE. Data format: Float Value (4 bytes) Factory setting: -1.# INF (not active)
DV_LO_PRI Deviation Low Alarm Priority Read & Write	58	Priority of the alarm DV_LO_ALARM. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0

Label/parameter name/ access	Index (rel.)	Description/format
FF_GAIN Feed Forward Gain Read & Write	42	Gain factor for the disturbance variable feedforward. The manipulated variable applied via FF_VAL is multiplied by this factor before it is added to the output value. Data format: Float Value (4 bytes) Factory setting: 0.0
FF_SCALE (Record) Feed Forward Scale	41	The limits for the high and low range, the technical units and the number of digits right of the decimal point for the disturbance variable input. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read & Write	41.1	The value of the technical unit which specifies the high limit of the adjustment range for the associated disturbance variable input. Data format: Float Value (4 bytes) Factory setting: 100.0 %
2. EU_0 EU at 0% Read & Write	41.2	The value of the technical unit which specifies the low limit of the adjustment range for the associated disturbance variable input. Data format: Float Value (4 bytes) Factory setting: 0.0 %
3. UNITS_INDEX Units Index Read & Write	41.3	The device description index with the units codes for the FF input. Note: *You can find a complete list of index codes for the units in the Foundation™ Fieldbus Specification Ff-131 FS 1.0. Section 3.* Data format: Unsigned 16 Factory setting: %
4. DECIMAL Decimal Read & Write	41.4	The number of digits right of the decimal point to be used by an interface device for displaying the FF input. Data format: Unsigned 8 Factory setting: 0
FF_VAL (Record) Feed Forward Value	40	Input used as the disturbance variable in the PID algorithm. Data format: Record with 2 parameters (5 bytes)
1. STATUS	40.1	See PID block -> BKCAL_IN
2. VALUE	40.2	See PID block -> BKCAL_IN
GAIN Gain Read & Write	23	Proportional gain used by the PID algorithm. Data format: Float Value (4 bytes) Factory setting: 0.0
GRANT_DENY (Record) Grant Deny	12	Enable (Grant) or disable (Deny) access privileges of a host system to the field device. Data format: Record with 2 parameters (2 bytes)

Label/parameter name/ access	Index (rel.)	Description/format
1. GRANT Grant Read & Write	12.1	Depending on the philosophy in the respective factory, the operator or a higher level device (HLD or a local operator panel (LOP), if Local is set, can activate a point of the Grant attribute (Program, Tuning, Alarm or Local). • Bit 0: Program – *changed by HLD* • Bit 1: Tune – *changed by HLD* • Bit 2: Alarm – *changed by HLD* • Bit 3: Local – *changed by LOP* Data format: Bit string with 8 bits (1 byte) Factory setting: 0x00
2. DENY Deny Read & Write	12.2	The Denied attribute is provided for use by a monitoring application in an interface device and cannot be changed by the operator. • 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) Factory setting: 0x00
HI_HI_ALARM (Record) High High alarm	60	Status information, time, and associated value for an alarm which was triggered because the process value PV exceeded the high limit HI_HI_LIM. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	60.1	See PID block -> DV_HI_ALARM
2. ALARM STATE	60.2	See PID block -> DV_HI_ALARM
3. TIME STAMP	60.3	See PID block -> DV_HI_ALARM
4. SUB_CODE	60.4	See PID block -> DV_HI_ALARM
5. VALUE	60.5	See PID block -> DV_HI_ALARM
HI_HI_LIM High High Alarm Limit Read & Write	49	The limit for the HI_HI_ALARM alarm. The setting is specified in the technical units of PV_SCALE. Data format: Float Value (4 bytes) Factory setting: 1.# INF (not active)
HI_HI_PRI High High Alarm Priority Read & Write	48	Priority of the HI_HI_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
HI_ALARM (Record) High alarm	61	Status information, time, and associated value for an alarm which was triggered because the process value PV exceeded the high limit HI_LIM. Data format: Record with 5 parameters (13 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	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 for the HI_ALARM alarm. The setting is specified in the technical units of PV_SCALE. Data format: Float Value (4 bytes) Factory setting: 1.# INF
HI_PRI High Alarm Priority Read & Write		50	Priority of the HI_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
IN (Record) Input		15	The input for the process variable to be controlled. 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	Status information, time, and associated value for an alarm which was triggered because the process value PV falls below the low limit LO_LIM. 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 for the LO_ALARM alarm. The setting is specified in the technical units of PV_SCALE. Data format: Float Value (4 bytes) Factory setting: -1.# INF (not active)
LO_PRI Low Alarm Priority Read & Write		52	Priority of the LO_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0

Label/parameter name/ access	Index (rel.)	Description/format
LO_LO_ALARM (Record) Low Low alarm	63	Status information, time, and associated value for an alarm which was triggered because the process value PV falls below the low limit LO_LO_LIM. Data format: Record with 5 parameters (13 bytes)
1. UNACKNOWLEDGED	63.1	See PID
2. ALARM STATE	63.2	See PID
3. TIME STAMP	63.3	See PID
4. SUB_CODE	63.4	See PID
5. VALUE	63.5	See PID
LO_LO_LIM Low Low Alarm Limit Read & Write	55	The limit for the LO_LO_ALARM alarm. The setting is specified in the technical units of PV_SCALE. Data format: Float Value (4 bytes) Factory setting: -1.# INF (not active)
LO_LO_PRI Low Low Alarm Priority Read & Write	54	Priority of the LO_LO_ALARM alarm. Data format: Unsigned 8 Value range: 0 … 15 Factory setting: 0
MODE_BLK (Record) Block Mode	5	The current, intended, permitted and normal operating mode of the block. Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the operating mode requested by the operator. The target operating mode is limited to the values defined by the "Permitted operating mode" parameter. • Bit 0: ROut (remote control output mode) • Bit 1: RCas (cascade remote control mode) • Bit 2: Cas (cascade control 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)

Label/parameter name/ access	Index (rel.)	Description/format
2. ACTUAL Actual Read only	5.2	This is the actual operating mode of the block and may deviate from the target mode depending on the operating conditions. Its value is calculated during block execution. • Bit 0: ROut • Bit 1: RCas • Bit 2: Cas • Bit 3: Auto • Bit 4: Man • Bit 5: LO (local priority mode) • Bit 6: IMan (manual initialization mode) • Bit 7: OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Specifies the operating modes which are permitted for the block at a specific point in time. The permitted operating mode is configured starting from the requirements of the application. • 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) Factory setting: 0x19 (Auto | Man | OOS)
4.NORMAL Normal Read & Write	5.4	The block should be set to this operating mode for normal operating conditions. • Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Factory setting: 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
OUT_HI_LIM Output High Limit Read & Write	28	This parameter is used to limit the output value OUT of the PID block to a maximum value. The setting is specified in the technical units of OUT_SCALE (+/- 10 %). Data format: Float Value (4 bytes) Factory setting: 100.0 %
OUT_LO_LIM Output Low Limit Read & Write	29	This parameter is used to limit the output value OUT of the PID block to a minimum value. The setting is specified in the technical units of OUT_SCALE (+/- 10 %). Data format: Float Value (4 bytes) Factory setting: 0.0 %

Label/parameter name/ access	Index (rel.)	Description/format
OUT_SCALE (Record) Output Scale	11	The limits for the high and low range, the technical units and the number of digits right of the decimal point for 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. Indicates the value and status of the variable that is processed 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 the single-pole filter for the process variable. The time is specified in seconds. Data format: Float Value (4 bytes) – *must be a positive number* Value range: ≥ 0.0 s Factory setting: 0.0 s
PV_SCALE (Record) Process Variable Scale	10	The limits for the high and low range, the technical units and the number of digits right of the decimal point for 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 time setting for the D component of the PID algorithm. Data format: Float Value (4 bytes) Factory setting: 0.0
RCAS_IN (Record) Remote Cascade Input	32	The setpoint and status for the analog setpoint in RCAS mode. The value is specified 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
RCAS_OUT (Record) Remote Cascade Output	35	The setpoint and status of the block in RCAS mode following application of the ramp function. Made available to a host computer to enable reaction to mode changes and signal limitations. Data format: Record with 2 parameters (5 bytes)
1. STATUS	35.1	See PID block -> BKCAL_IN
2. VALUE	35.2	See PID block -> BKCAL_IN

Label/parameter name/ access	Index (rel.)	Description/format
RESET Reset Read & Write	24	The integral action setting the PID algorithm. Units in seconds/repetition. Data format: Float Value (4 bytes) Factory setting: 1.# INF s/repeat
ROUT_IN (Record) Remote Output Input	33	Setpoint and status passed from the higher-level host computer to the analog output in the ROut mode. The value is specified in units of OUT_SCALE. Data format: Record with 2 parameters (5 bytes)
1. STATUS	33.1	See PID block -> BKCAL_IN
2. VALUE	33.2	See PID block -> BKCAL_IN
ROUT_OUT (Record) Remote Output Output	36	The output of the setpoint and status of the block in accordance with ROUT_IN in ROUT mode after application of the ramp function. Made available to a higher-level host computer to enable reaction to mode changes and signal limitations. Data format: Record with 2 parameters (5 bytes)
1. STATUS	36.1	See PID block -> BKCAL_IN
2. VALUE	36.2	See PID block -> BKCAL_IN
SHED_OPT Shed Options Read & Write	34	Specifies the measures to be executed in RCAS mode in the event of a host computer timeout. • 0: Not initialized • 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 Factory setting: 0
SP (Record) Setpoint Variable	8	The setpoint of the block. Indicates the value and status of the variable that is processed by the algorithm. Data format: Record with 2 parameters (5 bytes)
1. STATUS	8.1	See PID block -> BKCAL_IN
2. VALUE	8.2	See PID block -> BKCAL_IN
SP_HI_LIM Setpoint High Limit Read & Write	21	This parameter is used to limit the setpoint PV of the PID block to a maximum value. The setting is specified in the technical units of PV_SCALE (+/- 10 %). Data format: Float Value (4 bytes) Factory setting: 100.0 %

Label/parameter name/ access	Index (rel.)	Description/format
SP_LO_LIM Setpoint Low Limit Read & Write	22	This parameter is used to limit the setpoint PV of the PID block to a minimum value. The setting is specified in the technical units of PV_SCALE (+/- 10 %). Data format: Float Value (4 bytes) Factory setting: 0.0 %
SP_RATE_DN Setpoint Rate Down Read & Write	19	Ramp rate to react to downward changes to the setpoint in Auto mode in PV units per second. If the ramp rate is set to zero or the block is in a mode other than automatic, the setpoint is used immediately. Data format: Float Value (4 bytes) Factory setting: 1.# INF (not active)
SP_RATE_UP Setpoint Rate Up Read & Write	20	Ramp rate to react to upward changes to the setpoint in Auto mode in PV units per second. If the ramp rate is set to zero or the block is in a mode other than automatic, the setpoint is used immediately. Data format: Float Value (4 bytes) Factory setting: 1.# INF (not active)
ST_REV Static Revision Read only	1	The revision level of the static data assigned to the function block. The revision number increases by 1 when a static parameter value changes in the block. Data format: Unsigned 16
STATUS_OPTS Status Options Read & Write	14	Enables you to select options for the PID block. The following options are available: • Bit 0: IFS (Initiate Fault State) if Bad IN (Initiate Fault State if 'Bad IN') • Bit 1: IFS if Bad CAS_IN (Initiate Fault State if 'Bad CAS_IN') • Bit 2: Use Uncertain as Good • Bit 5: Target to Man if Bad IN (target to manual mode if 'Bad IN') • Bit 9: Target to next permitted mode if Bad CAS_IN Data format: Bit string with 16 bits (2 bytes) Factory setting: 0x0000
STRATEGY Strategy Read & Write	3	Groups of blocks can be specified using the Strategy field. This data is not checked or processed by the block. Data format: Unsigned 16 Factory setting: 0
TAG_DESC Tag Description Read & Write	2	A text entered by the user as a description for the PID block. Data format: 8-bit string (32 bytes)
TRK_IN_D (Record) Tracking Input - Discrete	38	Used to activate the tracking function. Data format: Record with 2 parameters (5 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	1. STATUS Status Read & Write	38.1	The status of the tracking input variable. Includes the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8
	2. VALUE Value Read only	38.2	The value of the discrete input that has been received from another block parameter to which the block is connected. Can also be a default value or a value specified by the user when the block input is not connected. • 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 limits for the high and low range, the technical units and the number of digits right of the decimal point for 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	This analog input serves as a tracking value if the tracking function has been enabled with the TRK_IN_D parameter. 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
UPDATE_EVT (Record) Update Event		43	This alarm is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
	1. UNACKNOWLEDGED Unacknowledged Read & Write	43.1	This parameter is set to "Unacknowledged" when an update occurs and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
	2. UPDATE_STATE Update State Read only	43.2	Indicates whether the alarm has been reported. • 0: Not initialized • 1: Update Reported • 2: Update Not Reported Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
3. TIME_STAMP Time Stamp Read only	43.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
4. STATIC_REVISION Static Revision Read only	43.4	The value of ST_REV at the point in time of the warning. The current value of the static change may be greater than this because the static parameter can be changed at any time. Data format: Unsigned 16
5. RELATIVE_INDEX Relative Index Read only	43.5	The relative index of the static parameter whose change triggered this alarm. If the updating event has been triggered in that several parameters were written simultaneously, the attribute is set to 0. Data format: Unsigned 16

6.5.6.1 Special functions and options

The inputs of the PID can come from internal analog input function blocks or through communication with external devices. The PID block can be used in cascade control.

6.5.6.2 Device description

The device description is based on the standard device description for the PID function block. Hierarchical parameter menus have been added.

If the host supports menus, the following menu structure is available. Sometimes the messages are abbreviated on the display.

Table 6- 16 Device description of the PID block

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	
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	

6.5.7 Transducer block, pressure with calibration

Overview

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

The pressure transducer block is closely modeled on the preliminary draft specification (Pressure Transducer Block with Calibration). This block contains a timer for calibration which works similar to the timer for the service interval of the resource block. It depends on the operating time of the sensor. In addition to function block simulation, this transducer block offers the option to simulate the measured values of all three strands that can be used by analog input function blocks.

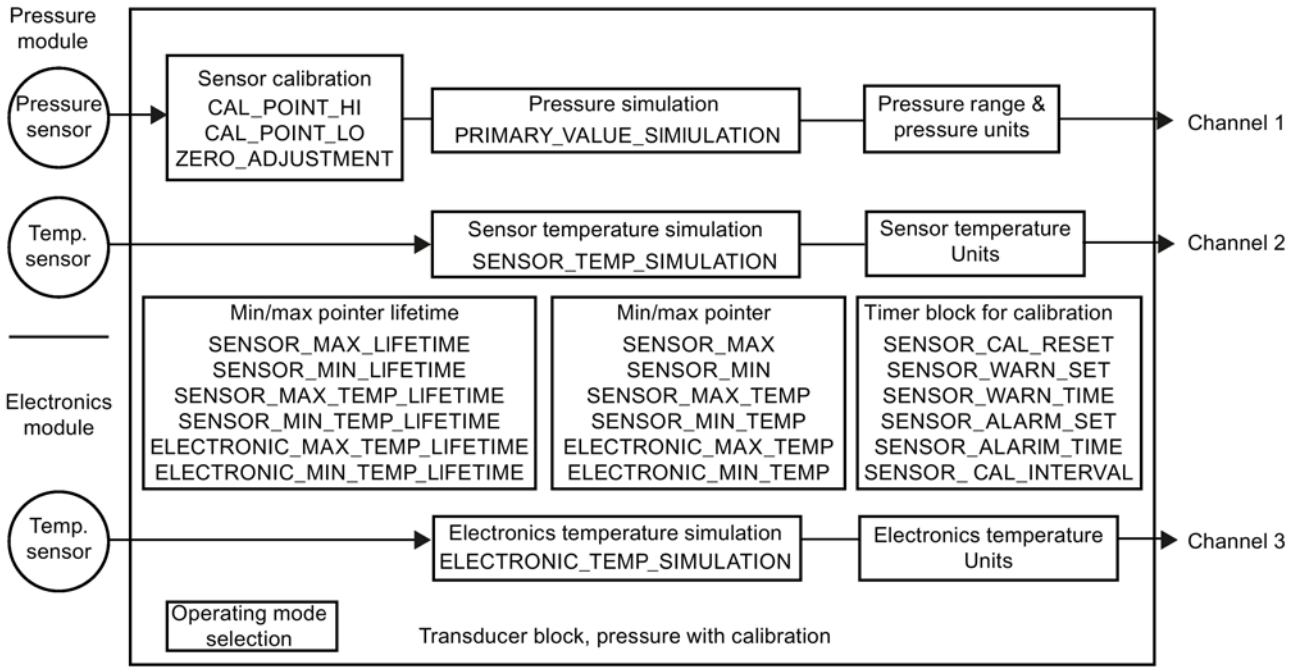


Image 6-6 How the transducer block pressure with calibration works

Parameter description

The pressure transducer bock contains all standard parameters as in [FF-891-1.5] as well as a number of vendor-specific parameters. These include additional static information about the device and an operating hours counter.

You can find detailed information in the following table.

Table 6- 17 Sensor Transducer Block

Label/parameter name/ access	Index (rel.)	Description/format
ALERT_KEY Alert Key Read & Write	4	The current alarm status, unacknowledged states and deactivated states of the alarms assigned to the function block. Data format: Unsigned 8 Value range: 1 … 255 Factory setting: 0
BLOCK_ALM (Record) Block alarm	8	The block alarm is used for all configuration, hardware and connection faults or system problems in the block. The cause of the alarm is entered in the subcode field. The first alarm which becomes active sets the active status in the status attribute. As soon as the Unreported status is cleared by the alarm message task, another block alarm 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	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • 0: Not initialized1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	8.2	Indicates whether the alarm is active and reported. 0: Not initialized1: Not active, but reported2: Not active, not reported3: Active and reported4: Active, but not reported. Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	8.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
4. SUB_CODE Subcode Read only	8.4	A selected value that indicates the cause of the alarm to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
5. Value Value Read only	8.5	The value of the assigned parameter at the point in time at which the alarm was detected. Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
BLOCK_ERR Block Error Read only	6	This parameter indicates the error status which is assigned to the hardware or software components that are associated with a block. Several errors may be indicated since this is a bit string. • Bit 6: Sensor Needs Service Soon – *A warning about pending servicing was output.* • Bit 13: Sensor Needs Service Now – *A warning about required servicing was output.* • Bit 15: Out of Service – *The current operating 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 minimum allowable difference between the high and low calibration point. The display is made 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 setting point of the sensor in the CAL_UNIT units used during the last calibration. If you write a value to this parameter, the maximum calibration value is set equal to the actual pressure at the input. Also sets the value 104 (User Trimmed Standard Calibration) for SENSOR_CAL_METHOD. Data format: Float Value (4 bytes)
CAL_POINT_LO Calibration Point Low Read & Write	17	The minimum setting point of the sensor in the CAL_UNIT units used during the last calibration. If you write a value to this parameter, the minimum calibration value is set equal to the actual pressure at the input. Also sets the value 104 (User Trimmed Standard Calibration) for SENSOR_CAL_METHOD. Data format: Float Value (4 bytes)

Label/parameter name/ access	Index (rel.)	Description/format
CAL_UNIT Calibration Units Read & Write	19	Defines the technical units used in the calibration of 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) (inch water column at 4°C) • 1148: inH_2O (68°F) (inch water column at 68°F) • 1150: mmH_2O (4°C) (millimeter water column at 4°C) • 1151: mmH_2O (68°F) (millimeter water column at 68°F) • 1154: ftH_2O (68°F) (foot water column at 68°F) • 1156: inHg (0°C) (inch mercury column at 0°C) • 1158: mmHg (0°C) (millimeter mercury column at 0°C) Data format: Unsigned 16
COLLECTION_DIRECTORY Collection Directory Read only	12	This directory lists the number, the starting index and DD ID numbers of 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 temperature of the electronics since the last reset. If you write the value 0 to this parameter, the value is reset to the current temperature. Data format: Float Value (4 bytes) Note: *This value for the electronics temperature is obtained from the actual measurement or by a simulated value. This value must be reset after simulation.*
ELECTRONIC_MAX_TEMP_LIFETIME Electronic Maximum Temperature - Lifetime Read only	51	The maximum temperature of the electronics since the first installation of the transmitter. Data format: Float Value (4 bytes) Note: *This value is not affected by a simulation.*
ELECTRONIC_MIN_TEMP Electronic Minimum Temperature Read & Write	50	The minimum temperature of the electronics since the last reset. If you write the value 0 to this parameter, the value is reset to the current temperature. Data format: Float Value (4 bytes) Note: *This value for the electronics temperature is obtained from the actual measurement or by a simulated value. This value must be reset after simulation.*

Label/parameter name/ access	Index (rel.)	Description/format
ELECTRONIC_MIN_TEMP_ LIFETIME Electronic Minimum Tem- perature - Lifetime Read only	52	The minimum temperature of the electronics since the first installation of the transmitter. Data format: Float Value (4 bytes) Note: *This value is not affected by a simulation.*
ELECTRONIC_TEMP_RAN GE (Record) Electronic Temperature Range	33	The limits for the high and low range, the technical units and the number of digits right of the decimal point that should be used to display the electronics temperature. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100 %Read only	33.1	The value of the technical unit which specifies the high limit of the adjustment range for the electronics temperature. Data format: Float Value (4 bytes) Factory setting: 85.0 °C
2. EU_0 EU at 0% Read only	33.2	The value of the technical unit which specifies the low limit of the adjustment range for the electronics temperature. Data format: Float Value (4 bytes) Factory setting: –40.0 °C
3. UNITS_INDEX Units Index Read only	33.3	The device description index with the unit codes for the elec- tronics temperature. The values are always given in °C. Data format: Unsigned 16 Factory setting: 1001: °C (degrees Celsius)
4. DECIMAL Decimal Read only	33.4	The number of digits right of the decimal point to be used by an interface device for displaying the electronic temperature. Data format: Unsigned 8 Factory setting: 2
ELECTRONIC_TEMP_SIM U LATION (Record) Electronic Temperature Simulation	55	Enables you to simulate the electronics temperature value. Data format: Record with 6 parameters (17 bytes)
1. FIXED_VALUE Fixed Value Read & Write	55.1	This value is used for the simulation of the electronics tem- perature when the fixed value simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0
2. MINIMUM_VALUE Minimum Value Read & Write	55.2	This value is used as the starting point in the simulation of the electronics temperature when the ramp simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0
3. MAXIMUM_VALUE Maximum Value Read & Write	55.3	This value is used as the end point in the simulation of the electronics temperature when the ramp simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0

Label/parameter name/ access		Index (rel.)	Description/format
	4. NUMBER_OF_STEPS Number of Steps Read & Write	55.4	The number of ramp steps when ramp simulation has been selected. Data format: Unsigned 16 value range: 1 … 65535 Factory setting: 1
	5. DURATION_OF_STEP Duration of a Step Read & Write	55.5	The duration of each step in seconds when ramp simulation has been selected. Data format: Unsigned 16 value range: 1 … 65535 Factory setting: 1
	6. SMODE Simulation Mode Read & Write	55.6	Simulation mode. The following options can be selected: • 0: Off • 1: Fixed value simulation • 2: Ramp simulation Data format: Unsigned 8 Factory setting: 0
ELECTRONIC_ TEMPERATURE (Record) Electronic Temperature		32	The electronics temperature and output of channel 3 of the transducer block. Data format: Record with 2 parameters (5 bytes)
	1. STATUS Status Read & Write	32.1	The status of the electronics temperature variable. Includes the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8
	2. VALUE Value Read only	32.2	The value of the electronics temperature in the units defined by ELECTRONIC_TEMPERATURE_RANGE.UNITS_INDEX. Data format: Float Value (4 bytes)
MODE_BLK (Record) Block Mode		5	The current, intended, permitted and normal operating mode of the block. Data format: Record with 4 parameters (4 bytes)
	1. TARGET Target Read & Write	5.1	This is the operating mode requested by the operator. The target operating mode is limited to the values defined by the "Permitted operating 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 actual operating mode of the block and may deviate from the target mode depending on the operating conditions. Its value is calculated during block execution. • Bit 3: Auto • Bit 7: OOS Data format: Bit string with 8 bits (1 byte)

Label/parameter name/ access		Index (rel.)	Description/format
	3. PERMITTED Permitted Read & Write	5.3	Specifies the operating modes which are permitted for the block at a specific point in time. The permitted operating mode is configured starting with the requirements of the application. • Bit 3: Auto • Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Factory setting: 0x11 (Auto | OOS)
	4.NORMAL Normal Read & Write	5.4	The block should be set to this operating mode for normal operating conditions. • Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Factory setting: 0x10 (Auto)
MODULE_RANGE_CODE Module Range Code Read only		60	Indicates the measuring 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

Label/parameter name/ access	Index (rel.)	Description/format
MODULE_TYPE Module Type Read only	59	Specifies the type of sensor module. • 0: Differential pressure (DP), PN 160 • 1: Manometer pressure/pressure (GP) • 2: Absolute pressure (AP), (from DP) • 3: DP, high pressure (HP), PN 420 • 4: Fill level, LT or LLT • 5: DP, PN 32 • 6: DP, PN 320 • 236: PMC type • 237: AP (of 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 required pressure offset for zero calibration of the transmitter to compensate for mounting position related errors. Data format: Float Value (4 bytes)
PRIMARY_VALUE (Record) Primary Value	14	The primary value and output of channel 1 of the transducer block. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	14.1	The status of the primary value. Includes the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8
2. VALUE Value Read only	14.2	The value of the primary value in the units defined by PRIMARY_VALUE_RANGE.UNITS_INDEX. Data format: Float Value (4 bytes)
PRIMARY_VALUE_RANGE (Record) Primary Value Range	15	The limits for the high and low range, the technical units and the number of digits right of the decimal point that should be used to display the primary value. Data format: Record with 4 parameters (11 bytes)
1. EU_100 EU at 100% Read only	15.1	The value of the technical unit which specifies the high limit of the adjustment range for the associated primary value. Data format: Float Value (4 bytes)
2. EU_0 EU at 0% Read only	15.2	The value of the technical unit which specifies the low limit of the adjustment range for the associated primary value. Data format: Float Value (4 bytes)
3. UNITS_INDEX Units Index Read only	15.3	The device description index with the unit codes for the primary value. Data format: Unsigned 16

Label/parameter name/ access		Index (rel.)	Description/format
	4. DECIMAL Decimal Read only	15.4	The number of digits right of the decimal point to be used by an interface device for displaying the primary value. Data format: Unsigned 8
PRIMARY_VALUE_ SIMULATION (Record) Primary Value Simulation		53	Enables you to simulate the primary value. Data format: Record with 6 parameters (17 bytes)
	1. FIXED_VALUE Fixed Value Read & Write	53.1	This value is used for the simulation of the primary value when the fixed value simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0
	2. MINIMUM_VALUE Minimum Value Read & Write	53.2	This value is used as the starting point in the simulation of the primary value when the ramp simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0
	3. MAXIMUM_VALUE Maximum Value Read & Write	53.3	This value is used as the end point in the simulation of the primary value when the ramp simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0
	4. NUMBER_OF_STEPS Number of Steps Read & Write	53.4	The number of ramp steps when ramp simulation has been selected. Data format: Unsigned 16 value range: 1 … 65535 Factory setting: 1
	5. DURATION_OF_STEP Duration of a Step Read & Write	53.5	The duration of each step in seconds when ramp simulation has been selected. Data format: Unsigned 16 value range: 1 … 65535 Factory setting: 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: Ramp simulation Data format: Unsigned 8 Factory setting: 0 You can only activate simulation mode if you have set the simulation jumper as described in the section Enable/disable simulation (Page 169).
PRIMARY_VALUE_TYPE Primary Value Type Read & Write		13	Specifies the type of the primary measured variable. • 107: Differential pressure • 108: Gauge pressure • 109: Absolute pressure Data format: Unsigned 16

Label/parameter name/ access	Index (rel.)	Description/format
SECONDARY_VALUE (Record) Secondary Value	29	The secondary value (sensor temperature) and output of channel 2 of the transducer block. Data format: Record with 2 parameters (5 bytes)
1. STATUS Status Read & Write	29.1	The status of secondary value. Includes the attributes QUALITY, LIMITS and SUBSTATUS for the value. Data format: Unsigned 8
2. VALUE Value Read only	29.2	The value of the secondary value in the units defined by SECONDARY_VALUE_UNIT. Data format: Float Value (4 bytes)
SECONDARY_VALUE_ UNIT Secondary Value Units Read & Write	30	The device description index with the unit codes for the secondary value (sensor temperature). • 1000: K (Kelvin) • 1001: °C (degrees Celsius) • 1002: °F (degrees Fahrenheit) • 1003: °R (degrees Rankine) Data format: Unsigned 16
SENSOR_ALARM_SET Sensor Alarm Setting Read & Write	38	Sets how long to wait (in hours) after a sensor calibration warning before a sensor calibration alarm is generated. Data format: Float Value (4 bytes) Value range: 0.0 h to 596000 h Factory setting: 720 h
SENSOR_ALARM_TIME Sensor Alarm Time Read only	37	The time (in hours) since the sensor calibration warning was output. The value is 0.0 prior to the warning. When this time reaches the value of SENSOR_ALARM_SET, bit 13 is set in BLOCK_ERR and SENSOR_CAL_INTERVAL has the value. 4 Data format: Float Value (4 bytes)
SENSOR_CAL_DATE Sensor Calibration Date Read & Write	25	Date of last calibration of the sensor. Date format: Date - MM/DD/YY HH:MM:SS
SENSOR_CAL_INTERVAL Sensor Calibration Interval Read & Write	34	Enables you to set options for the warnings relating to the sensor calibration interval as well as alarm options. • 1: Off • 2: ON (timer block only) • 3: ON (warning) • 4: ON (warning and alarm) Data format: Unsigned 8
SENSOR_CAL_LOC Sensor Calibration Location Read & Write	24	The location of the last calibration of the device. Data format: Visible String (32 bytes)

Label/parameter name/ access	Index (rel.)	Description/format
SENSOR_CAL_METHOD Sensor Calibration Method Read & Write	23	Method currently used for sensor calibration. • 103: Factory Trim Standard Calibration • 104: User Trimmed Standard Calibration Data format: Unsigned 8
SENSOR_CAL_RESET Sensor Calibration Reset Read & Write	39	Enables you to reset the timer for sensor calibration to 0. • 0: Timer block not reset • 1: Timer block 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 responsible for the last calibration. Data format: Visible String (32 bytes)
SENSOR_FILL_FLUID Sensor Fill Fluid Read only	28	Refers to the type of fluid used in the sensor. • 1: Silicone oil • 2: Inert • 239: Fluorolube • 240: Silicone oil / nonfat • 252: Unknown • 253: Special Data format: Unsigned 16
SENSOR_ISOLATOR_MTL Sensor Isolator Material Read only	27	The material of which the wetted parts of the seal diaphragm / measuring cell is made. • 1: Stainless steel/Stainless steel (304) • 2: Stainless steel/Stainless steel (316) • 3: Hastelloy-C/Hastelloy-C • 4: Monel/Monel • 5: Tantal/Tantal • 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

Label/parameter name/ access	Index (rel.)	Description/format
SENSOR_MAX_STATIC_ PRESS Sensor Maximum Static Pressure Read only	40	The maximum premitted static pressure of the sensor Data format: Float Value (4 bytes)
SENSOR_MAX_TEMP Sensor Maximum Temperature Read & Write	45	The maximum temperature of the sensor since the last reset. If you write the value 0 to this parameter, the value is reset to the current temperature. Data format: Float Value (4 bytes) Note: *This value for the sensor temperature is obtained from the actual measurement or by a simulated value. This value must be reset after simulation.*
SENSOR_MAX_TEMP_ LIFETIME Sensor Maximum Temperature - Lifetime Read only	47	The maximum temperature of the sensor since the first installation of the transmitter. Data format: Float Value (4 bytes) Note: *This value is not affected by a simulation.*
SENSOR_MAX_VALUE Sensor Maximum Value Read & Write	41	The maximum static pressure that was applied to the sensor since the last reset. When you write the value 0.0 to this parameter, the value is reset to the current pressure. Data format: Float Value (4 bytes) Note: *This value of the pressure sensor is obtained from the actual measurement or by a simulated value. A user calibration is also taken into consideration. This value must be reset after simulation.*
SENSOR_MAX_VALUE_ LIFETIME Sensor Maximum Value - Lifetime Read only	43	The maximum static pressure since the first installation of the transmitter. Data format: Float Value (4 bytes) Note: *The value for the lifetime 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 temperature of the sensor since the last reset. If you write the value 0 to this parameter, the value is reset to the current temperature. Data format: Float Value (4 bytes) Note: *This value for the sensor temperature is obtained from the actual measurement or by a simulated value. This value must be reset after simulation.*
SENSOR_MIN_TEMP_ LIFETIME Sensor Minimum Temperature - Lifetime Read only	48	The minimum temperature of the sensor since the first installation of the transmitter. Data format: Float Value (4 bytes) Note: *This value is not affected by a simulation.*

Label/parameter name/ access	Index (rel.)	Description/format
SENSOR_MIN_VALUE Sensor Minimum Value Read & Write	42	The minimum static pressure that was applied to the sensor since the last reset. When you write the value 0.0 to this parameter, the value is reset to the current pressure. Data format: Float Value (4 bytes) Note: *This value of the pressure sensor is obtained from the actual measurement or by a simulated value. A user calibration is also taken into consideration. This value must be reset after simulation.*
SENSOR_MIN_VALUE_ LIFETIME Sensor Minimum Value - Lifetime Read only	44	The minimum static pressure since the first installation of the transmitter. Data format: Float Value (4 bytes) Note: *The value for the lifetime always uses the internal value from the factory calibration. A user calibration or simulation does not affect the value.*
SENSOR_OP_HOURS Sensor Operating Hours Read only	56	Total operating hours of the sensor. Data format: Unsigned 32
SENSOR_RANGE (Record) Sensor Range	21	The limits for the high and low range, the technical units and the number of digits right of the decimal point that should 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 value of the technical unit which specifies the high limit of the adjustment range for the associated sensor input. Data format: Float Value (4 bytes)
2. EU_0 EU at 0% Read only	21.2	The value of the technical unit which specifies the low limit of the adjustment range for the associated sensor input. Data format: Float Value (4 bytes)

Label/parameter name/ access		Index (rel.)	Description/format
	3. UNITS_INDEX Units Index Read only	21.3	The device description index with the unit codes for the sensor input. • 1130: Pa (Pascal) • 1132: MPa (Megapascal) • 1133: kPa (Kilopascal) • 1137: bar • 1138: mbar (Millibar) • 1139: torr1140: atm (atmospheres) • 1141: psi (pounds per square inch) • 1144: g/cm21145: kg/cm2 (kilograms per • square centimeter) • 1147: inH2O (4 °C) (inch water column at 4 °C) • 1148: inH2O (68 °F) (inch water column at 68 °F) • 1150: mmH2O (4 °C) (millimeter water column at 4 °C) • 1151: mmH2O (68 °F) (millimeter water column at 68 °F) • 1154: ftH2O (68 °F) (foot water column at 68 °F) • 1156: inHg (0 °C) (inch mercury column at 0 °C) • 1158: mmHg (0 °C) (millimeter mercury column at 0 °C) Data format: Unsigned 16
	4. DECIMAL Decimal Read only	21.4	The number of digits right of the decimal point to be used by an interface device for displaying the sensor input. Data format: Unsigned 8 factory setting: 2
SENSOR_SN Sensor Serial Number Read only		22	The unique serial number of the manufacturer of the sensor. Data format: Visible String (32 bytes)
SENSOR_TEMP_RANGE (Record) Sensor Temperature Range		31	The limits for the high and low range, the technical units and the number of digits right of the decimal point that should be used to display the sensor temperature. Data format: Record with 4 parameters (11 bytes)
	1. EU_100EU at 100% read only	31.1	The value of the technical unit which specifies the high limit of the adjustment range for the associated sensor temperature. Data format: Float Value (4 bytes) Factory setting: 100.0 °C
	2. EU_0EU at 0% read only	31.2	The value of the technical unit which specifies the low limit of the adjustment range for the sensor temperature. Data format: Float Value (4 bytes) Factory setting: –40.0 °C
	3. UNITS_INDEX Units Index Read only	31.3	The device description index with the unit codes for the sensor temperature. The values are always given in °C. Data format: Unsigned 16 Factory setting: 1001: °C (degrees Celsius)

Label/parameter name/ access		Index (rel.)	Description/format
	4. DECIMALDecimal- Read only	31.4	The number of digits right of the decimal point to be used by an interface device for displaying the sensor temperature. Data format: Unsigned 8 Factory setting: 2
SENSOR_TEMP_SIMULATION (Record) Sensor Temperature Simulation		54	Enables you to simulate 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 for the simulation of the sensor temperature when the fixed value simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 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 the ramp simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0
	3. MAXIMUM_VALUE Maximum Value Read & Write	54.3	This value is used as the end point in the simulation of the sensor temperature when the ramp simulation has been selected. Data format: Float Value (4 bytes) Factory setting: 0
	4. NUMBER_OF_STEPS Number of Steps Read & Write	54.4	The number of ramp steps when ramp simulation has been selected. Data format: Unsigned 16 Value range: 1 … 65535 factory setting: 1
	5. DURATION_OF_STEP Duration of a Step Read & Write	54.5	The duration of each step in seconds when ramp simulation has been selected. Data format: Unsigned 16 value range: 1 … 65535 Factory setting: 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: Ramp simulation Data format: Unsigned 8 Factory setting: 0
SENSOR_TYPE Sensor Type Read only		20	Type of sensor. Data format: Unsigned 16 Factory setting: 125: Piezo resistor
SENSOR_WARN_SET Sensor Warning Setting Read & Write		36	The waiting time (in hours) before the sensor calibration warning is output. Data format: Float Value (4 bytes) Value range: 0.0 h to 596000 h Factory setting: 8760 h

Label/parameter name/ access	Index (rel.)	Description/format
SENSOR_WARN_TIME Sensor Warning Time Read only	35	The time (in hours) since the reset SENSOR_CAL_RESET. When this time reaches the value of SENSOR_WARN_SET, bit 6 in the BLOCK_ERR parameter, if the SENSOR_CAL_INTERVAL parameter has the value 3 or 4. Data format: Float Value (4 bytes)
ST_REV Static Revision Read only	1	The revision level of the static data assigned to the function block. The revision number increases by 1 when a static parameter value changes in the block. Data format: Unsigned 16
STRATEGY Strategy Read & Write	3	Groups of blocks can be specified using the Strategy field. This data is not checked or processed by the block. Data format: Unsigned 16 Factory setting: 0
TAG_DESC Tag Description Read & Write	2	A text entered by user as a description for the sensor transducer function block. Data format: 8-bit string (32 bytes)
TRANSDUCER_ DIRECTORY Transducer Directory Read only	9	This directory lists the number and the starting index of the transmitter in the transducer block. Data format: Unsigned 16 Factory setting: 0x0000
TRANSDUCER_TYPE Transducer Type Read only	10	Specifies the type of transmitter. • 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 highly-developed positioner with calibration • 107: Standard discrete valve • 65535: Other Data format: Unsigned 16 Factory setting: 100
UPDATE_EVT (Record) Update Event	7	This alarm is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
1. UNACKNOWLEDGED Unacknowledged Read & Write	7.1	This parameter is set to "Unacknowledged" when an update occurs and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8

Label/parameter name/ access		Index (rel.)	Description/format
	2. UPDATE_STATE Update State Read only	7.2	Indicates whether the alarm has been reported. • 0: Not initialized • 1: Update Reported • 2: Update Not Reported Data format: Unsigned 8
	3. TIME_STAMP Time Stamp Read only	7.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
	4. STATIC_REVISION Static Revision Read only	7.4	The value of ST_REV at the point in time of the warning. It may be that the current value of the static change is greater than this because static parameters can change at any time. Data format: Unsigned 16
	5. RELATIVE_INDEX Relative Index Read only	7.5	The relative index of the static parameter whose change triggered this alarm. If the updating event has been triggered in that several parameters were written simultaneously, the attribute is set to 0. Data format: Unsigned 16
XD_ERROR Transducer Error Read only		11	These are transducer error codes as 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 fault • 21: Mechanical fault • 22: I/O error • 23: Data integrity error • 24: Software error • 25: Algorithm error Data format: Unsigned 8
ZERO_ADJUSTMENT Zero Adjustment Read & Write		58	The command to start the zero calibration for the pressure. • 0: Off • 1: Start – *Parameter returns to 0 after initialization* Data format: Unsigned 8

6.5.7.1 Special functions and options

The calibration timer depends on the operating hours of the sensor. To activate it, first write the desired values to SERVICE_WARN_SET and SERVICE_ALARM_SET. When the device reaches the value of SENSOR_WARN_SET, the "Device needs maintenance soon" bit is set in BLOCK_ERR. When the device reaches the value of SENSOR_ALARM_SET, the "Device needs maintenance now" bit is set. The calibration timer should determine the time until the next calibration is required. The calibration timer must be activated in the SENSOR_CAL_INTERVAL parameter. If both bits are required, you must select the value "ON (warning + alarm)".

The timer and the bits are reset in the SENSOR_CAL_RESET parameter.

Calibration can be performed using the CAL_POINT_HI and CAL_POINT_LO parameters. The CAL_MIN_SPAN parameter specifies the minimum span between CAL_POINT_LO and CAL_POINT_HI. CAL_UNIT is the unit in which the transducer block expects the values for the high and low calibration point. Only an offset is changed when writing to CAL_POINT_LO. Writing a value in CAL_POINT_HI does not affect the value of CAL_POINT_LO, which means the gain factor is changed. To perform a calibration, follow these steps:

1. Set "Out of Service" as the block operating mode.
2. Select a calibration unit (CAL_UNIT).
3. Apply the high calibration pressure and wait for the stabilization.
4. Write the actual pressure value to CAL_POINT_LO.
5. Check the measured value of the pressure (PRIMARY_VALUE). Due to the block operating mode, the status "Bad" is reported under certain circumstances. If the value is not within the tolerance, return to step. 4
6. Apply the high calibration pressure and wait for the stabilization.
7. Write the actual pressure value to CAL_POINT_HI.
8. Check the measured value of the pressure (PRIMARY_VALUE). Due to the block operating mode, the status "Bad" is reported under certain circumstances. If the value is not within the tolerance, return to step. 7
9. Set "Auto" as the block operating mode.

You can document the calibration more accurately with the following parameters:
SENSOR_CAL_DATE Date
SENSOR_CAL_LOC Location
SENSOR_CAL_WHO Person

In addition to the calibration, you can also make a zero point calibration. It is used to eliminate offsets that may be caused by the mounting position. This is similar to mode 07 for local operation. To do this, follow these steps:

1. Set "Out of Service" as the block operating mode.
2. Apply the zero pressure and wait for the stabilization.
3. Perform the zero point calibration (ZERO_ADJUSTMENT). Use the "Start" value.
4. Check the measured value of the pressure (PRIMARY_VALUE). Due to the block operating mode, the status "Bad" is reported under certain circumstances. If the value is not within the tolerance, return to step. 3
5. Set "Auto" as the block operating mode.

Note

A zero point calibration is also available for transmitters that measure absolute pressure. In any case, create the real zero point (which means the absolute zero for an absolute pressure transmitter) before performing this function. This function can only be reset over the communication. Set SENSOR_CAL_METHOD to "Factory Trim".

You can see the total offset, which means the combination of zero point calibration and low sensor calibration, in the PRESSURE_OFFSET parameter. SENSOR_CAL_METHOD describes the calibration method. It is either "Factory Trim" or "User Trim". When you write "Factory Trim" to this parameter, the factory settings are restored for calibration and zero point calibration. When a zero point calibration or a calibration is performed, the parameter returns to "User Trim".

The simulation function is accessed through the following parameters for pressure, the sensor temperature or the electronics temperature:

- PRIMARY_VALUE_SIMULATION
- SENSOR_TEMP_SIMULATION
- ELECTRONIC_TEMP_SIMULATION

The parameters of these records have the following meanings:

Table 6- 18 Simulation parameters

Parameters	Description
FIXED_VALUE	Simulation value, if SMODE = Fixed value simulation
MINIMUM_VALUE	Low value of the simulation if SMODE = ramp simulation
MAXIMUM_VALUE	High value of the simulation, if SMODE = ramp simulation
NUMBER_OF_STEPS	The number of steps between MINIMUM_VALUE and MAXIMUM_VALUE. Each step takes DURATION_OF_STEP seconds. if SMODE = ramp simulation.
DURATION_OF_STEP	Duration of a step in seconds if SMODE = ramp simulation
SMODE	Simulation mode. If this parameter is deactivated (off), the measurement parameters are returned. FIXED_VALUE is returned with the "Fixed value simulation". When "Ramp simulation" is set, a ramp is generated that contains NUMBER_OF_STEPS values with the same distance between MINIMUM_VALUE and MAXIMUM_VALUE. Each step takes DURATION_OF_STEP seconds.

The simulation is deactivated when the simulation jumper is not set (see Enable/disable simulation (Page 169)). If a simulation is used, the simulated values affect the min/max pointers, which can be reset. After a simulation, they should be reset by editing the maximum/minimum values accordingly. The min/max pointers for the entire lifetime is always based on the actual measurements. They are therefore not affected by simulations.

Min/max pointers that cannot be reset for the entire lifetime are not affected by simulations. The pressure min/max pointers for the entire lifetime, SENSOR_MAX_VALUE_LIFETIME and SENSOR_MIN_VALUE_LIFETIME, are always based on the factory-calibrated measurements. A user calibration does not result in changes to values.

6.5.7.2 Device description

The Device Description (DD) is based on the standard device description for the pressure transducer block with calibration.

If the host supports menus, the following menu structure is available. Sometimes the messages are abbreviated on the display.

Table 6- 19 Device description of the sensor transducer block

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	Min/max pointers
			Simulation
		Sensor Temperature	Min/max pointers
			Simulation
		Electronic Temperature	Min/max pointers

			Simulation
Menu	Diagnostics	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		

The "Reset Calibration Timer" method resets the calibration timer. It provides an easy way to confirm the output of a warning or an alarm on the part of the calibration timer.

The zero point calibration can be performed with the "Zero Trim" method. Before the method can be performed, however, zero pressure must be applied. This method does not put the transducer block in "Out of Service" mode. It is executed even with an incorrect block mode. With an incorrect block mode, however, there is no zero point calibration, even if the method reports successful execution.

The "Set Factory Calibration" method restores the factory settings for all calibrations, zero point calibrations and mounting position adjustments. This method cannot process block modes and therefore always reports successful execution regardless of the block mode. The execution of this method depends on the implementation of the method interpreter. Certain interpreters may refuse to execute under some circumstances. This problem is corrected in a new DD or device version. If this method is not available, use the SENSOR_CAL_METHOD parameter, set it to "Factory Trim Standard Calibration" and write the parameter to the device. The pressure transducer block must be in the "Out of Service" block mode. The method "Restart: Default values" of the resource block also resets the calibration to factory settings. However, this causes other parameters to be reset in other blocks.

6.5.8 Transducer block LCD

Overview

The LCD transducer block is a user-specific block that is used to configure the display of measurement results. Up to four measured values are displayed on the device along with customized tags.

This block contains the parameter assignment for up to four measured values and a user-defined description (tag) for the display. Devices can be clearly identified in the field by reading the tags.

Parameter description

The LCD transducer bock contains all standard parameters as in [FF-891-1.5] as well as a number of vendor-specific parameters.
You can find detailed information in the following table.

Table 6- 20 LCD Transducer Block

Label/parameter name/ access	Index (rel.)	Description/format
ALERT_KEY Alert Key Read & Write	4	The identification number of the plant unit. This information can be used in the host for sorting alarms, etc. Data format: Unsigned 8 Value range: 1 … 255 Factory setting: 0
BLOCK_ALM (Record) Block alarm	8	The block alarm is used for all configuration, hardware and connection faults or system problems in the block. The cause of the alarm is entered in the subcode field. The first alarm which becomes active sets the active status in the status attribute. As soon as the Unreported status is cleared by the alarm message task, another block alarm 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	This parameter is set to "Unacknowledged" when an alarm is triggered and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the alarm or event has been reported. • .0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8
2. ALARM_STATE Alarm State Read only	8.2	Indicates whether the alarm is active and has been reported. • 0: Not initialized • 1: Not active, but reported • 2: Active, but not reported • 3: Active and reported • 4: Active, but not reported Data format: Unsigned 8
3. TIME_STAMP Time Stamp Read only	8.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
4. SUB_CODE Subcode Read only	8.4	A selected value that indicates the cause of the alarm to be reported. Values: see BLOCK_ERR Data format: Unsigned 16
5. Value Value Read only	8.5	The value of the assigned parameter at the point in time at which the alarm was detected. Data format: Unsigned 8

Label/parameter name/ access	Index (rel.)	Description/format
BLOCK_ERR Block Error Read only	6	This parameter indicates the error status which is assigned to the hardware or software components that are associated with a block. Several errors may be indicated since this is a bit string. The following bits are supported: • Bit 15: OOS – *The current operating mode is "Out of Service"* Data format: Bit string with 16 bits (2 bytes)
COLLECTION_DIRECTORY Collection Directory Read only	12	This directory lists the number, the starting index and DD ID numbers of 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 operating mode of the display. • 0: Measured values only • 1: Tag • 2: Measured values and tags Data format: Unsigned 8 Factory setting: 0
DISPLAY_TAG Display Tag Read & Write	26	Tag specified by the user that identifies the field devices locally. • Data format: Visible String (16 bytes)
LOCAL_DISPLAY_1 Local Display 1 Read & Write	13	Selects the value to be displayed for LOCAL_DISPLAY_1. If multiple displays are configured, LOCAL_DISPLAY_1 shows each value for approx. 3 seconds. • 0: Not defined • 1: Primary value – *Transmitter parameters* • *PRIMARY_VALUE* • 2: Secondary value – *Transmitter parameters* • *SECONDARY_VALUE* • 3: Electronic temperature – *Transmitter parameters* • *ELECTRONIC_TEMP* • 4: AI1 Function block output – *OUT parameter* • 5: AI2 Function block output – *OUT parameter* • 6: AI3 Function block output – *OUT parameter* • 7: PID Function block input – *IN parameter* • 8: PID Function block output – *OUT parameter* • 9: PID Function block setpoint – *SP parameter* • 10: PID Function block operating mode – *Parameters* • *MODE_BLK.ACTUAL* Data format: Unsigned 8 Factory setting: 0

Label/parameter name/ access	Index (rel.)	Description/format
LOCAL_DISPLAY_1_ DIGITS Local Display 1 Digits Read & Write	14	Selects the number of digits right of the decimal point to be displayed. • 0: 0 digits • 1: 1 digit • 2: 2 digits • 3: 3 digits • 4: 4 digits • 255: Auto Data format: Unsigned 8 Factory setting: 0
LOCAL_DISPLAY_1_TAG Local Display 1 Tag Read & Write	15	User-defined tag that identifies the measured values on the display. Data format: Visible String (5 bytes)
LOCAL_DISPLAY_2 Local Display 2 Read & Write	16	Select the size for LOCAL_DISPLAY_2. If multiple displays are configured, the display shows each value for approx. 3 seconds. • 0: Not defined • 1: Primary value – *Transmitter parameters* • *PRIMARY_VALUE* • 2: Secondary value – *Transmitter parameters* • *SECONDARY_VALUE* • 3: Electronic temperature – *Transmitter parameters* • *ELECTRONIC_TEMP* • 4: AI1 Function block output – *OUT parameter* • 5: AI2 Function block output – *OUT parameter* • 6: AI3 Function block output – *OUT parameter* • 7: PID Function block input – *IN parameter* • 8: PID Function block output – *OUT parameter* • 9: PID Function block setpoint – *SP parameter* • 10: PID Function block operating mode – *Parameters* • *MODE_BLK.ACTUAL* Data format: Unsigned 8 Factory setting: 0

Label/parameter name/ access	Index (rel.)	Description/format
LOCAL_DISPLAY_2_ DIGITS Local Display 2 Digits Read & Write	17	Selects the number of digits right of the decimal point to be displayed. • 0: 0 digits • 1: 1 digit • 2: 2 digits • 3: 3 digits • 4: 4 digits • 255: Auto Data format: Unsigned 8 Factory setting: 0
LOCAL_DISPLAY_2_TAG Local Display 2 Tag Read & Write	18	User-defined tag that identifies the measured values on the display. Data format: Visible String (5 bytes)
LOCAL_DISPLAY_3 Local Display 3 Read & Write	19	Select the size for LOCAL_DISPLAY_3. If multiple displays are configured, the display shows each value for approx. 3 seconds. • 0: Not defined • 1: Primary value – *Transmitter parameters* • *PRIMARY_VALUE* • 2: Secondary value – *Transmitter parameters* • *SECONDARY_VALUE* • 3: Electronic temperature – *Transmitter parameters* • *ELECTRONIC_TEMP* • 4: AI1 Function block output – *OUT parameter* • 5: AI2 Function block output – *OUT parameter* • 6: AI3 Function block output – *OUT parameter* • 7: PID Function block input – *IN parameter* • 8: PID Function block output – *OUT parameter* • 9: PID Function block setpoint – *SP parameter* • 10: PID Function block operating mode – *Parameters* • *MODE_BLK.ACTUAL* Data format: Unsigned 8 Factory setting: 0

Label/parameter name/ access	Index (rel.)	Description/format
LOCAL_DISPLAY_3_ DIGITS Local Display 3 Digits Read & Write	20	Selects the number of digits right of the decimal point to be displayed. • 0: 0 digits • 1: 1 digit • 2: 2 digits • 3: 3 digits • 4: 4 digits • 255: Auto Data format: Unsigned 8 Factory setting: 0
LOCAL_DISPLAY_3_TAG Local Display 3 Tag Read & Write	21	User-defined tag that identifies the measured values on the display. Data format: Visible String (5 bytes)
LOCAL_DISPLAY_4 Local Display 4 Read & Write	22	Select the size for LOCAL_DISPLAY_4. If multiple displays are configured, the display shows each value for approx. 3 seconds. • 0: Not defined • 1: Primary value – *Transmitter parameters* • *PRIMARY_VALUE* • 2: Secondary value – *Transmitter parameters* • *SECONDARY_VALUE* • 3: Electronic temperature – *Transmitter parameters* • *ELECTRONIC_TEMP* • 4: AI1 Function block output – *OUT parameter* • 5 AI2 Function block output – *OUT parameter* • 6: AI3 Function block output – *OUT parameter* • 7: PID Function block input – *IN parameter* • 8: PID Function block output – *OUT parameter* • 9: PID Function block setpoint – *SP parameter* • 10: PID Function block operating mode – *Parameters* • *MODE_BLK.ACTUAL* Data format: Unsigned 8 Factory setting: 1

Label/parameter name/ access	Index (rel.)	Description/format
LOCAL_DISPLAY_4_ DIGITS Local Display 4 Digits Read & Write	23	Selects the number of digits right of the decimal point to be displayed. • 0: 0 digits • 1: 1 digit • 2: 2 digits • 3: 3 digits • 4: 4 digits • 255: Auto Data format: Unsigned 8 Factory setting: 255
LOCAL_DISPLAY_4_TAG Local Display 4 Tag Read & Write	24	User-defined tag that identifies the measured values on the display. Data format: Visible String (5 bytes) Factory setting: PRESS
MODE_BLK (Record) Block Mode	5	The current, intended, permitted and normal operating mode of the block. Data format: Record with 4 parameters (4 bytes)
1. TARGET Target Read & Write	5.1	This is the operating mode requested by the operator. The target operating mode is limited to the values defined by the "Permitted operating 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 actual operating mode of the block and may deviate from the target mode depending on the operating conditions. Its value is calculated during block execution. • Bit 3: Auto • Bit 7: OOS Data format: Bit string with 8 bits (1 byte)
3. PERMITTED Permitted Read & Write	5.3	Specifies the operating modes which are permitted for the block at a specific point in time. The permitted operating mode is configured starting from the requirements of the application. • Bit 3: Auto • Bit 7: OOS Data format: Bit string with 8 bits (1 byte) Factory setting: 0x11 (Auto | OOS)

Label/parameter name/ access		Index (rel.)	Description/format
	4.NORMAL Normal Read & Write	5.4	The block should be set to this operating mode for normal operating conditions. • Bit 3: Auto Data format: Bit string with 8 bits (1 byte) Factory setting: 0x10 (Auto)
ST_REV Static Revision Read only		1	The revision level of the static data assigned to the function block. The revision number increases by 1 when a static parameter value changes in the block. Data format: Unsigned 16
STRATEGY Strategy Read & Write		3	Groups of blocks can be specified using the Strategy field. This data is not checked or processed by the block. Data format: Unsigned 16 Factory setting: 0
TAG_DESC Tag Description Read & Write		2	A text entered by the user as a description for the LCD transducer block. Data format: 8-bit string (32 bytes)
TRANSDUCER_DIRECTORY Transducer Directory Read only		9	This directory lists the number and the starting index of the transmitter in the transducer block. Data format: Unsigned 16 Factory setting: 0x0000
TRANSDUCER_TYPE Transducer Type Read only		10	Specifies the type of transmitter. • 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 highly-developed positioner with calibration • 107: Standard discrete valve • 65535: Other Data format: Unsigned 16 Factory setting: 65535
UPDATE_EVT (Record) Update Event		7	This alarm is generated by any change to the static data. Data format: Record with 5 parameters (14 bytes)
	1. UNACKNOWLEDGED Unacknowledged Read & Write	7.1	This parameter is set to "Unacknowledged" when an update occurs and set to "Acknowledged" by writing from a user interface or another unit which can acknowledge that the event has been reported. • 0: Not initialized • 1: Acknowledged • 2: Unacknowledged Data format: Unsigned 8

Label/parameter name/ access		Index (rel.)	Description/format
	2. UPDATE_STATE Update State Read only	7.2	Indicates whether the alarm has been reported. • 0: Not initialized • 1: Update Reported • 2: Update Not Reported Data format: Unsigned 8
	3. TIME_STAMP Time Stamp Read only	7.3	The time at which the evaluation of the block was started and an unreported change of the alarm/event status was determined. The time stamp value is maintained as constant until alarm acknowledgment has been received - even if another status change occurs. Data format: Time Value (8 bytes)
	4. STATIC_REVISION Static Revision Read only	7.4	The value of ST_REV at the point in time of the warning. It may be that the current value of the static change is greater than this because static parameters can change at any time. Data format: Unsigned 16
	5. RELATIVE_INDEX Relative Index Read only	7.5	The relative index of the static parameter whose change triggered this alarm. If the updating event has been triggered in that several parameters were written simultaneously, the attribute is set to 0. Data format: Unsigned 16
XD_ERROR Transducer Error Read only		11	These are transducer error codes as 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 fault • 21: Mechanical fault • 22: I/O error • 23: Data integrity error • 24: Software error • 25: Algorithm error Data format: Unsigned 8

6.5.8.1 Special functions and options

The tags for the measurement displays can only be up to five characters long. They are shown in the "Unit/error code" field of the display (see Units display (Page 68)). DISPLAY_TAG can contain up to 16 characters. If you use more than five characters, the tag is shown by scrolling in the "Unit/error code" field on the digital display.

The measured values (LOCAL_DISPLAY_1, LOCAL_DISPLAY_2,...) are not always shown in ascending order (1, 2, etc.). The order in which they are displayed depends on the order specified in the parameter setting. You can find more detailed information on displaying values in the section Measured value display (Page 68).

6.5.8.2 Device description

The device description contains the block-specific parameters and hierarchical parameter menus.

If the host supports menus, the following menu structure is available. Sometimes the messages are abbreviated on the display.

Table 6- 21 Device description of the LCD transducer block

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	

6.5.9 Link Master function

The SITRANS P DS III FF includes a Link Master function. This means that it can act as an LAS (Link Active Scheduler). It controls the bus communication and coordinates the bus assignment in this management function. The schedule is executed on the device. This enables you to set up local control loops.

Moreover, it can also act as a reserve LAS. If the active LAS encounters a problem or is not working correctly, SITRANS P DS III FF can substitute to maintain the operation of the FF segment. For this, the SITRANS P DS III FF must be provided the schedule with its configuration.

You can find detailed instructions for configuring the system management functions of your system in the documentation of the respective system vendor.

Planning/Configuring

7

7.1 Data transmission

7.1.1 Description

The FOUNDATION ™ Fieldbus protocol was designed for distributed control. With this type of control, control functions can be located in the field devices. A system may be set up in the conventional form. Here, a central system accepts all inputs, processes them and sends the output back to the actuators. During the development of a control system, however, the commissioning engineer can also specify that the field devices should process the information. This mainly depends on the functions and configuration programs that are supported by the respective system.

A schedule is created in the development tool. This schedule notifies the devices when they should publish their output or results and what data a device is to receive. This schedule is loaded into the available Link Master. The Link Active Scheduler (LAS) is such a utility. It is used for the allocation of the bus. Other link masters can be used as reserve LAS to take over the allocation if the LAS fails. You can find detailed information on creating a specific fieldbus system in the manuals of the respective manufacturer.

7.1.2 Addressing

In order for the fieldbus unit to work properly, it must have a unique node address and physical device tag for the FOUNDATION™ Fieldbus. The node address must be unique within the connection (segment), whereby the physical device TAG must be unique within the entire network.

The default physical device tag of the pressure transmitter consists of the string "SITRANS_P_DS3_FF" + manufacturing number (N1-...), which is on the nameplate. The default node address is set to "27".

When the device is configured, the node address is set to a value that is unique within the connection. To avoid address conflicts, the pressure transmitter automatically sets its address to one of the temporary addresses between 248 and 251 if it detects another device with the same node address.

7.1.3 Parameter assignment

7.1.3.1 Description

For parameter assignment of the pressure transmitter, 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 contains all the information available from the fieldbus interface in machine-readable format. It also contains instructions on how the user can display information on the screen, and notes on the arrangement of parameters in hierarchical menus. Another element of the DD is a number of "methods" that include standard operating procedures for the device. The DD also contains detailed help text describing the meaning and handling of the individual parameters.

Host computers and configuration tools can use the information contained in the DD to provide a user-friendly parameterization interface.

The DD consists of two files:

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

The capability file (010102.cff) contains all the information required for offline configuration.

You can find information on installing the files in the manual for your configuration tool or control system.

7.1.3.2 Status

The status provides information on:

- The usability of the measured value in the application program
- The device status (self-diagnostics / system diagnostics)
- Additional process information (hardware interrupts)

The coding of the status byte is listed on the following pages. The possible cause of an error and measures for its elimination are also provided.

The digital codes listed in the following tables appear in the "Unit/error code" section of the display when the displayed variable has an active status condition. See also Alarm, error, and system messages (Page 191) .

In the table below, you can see the status code for the status "Good":

Table 7- 1 Status code for "Quality good"

Status code	Meaning
G_001, G_004	Unreported block alarm
G_002, G_005	High or low alarm limit reached

Status code	Meaning
G_003, G_006	High or low alarm limit reached
Gc001, Gc008	Initial value BKCAL_IN (cascade) set Initializes fault status (cascade)

In the table below, you can see the status code for the status "Bad":

Table 7- 2 Status code for "Quality bad"

Status code	Meaning
B_001	Parameter assignment error
B_003	Value not calculated or device error
B_004	Sensor fault (brake)
B_006	Value is not transmitted
B_007	Out of Service

In the table below, you can see the status code for the status "Uncertain":

Table 7- 3 Status coding for "Quality uncertain"

Status code	Meaning
U_002	Substitute value
U_004	Low limit for overload exceeded (< 20 %) High limit for overload exceeded (> 120%) Inaccurate value

Commissioning

8

8.1 Basic safety instructions

⚠ DANGER

Toxic gases and liquids

Danger of poisoning when venting the device: if toxic process media are measured, toxic gases and liquids can be released.

- Before venting ensure that there are no toxic gases or liquids in the device, or take the appropriate safety measures.

⚠ WARNING

Improper commissioning in hazardous areas

Device failure or danger of explosion in hazardous areas.

- Do not commission the device until it has been mounted completely and connected in accordance with the information in Chapter "Technical data (Page 193)".
- Before commissioning take the effect on other devices in the system into account.

⚠ WARNING

Opening device in energized state

Danger of explosion in areas subject to explosion hazard.

- Only open the device in a de-energized state.
- Check prior to commissioning that the cover, cover locks, and cable inlets are assembled in accordance with the directives.

Exception: Devices having the type of protection "Intrinsic safety Ex i" may also be opened in energized state in hazardous areas.

8.2 Enable/disable simulation

The SITRANS P DS III with FF has a jumper that allows you to activate or deactivate the simulation functions of the device.

If the jumper is set to position 2 ⑤, the device accepts simulation requests from the fieldbus communication connection. If the jumper is not set (position 1 ④), simulation requests are rejected. If you remove the jumper, any ongoing simulation is aborted. The jumper affects the simulation of the function blocks and the pressure transducer block.

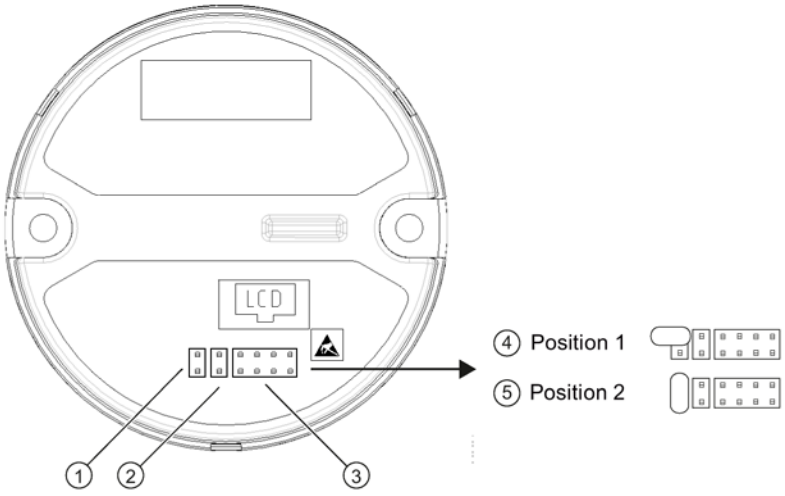


Image 8-1 Interfaces in the electronics compartment

① PINs for simulation function

② PINs to reset (warm restart)

③ PINs for display connection

④ Position 1: Jumper: Simulation function cannot be activated. (factory state)

⑤ Position 2: Jumper: Simulation function can be activated.

CAUTION

Warm restart of the device

Once the PIN for reset ② is touched or used, the device performs a warm restart.

1. Do not touch the PINs for reset when setting the jumper.
2. Do not use the PINs for reset.

Procedure

To activate/deactivate the simulation function of the device, proceed as follows:

1. Remove the safety catch of the cover (front), optional with inspection window.
2. Unscrew the front cover.
3. Remove the display with a Phillips screwdriver.
4. Pull the display out of the housing.
   The PINs are located behind it.
5. Set the jumper to the desired position.
   See figure ④ or ⑤ above.
6. Close this device in the reverse order. See section Connecting the device (Page 62).

8.3 Introduction to commissioning

Following commissioning, the pressure transmitter is immediately ready for use.

To obtain stable measured values, the pressure transmitter needs to be allowed to warm up for around 5 minutes after the power supply is switched on. When it starts up, the pressure transmitter goes through an initialization routine. If the pressure transmitter does not complete the initialization routine, check the auxiliary power.

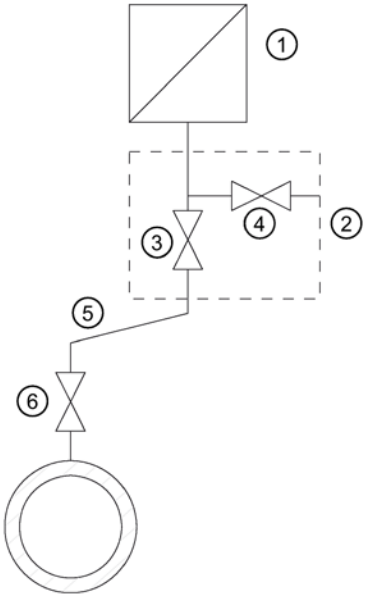
The operating data must correspond to the values specified on the nameplate. If you switch on the auxiliary power, the pressure transmitter is in operation.

The following commissioning cases are typical examples. Configurations different from those listed here may be meaningful depending on the system configuration.

8.4 Gauge pressure, absolute pressure from differential pressure series, and absolute pressure from gauge pressure series

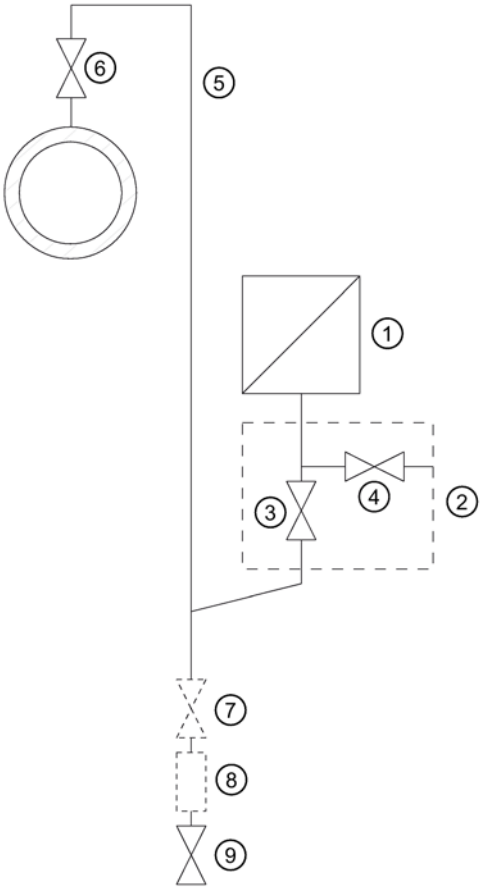
8.4.1 Commissioning for gases

Usual arrangement



Measuring gases above the pressure tapping point

Special arrangement



Measuring gases below the pressure tapping point

① Pressure transmitter
② Shut-off valve
③ Shut-off valve to process
④ Shut-off valve for test connection or for bleed screw
⑤ Pressure line
⑥ Shut-off valve
⑦ Shut-off valve (optional)
⑧ Condensate vessel (optional)
⑨ Drain valve

Requirement

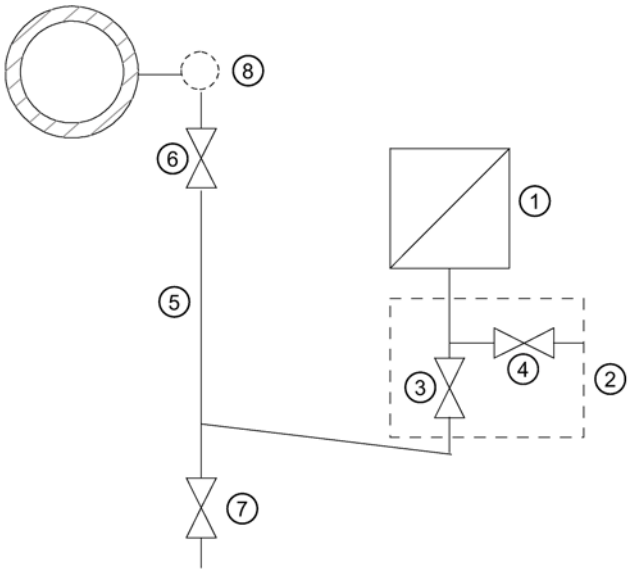
All valves are closed.

Procedure

To commission the pressure transmitter for gases, proceed as follows:

1. Open the shut-off valve for the test connection ④.
2. Via the test connection of the shut-off valve ②, apply the pressure corresponding to the start of scale value to the pressure transmitter ①.
3. Check the start of scale value.
4. If the start of scale value differs from the value desired, correct it.
5. Close the shut-off valve for the test connection ④.
6. Open the shut-off valve ⑥ at the pressure tapping point.
7. Open the shut-off valve for the process ③.

8.4.2 Commissioning with steam or liquid



① Pressure transmitter
② Shut-off valve
③ Shut-off valve to process
④ Shut-off valve for test connection or for bleed screw
⑤ Pressure line
⑥ Shut-off valve
⑦ Drain valve
⑧ Compensation vessel (steam only)

Image 8-2 Measuring steam

Requirement

All valves are closed.

Procedure

To commission the pressure transmitter for steam or liquid, proceed as follows:

1. Open the shut-off valve for the test connection ④.
2. Via the test connection of the shut-off valve ②, apply the pressure corresponding to the start of scale value to the pressure transmitter ①.
3. Check the start of scale value.
4. If the start of scale value differs from the value desired, correct it.
5. Close the shut-off valve for the test connection ④.
6. Open the shut-off valve ⑥ at the pressure tapping point.
7. Open the shut-off valve for the process ③.

8.5 Differential pressure and flow rate

8.5.1 Safety notes for commissioning with differential pressure and flow rate

⚠ WARNING

Incorrect or improper operation

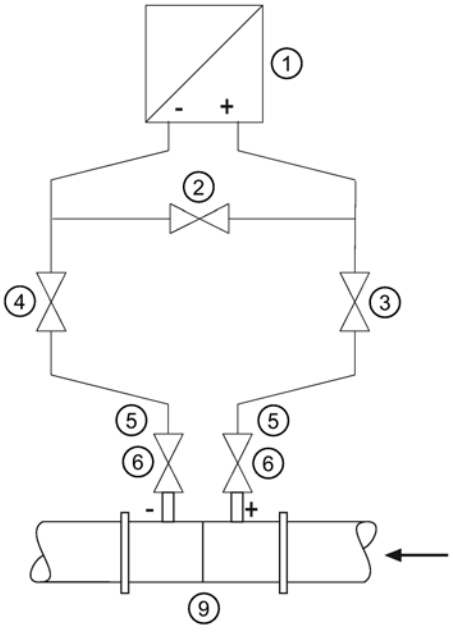
If the lock screws are missing or are not sufficiently tight, and/or if the valves are operated incorrectly or improperly, it could lead to serious physical injuries or considerable damage to property.

Measure

- Make sure the locking screw and/or the vent valve are screwed in and tightened.
- Ensure that the valves are operated correctly and properly.

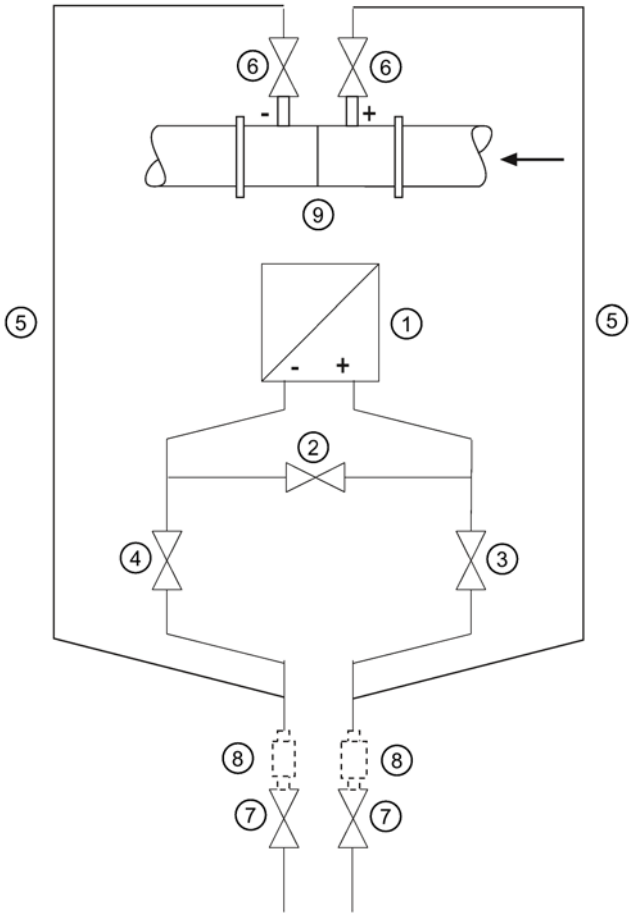
8.5.2 Commissioning in gaseous environments

Usual arrangement



Pressure transmitter **above** the differential pressure transducer

Special arrangement



Pressure transmitter **below** the differential pressure transducer

① Pressure transmitter
② Stabilizing valve
③, ④ Differential pressure valves
⑤ Differential pressure lines
⑥ Shut-off valves
⑦ Drain valves
⑧ Condensation vessels (optional)
⑨ Differential pressure transducer

Requirement

All shut-off valves are closed.

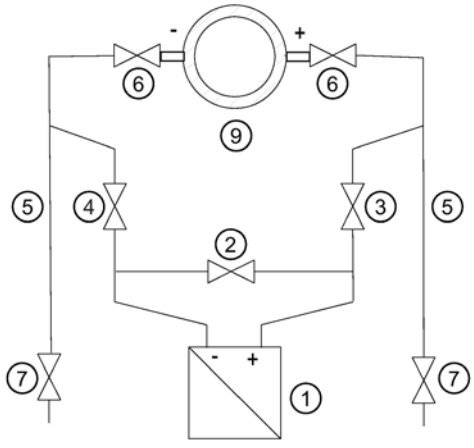
Procedure

To commission the pressure transmitter for gases, proceed as follows:

1. Open both the shut-off valves ⑥ at the pressure tapping point.
2. Open the stabilizing valve ②.
3. Open the differential pressure valve (③ or ④).
4. Check and, if necessary, correct the zero point when the start of scale value is 0 kPa.
5. Close the stabilizing valve ②.
6. Open the other differential pressure valve (③ or ④).

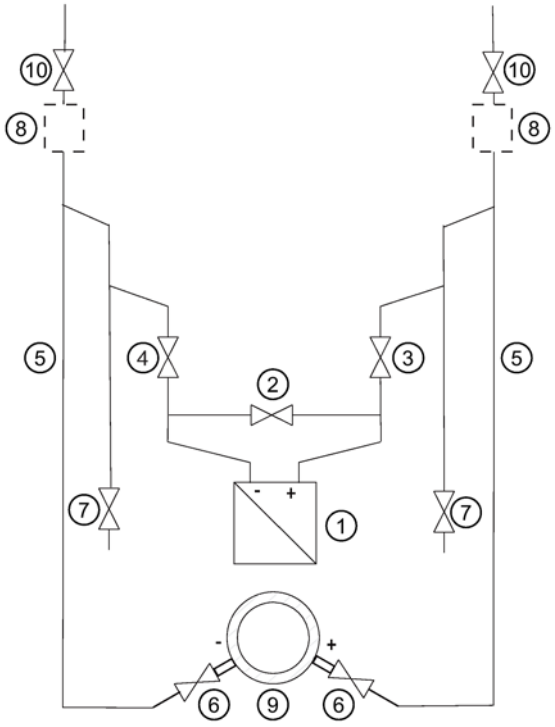
8.5.3 Commissioning for liquids

Usual arrangement



Pressure transmitter **below** the differential pressure transducer

Special arrangement



Pressure transmitter **above** the differential pressure transducer

①	Pressure transmitter	⑦	Drain valve
②	Stabilizing valve	⑧	Gas collector vessels (optional)
③, ④	Differential pressure valves	⑨	Differential pressure transducer
⑤	Differential pressure lines	⑩	Vent valves
⑥	Shut-off valves		

Requirement

All valves are closed.

Procedure

⚠ DANGER

Toxic liquids

Danger of poisoning when the device is vented.

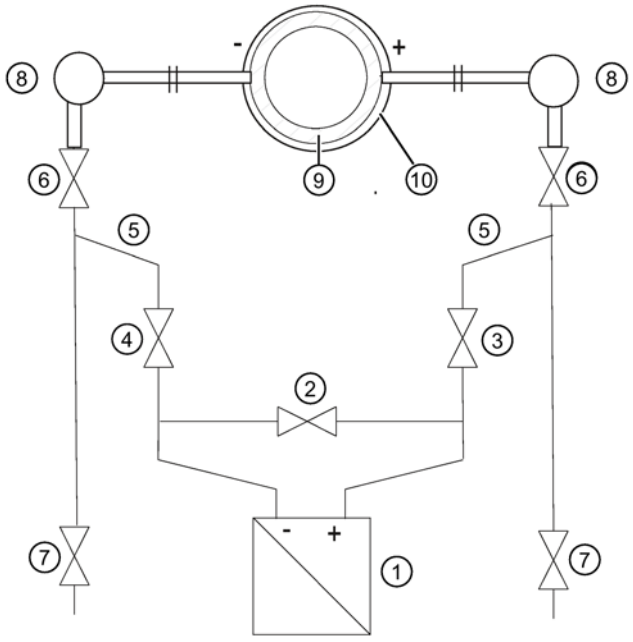
If toxic process media are measured with this device, toxic liquids can escape when the device is vented.

- Before venting, make sure there is no liquid in the device or take the necessary safety precautions.

To commission the pressure transmitter for liquids, proceed as follows:

1. Open both the shut-off valves ⑥ at the pressure tapping point.
2. Open the stabilizing valve ②.
3. With **pressure transmitters below the differential pressure transducer**, open both drain valves one after the other ⑦ until the liquid emerges without bubbles.
   In the case of a **pressure transmitter above the differential pressure transducer**, open both vent valves one after the other ⑩ until the liquid emerges without bubbles.
4. Close both drain valves ⑦ or vent valves ⑩.
5. Open the differential pressure valve ③ and the vent valve on the positive side of the pressure transmitter ① slightly, until fluid escapes without bubbles.
6. Close the vent valve.
7. Open the vent valve on the negative side of the pressure transmitter ① slightly, until fluid escapes without bubbles.
8. Close the differential pressure valve ③.
9. Open the differential pressure valve ④ until the liquid emerges and then close it.
10. Close the vent valve on the negative side of the pressure transmitter ①.
11. Open the differential pressure valve ③ by rotating it in half a turn.
12. Check and if required correct the zero point when the start of scale value is 0 kPa.
13. Close the stabilizing valve ②.
14. Open the differential pressure valves (③ and ④) completely.

8.5.4 Commissioning with vapor



①	Pressure transmitter	⑦	Drain valve
②	Stabilizing valve	⑧	Condensate pots
③, ④	Differential pressure valves	⑨	Differential pressure transducer
⑤	Differential pressure lines	⑩	Insulation
⑥	Shut-off valves		

Image 8-3 Measuring steam

Requirement

All valves are closed.

Procedure

⚠ WARNING

Hot vapor

Danger of injury or damage to device.

If the shutoff valves ⑥ and the differential pressure valve ③ are both open and the stabilizing valve ② is then opened, the pressure transmitter ① can be damaged by the flow of vapor.

- Follow the specified procedure for commissioning.

⚠ WARNING

Hot vapor

Danger of injury.

You can briefly open the drain valves ⑦ to clean the line. Hot vapor can escape in the process.

- Only open the drain valves ⑦ briefly, and close them again before vapor escapes.

Note

Incorrect measurement results

The measurement result is only free of errors if the differential pressure lines ④ have equally high condensate columns with the same temperature. The zero calibration must be repeated, if required, if these conditions are fulfilled.

To commission the pressure transmitter for vapor, proceed as follows:

1. Open both the shut-off valves ⑥ at the pressure tapping point.
2. Open the stabilizing valve ②.
3. Wait till the vapor in the differential pressure lines ⑤ and in the condensate pots ⑧ condenses.
4. Open the differential pressure valve ③ and the vent valve on the positive side of the pressure transmitter ① slightly, until condensate escapes without bubbles.
5. Close the vent valve.
6. Open the vent valve on the negative side of the pressure transmitter ① slightly, until condensate escapes without bubbles.
7. Close the differential pressure valve ③.
8. Open the differential pressure valve ④ till the air-free condensate goes out and then close it.
9. Close the vent valve on the negative side ①.
10. Open the differential pressure valve ③ by rotating it in half a turn.
11. Check and if required correct the zero point when the start of scale value is 0 kPa.
12. Close the stabilizing valve ②.
13. Open the differential pressure valve ③ and ④ completely.
14. You can briefly open the blow-out valves ⑦ to clean the line. Close before steam starts to leak.

Service and maintenance

9

9.1 Basic safety instructions

⚠ WARNING

Impermissible repair of explosion protected devices

Danger of explosion in areas subject to explosion hazard.

- Repair must be carried out by Siemens authorized personnel only.

⚠ WARNING

Impermissible accessories and spare parts

Danger of explosion in areas subject to explosion hazard.

- Only use original accessories or original spare parts.
- Observe all relevant installation and safety instructions described in the instructions for the device or enclosed with the accessory or spare part.

⚠ WARNING

Use of incorrect device parts in potentially explosive environments

Devices and their associated device parts are either approved for different types of protection or they do not have explosion protection. There is a danger of explosion if device parts (such as covers) are used for devices with explosion protection that are not expressly suited for this type of protection. If you do not adhere to these guidelines, the test certificates and the manufacturer warranty will become null and void.

- Use only device parts that have been approved for the respective type of protection in the potentially explosive environment. Covers that are not suited for the "explosion-proof" type of protection are identified as such by a notice label attached to the inside of the cover with "Not Ex d Not SIL".
- Do not swap device parts unless the manufacturer specifically ensures compatibility of these parts.

⚠ WARNING

Maintenance during continued operation in a hazardous area

There is a danger of explosion when carrying out repairs and maintenance on the device in a hazardous area.

- Isolate the device from power.

- or -

- Ensure that the atmosphere is explosion-free (hot work permit).

⚠ WARNING

Commissioning and operation with pending error

If an error message appears, correct operation in the process is no longer guaranteed.

- Check the gravity of the error.
- Correct the error.
- If the error still exists:
  - Take the device out of operation.
  - Prevent renewed commissioning.

See also

Display in case of a fault (Page 185)

⚠ WARNING

Hot, toxic or corrosive process media

Danger of injury during maintenance work.

When working on the process connection, hot, toxic or corrosive process media could be released.

- As long as the device is under pressure, do not loosen process connections and do not remove any parts that are pressurized.
- Before opening or removing the device ensure that process media cannot be released.

⚠ WARNING

Improper connection after maintenance

Danger of explosion in areas subject to explosion hazard.

- Connect the device correctly after maintenance.
- Close the device after maintenance work.

Refer to Chapter "Technical data (Page 193)".

⚠ WARNING

Use of a computer in a hazardous area

If the interface to the computer is used in the hazardous area, there is a danger of explosion.

- Ensure that the atmosphere is explosion-free (hot work permit).

⚠ CAUTION

Releasing key lock

Improper modification of parameters could influence process safety.

- Make sure that only authorized personnel may cancel the key locking of devices for safety-related applications.

⚠ CAUTION

Hot surfaces

Danger of burns during maintenance work on parts having surface temperatures exceeding 70 °C (158 °F).

- Take corresponding protective measures, for example by wearing protective gloves.
- After carrying out maintenance, remount touch protection measures.

⚠ WARNING

Hazardous voltage with open device in versions with 4-conductor extension

Danger of electrocution when the enclosure is opened or enclosure parts are removed.

- Disconnect the device before you open the enclosure or remove enclosure parts.
- Observe the special precautionary measures if maintenance is required while the device is live. Have maintenance work carried out by qualified personnel.

NOTICE

Electrostatic-sensitive devices

The device contains electrostatic-sensitive devices (ESD). ESD can be destroyed by voltages far too low to be detected by humans. These voltages can occur if you simply touch a component part or the electrical connections of a module without being electrostatically discharged. The damage to a module caused by overvoltage cannot normally be detected immediately; it only becomes apparent after a longer period of operating time has elapsed.

Protective measures against the discharge of static electricity:

- Make sure that no power is applied.
- Before working with modules, make sure that you discharge static from your body, for example by touching a grounded object.
- Devices and tools used must be free of static charge.
- Hold modules only by their edges.
- Do not touch connector pins or conductor tracks on a module with the ESD notice.

9.2 Maintenance and repair work

9.2.1 Defining the maintenance interval

⚠ WARNING

No maintenance interval has been defined

Device failure, device damage, and risk of injury.

- Define a maintenance interval for recurring tests depending on the use of the device and your own experience.
- The maintenance interval will vary from site to site depending on corrosion resistance.

9.2.2 Checking the gaskets

Inspect the seals at regular intervals

Note

Incorrect seal changes

Incorrect measured values will be displayed. Changing the seals in a process flange of a differential pressure measuring cell can alter the start-of-scale value.

- Changing seals in devices with differential pressure measuring cells may only be carried out by personnel authorized by Siemens.

Note

Using the wrong seals

Using the wrong seals with flush-mounted process connections can cause measuring errors and/or damage the diaphragm.

- Always use seals which comply with the process connection standards or are recommended by Siemens.

1. Clean the enclosure and seals.
2. Check the enclosure and seals for cracks and damage.
3. Grease the seals if necessary.
   - or -
4. Replace the seals.

9.2.3 Display in case of a fault

Check the start of scale value of the device from time to time.

Differentiate between the following in case of a fault:

- The internal self test has detected a fault, for example, sensor break, hardware fault/firmware fault.

  Displays:

  – Display: "ERROR" display

  – Fieldbus: B_004: Sensor error
  diagnostics in measured-value recording

- Critical hardware fault, the processor is not functioning.

  Displays:

  – Display: No defined display

  – Fieldbus: Slave not available

In case of a defect, you can replace the electronic unit by following the warning notes and the provided operating instructions.

See also

Error display (Page 72)

9.2.4 Changing the measuring cell and application electronics

Related

Note

Replacement of application electronics and/or the measuring cell is only permitted for SITRANS P DS III

Due to the higher accuracy of the SITRANS P410 of 0.04%, it is not possible to replace the application electronics and/or measuring cell.

You can replace the application electronics and/or the measuring cell only for SITRANS P DS III.

Each of the individual components "Measuring cell" and "Electronics" has a non-volatile memory (EEPROM).

Measuring cell data (e.g.: measuring range, measuring cell material, oil filling) and application-specific electronics data (e.g.: downscaling, additional electrical damping) are located in the measuring cell EEPROM.

Application-specific data (for example: reduction ratio, additional damping) are stored in the EEPROM of the application electronics. Application-specific data are lost when the measuring cell is changed. Application-specific data are not lost when the application electronics are changed. This ensures that the relevant data is retained for the remaining component when the electronics are replaced.

Before beginning with the replacement, you can determine over the FOUNDATION™ Fieldbus whether the common measuring range settings are to be adopted from the measuring cell or the electronics after the replacement or whether a standard parameter assignment is to be performed. The measuring accuracy in the specified measuring limits (with a 1:1 reduction ratio) can be reduced by the temperature error in unfavorable cases.

Technical developments enable advanced functions to be implemented in the firmware of the measuring cell or application electronics. Further technical developments are indicated by modified firmware statuses (FW). The firmware status does not affect whether the modules can be replaced. However, the scope of functions is limited to the function of existing components.

If a combination of specific firmware versions of measuring cell and application electronics is not possible for technical reasons, the device will identify this problem and go into "Error" status. This information is also provided over the FOUNDATION™ Fieldbus-interface.

9.3 Cleaning

⚠ WARNING

Dust layers above 5 mm

Danger of explosion in hazardous areas. Device may overheat due to dust build up.

- Remove dust layers in excess of 5 mm.

NOTICE

Penetration of moisture into the device

Device damage.

- Make sure when carrying out cleaning and maintenance work that no moisture penetrates the inside of the device.

Cleaning the enclosure

- Clean the outside of the enclosure and the display window using a cloth moistened with water or a mild detergent.
- Do not use aggressive cleaning agents or solvents. Plastic components or painted surfaces could be damaged.

⚠ WARNING

Electrostatic charge

Danger of explosion in hazardous areas if electrostatic charges develop, for example, when cleaning plastic surfaces with a dry cloth.

- Prevent electrostatic charging in hazardous areas.

9.3.1 Servicing the remote seal measuring system

The remote seal measuring system usually does not need servicing.

If the mediums are contaminated, viscous or crystallized, it could be necessary to clean the diaphragm from time to time. Use only a suitable solvent to remove the deposits from the diaphragm. Do not use corrosive cleaning agents. Prevent the diaphragm from getting damaged due to sharp-edged tools.

NOTICE
Improper cleaning of diaphragm Device damage. The diaphragm can be damaged. • Do not use sharp or hard objects to clean the diaphragm.

9.4 Return procedure

Enclose the bill of lading, return document and decontamination certificate in a clear plastic pouch and attach it firmly to the outside of the packaging.

Required forms

- Delivery note
- Return document (http://www.siemens.com/processinstrumentation/returngoodsnote)

  with the following information:
  - Product (item description)
  - Number of returned devices/replacement parts
  - Reason for returning the item(s)
- Decontamination declaration (http://www.siemens.com/sc/declarationofdecontamination)

  With this declaration you warrant "that the device/replacement part has been carefully cleaned and is free of residues. The device/replacement part does not pose a hazard for humans and the environment."

  If the returned device/replacement part has come into contact with poisonous, corrosive, flammable or water-contaminating substances, you must thoroughly clean and decontaminate the device/replacement part before returning it in order to ensure that all hollow areas are free from hazardous substances. Check the item after it has been cleaned.

  Any devices/replacement parts returned without a decontamination declaration will be cleaned at your expense before further processing.

The forms can be found on the Internet as well as in the documentation which comes with the device.

9.5 Disposal

Devices identified by this symbol may not be disposed of in the municipal waste disposal services under observance of the Directive 2002/96/EC on waste electronic and electrical equipment (WEEE).

They can be returned to the supplier within the EC or to a locally approved disposal service. Observe the specific regulations valid in your country.

Note

Special disposal required

The device includes components that require special disposal.

- Dispose of the device properly and environmentally through a local waste disposal contractor.

Alarm, error, and system messages

10

10.1 Status messages

Display	Meaning
G_001, G_004	Unreported block alarm
G_002, G_005	High or low alarm limit reached
G_003, G_006	High or low alarm limit reached
Gc001 Gc008	Initial value BKCAL_IN (cascade) set Initializes fault status (cascade)
B_001	Parameter assignment error
B_003	Value not calculated or device error
B_004	Sensor fault (brake)
B_006	Value is not transmitted
B_007	Out of Service
U_002	Substitute value
U_004	Low limit for overload exceeded (<20 %) High limit for overload exceeded (>120 %) Inaccurate value

10.2 Error messages

Display	Meaning
F_001	Button and function lock
F_004	Decimal point is not optimal
F_007	Measuring range limited
F_008	Local operation deactivated

Technical data

11

11.1 Overview of technical data

Introduction

The following overview of technical data provides you with a quick and easy access to relevant data and characteristic numbers.

Remember that tables in part contain the data of the three communication types HART, PROFIBUS and FOUNDATION™ Fieldbus. This data deviates in many cases. Therefore, adhere to the communication type used by you when using the technical data.

Contents of the chapter

11.2 SITRANS P DS III input

Gauge pressure input			
Measured variable	Gauge pressure		
Span continuously adjustable) or measuring range, max. operating pressure (in accordance with 97/23/EC Pressure Equipment Directive) and max. test pressure (in accordance with DIN 16086) (for oxygen measurement, max. 100 bar and 60 °C ambient temperature/process temperature)	Span [1]	Maximum operating pressure MAWP (PS)	Maximum test pressure
	8.3 … 250 mbar	4 bar	6 bar
	0.83 ... 25 kPa	400 kPa	0.6 MPa
	0.12 … 3.6 psi	58 psi	87 psi
	0.01 … 1 bar	4 bar	6 bar
	1 ... 100 kPa	400 kPa	0.6 MPa
	0.15 … 14.5 psi	58 psi	87 psi
	0.04 … 4 bar	7 bar	10 bar
	4 ... 400 kPa	0.7 MPa	1 MPa
	0.58 … 58 psi	102 psi	145 psi
	0.16 … 16 bar	21 bar	32 bar
	16 ... 1600 kPa	2.1 MPa	3.2 MPa
	2.3 … 232 psi	305 psi	464 psi
	0.63 … 63 bar	67 bar	100 bar
	63 ... 6300 kPa	6.7 MPa	10 MPa
	9.1 … 914 psi	972 psi	1450 psi
	1.6 … 160 bar	167 bar	250 bar
	0.16 ... 16 MPa	16.7 MPa	2.5 MPa
	23 … 2321 psi	2422 psi	3626 psi
	4 … 400 bar	400 bar	600 bar
	0.4 ... 40 MPa	40 MPa	60 MPa
	58 … 5802 psi	5802 psi	8702 psi
	7 … 700 bar	800 bar	800 bar
	0.7 ... 70 MPa	80 MPa	80 MPa
	102 ... 10153 psi	11603 psi	11603 psi
Low measuring limit[2]			
• Measuring cell with silicone oil filling	30 mbar a/3 kPa a/0.44 psi a		
• Measuring cell with inert liquid	30 mbar a/3 kPa a/0.44 psi a		
Upper measuring limit	100 % of max. span (for oxygen measurement: max. 100 bar/10 MPa/1450 psi and 60 °C ambient temperature/process temperature)		
Start of scale value	Between the measuring limits (fully adjustable)		

[1] Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

[2] With 250mbar/25 kPa/3.6 psi measuring cells, the lower measuring limit is 750 mbar a/75 kPa a/10.8 psi a. The measuring cell is vacuum-tight down to 30 mbar a/3 kPa a/0.44 psi a.

gauge pressure input, with flush mounted diaphragm			
Measured variable	Gauge pressure		
Span (continuously adjustable) or measuring range, max. operating pressure and max. test pressure	Span [1]	Maximum operating pressure MAWP (PS)	Maximum test pressure
	0.01 … 1 bar	4 bar	6 bar
	1 ... 100 kPa	400 kPa	0.6 MPa
	0.15 … 14.5 psi	58 psi	87 psi
	0.04 … 4 bar	7 bar	10 bar
	4 ... 400 kPa	0.7 MPa	1 MPa
	0.58 … 58 psi	102 psi	145 psi
	0.16 … 16 bar	21 bar	32 bar
	0.06 ... 1600 kPa	2.1 MPa	3.2 MPa
	2.3 … 232 psi	305 psi	464 psi
	0.6 … 63 bar	67 bar	100 bar
	0.06 ... 6.3 MPa	6.7 MPa	10 MPa
	9.1 … 914 psi	972 psi	1450 psi
Lower measuring limit			
• Measuring cell with silicone oil filling	100 mbar a/10 kPa a/1.45 psi a		
• Measuring cell with inert liquid	100 mbar a/10 kPa a/1.45 psi a		
• Measuring cell with neobee	100 mbar a/10 kPa a/1.45 psi a		
Upper measuring limit	100% of maximum span		

[1] Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

Absolute pressure input, with flush-mounted diaphragm			
Measured variable	Absolute pressure		
Span (continuously adjustable) or measuring range, max. operating pressure and max. test pressure	Span [1]	Maximum operating pressure MAWP (PS)	Maximum test pressure
	43 … 1300 mbar a	2.6 bar a	10 bar a
	4.3 ... 130 kPa a	260 kPa a	1 MPa a
	17 … 525 inH_2O a	37.7 psi a	145 psi a
	160 … 5000 mbar a	10 bar a	30 bar a
	16 ... 500 kPa a	1 MPa a	3 MPa a
	2.32 … 72.5 psi a	145 psi a	435 psi a
	1 … 30 bar a	45 bar a	100 bar a
	0.1 ... 3 MPa a	4.5 MPa	10 MPa a
	14.5 … 435 psi a	653 psi a	1450 psi a
	Depending on the process connection, the span may differ from these values		
Lower measuring limit	0 mbar a/kPa a/psi a		
Upper measuring limit	100% of maximum span		

[1] Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

Input pressure transmitter with PMC connection			
Measured variable	Gauge pressure		
Span (continuously adjustable) or measuring range, max. operating pressure and max. test pressure	Span[1) 2)]	Maximum operating pressure MAWP (PS)	Maximum test pressure
	0.01 … 1 bar	4 bar	6 bar
	1 ... 100 kPa	400 kPa	600 kPa
	0.15 … 14.5 psi	58 psi	87 psi
	0.04 … 4 bar	7 bar	10 bar
	4 ... 400 kPa	700 kPa	1 MPa
	0.58 … 58 psi	102 psi	145 psi
	0.16 … 16 bar	21 bar	32 bar
	0.016... 1.6 MPa	2.1 MPa	3.2 MPa
	2.3 … 232 psi	305 psi	464 psi
Lower measuring limit			
• Measuring cell with silicone oil filling [2)]	100 mbar a/10 kPa a/1.45 psi a		
• Measuring cell with inert liquid [2)]	100 mbar a/10 kPa a/1.45 psi a		
• Measuring cell with neobee [2)]	100 mbar a/10 kPa a/1.45 psi a		
Upper measuring limit	100% of maximum span		

[1)] Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

[2)] For PMC-Style Minibolt, the span should not be less than 500 mbar

Absolute pressure input (from the gauge pressure series)			
Measured variable	Absolute pressure		
Span (continuously adjustable) or measuring range, maximum operating pressure (as per 97/23/EC pressure device guideline) and maximum test pressure (as per DIN 16086)	Span [1)]	Maximum operating pressure MAWP (PS)	Maximum test pressure
	8.3 … 250 mbar a	1.5 bar a	6 bar a
	0.83 ... 25 kPa a	150 kPa a	600 kPa a
	3 … 100 inH_2O a	21.8 psi a	87 psi a
	43 … 1300 mbar a	2.6 bar a	10 bar a
	4.3 ... 130 kPa a	260 kPa a	1 MPa a
	17 … 525 inH_2O a	37.7 psi a	145 psi a
	160 … 5000 mbar a	10 bar a	30 bar a
	16 ... 500 kPa a	1 MPa a	3 MPa a
	2.32 … 72.5 psi a	145 psi a	435 psi a
	1 … 30 bar a	45 bar a	100 bar a
	0.1 ... 3 MPa a	4.5 MPa a	10 MPa a
	14.5 … 435 psi a	653 psi a	1450 psi a
Lower measuring limit			
• Measuring cell with silicone oil filling	0 mbar a/kPa a/psi a		
• Measuring cell with inert liquid			

Absolute pressure input (from the gauge pressure series)	
for process temperature -20°C < ϑ ≤ 60°C (-4°F < ϑ ≤ +140°F)	30 mbar a/3 kPa a/0.44 psi a
for process temperature 60°C < ϑ ≤ 100°C (max. 85°C for measuring cell 30 bar) (140°F < ϑ ≤ 212°F (max. 185°F for measuring cell 435 psi))	30 mbar a + 20 mbar a • (ϑ - 60 °C)/°C 3 kPa a + 2 kPa a • (ϑ - 60 °C)/°C 0.44 psi a + 0.29 psi a • (ϑ - 108 °F)/°F
Upper measuring limit	100 % of max. span (for oxygen measurement: max. 100 bar/10 MPa/1450 psi and 60 °C ambient temperature/process temperature)
Start of scale value	Between the measuring limits (fully adjustable)

1) Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

Absolute pressure input (from the differential pressure series)		
Measured variable	Absolute pressure	
Span (continuously adjustable) or measuring range and max. operating pressure (in accordance with 97/23/EC Pressure Equipment Directive)	Span 1)	Maximum operating pressure MAWP (PS)
	8.3 … 250 mbar a 0.83 ... 25 kPa a 3 … 100 inH_2O a	32 bar a 3.2 MPa a 464 psi a
	43 … 1300 mbar a 4.3 ... 130 kPa a 17 … 525 inH_2O a	32 bar a 3.2 MPa a 464 psi a
	160 … 5000 mbar a 16 ... 500 kPa a 2.32 … 72.5 psi a	32 bar a 3.2 MPa a 464 psi a
	1 … 30 bar a 0.1 ... 3 MPa a 14.5 … 435 psi a	160 bar a 16 MPa a 2320 psi a
	5.3 … 100 bar a 0.5 ... 10 MPa a 76.9 … 1450 psi a	160 bar a 16 MPa a 2320 psi a
Lower measuring limit		
• Measuring cell with silicone oil filling	0 mbar a /kPa a /psi a	
• Measuring cell with inert liquid		
for process temperature -20°C < ϑ ≤ 60°C (-4°F < ϑ ≤ +140°F)	30 mbar a /3 kPa a /0.44 psi a	
for process temperature 60°C < ϑ ≤ 100°C (max. 85°C for measuring cell 30 bar) (140°F < ϑ ≤ 212°F (max. 185°F for measuring cell 435 psi))	30 mbar a + 20 mbar a • (ϑ - 60 °C)/°C 3 kPa a + 2 kPa a • (ϑ - 60 °C)/°C 0.44 psi a + 0.29 psi a • (ϑ - 108 °F)/°F	

Absolute pressure input (from the differential pressure series)	
Upper measuring limit	100 % of max. span (for oxygen measurement: max. 100 bar/10 MPa/1450 psi and 60 °C ambient temperature/process temperature)
Start of scale value	Between the measuring limits (fully adjustable)

1) Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

Differential pressure and flow rate input		
Measured variable	Differential pressure and flow rate	
Span (continuously adjustable) or measuring range and max. operating pressure (in accordance with 97/23/EC Pressure Equipment Directive)	Span 1)	Maximum operating pressure MAWP (PS)
	1 ... 20 mbar	32 bar
	0.1 ... 2 kPa	3.2 MPa
	0.4015 … 8.031 inH_2O	464 psi
	1 ... 60 mbar	160 bar
	0.1 ... 6 kPa	16 MPa
	0.4015 … 24.09 inH_2O	2320 psi
	2.5 … 250 mbar	160 bar
	0.2 ... 25 kPa	16 MPa
	1.004 … 100.4 inH_2O	2320 psi
	6 … 600 mbar	160 bar
	0.6 ... 60 kPa	16 MPa
	2.409 … 240.9 inH_2O	2320 psi
	16 … 1600 mbar	160 bar
	1.6 ... 160 kPa	16 MPa
	6.424 … 642.4 inH_2O	2320 psi
	50 … 5000 mbar	160 bar
	5 ... 500 kPa	16 MPa
	20.08 … 2008 inH_2O	2320 psi
	0.3 … 30 bar	160 bar
	0.03 ... 3 MPa	16 MPa
	4.35 … 435 psi	2320 psi
	2.5 … 250 mbar	420 bar
	0.25 ... 25 kPa	42 MPa
	1.004 … 100.4 inH_2O	6091 psi
	6 … 600 mbar	420 bar
	0.6 ... 60 kPa	42 MPa
	2.409 … 240.9 inH_2O	6091 psi
	16 … 1600 mbar	420 bar
	1.6 ... 160 kPa	42 MPa
	6.424 … 642.4 inH_2O	6091 psi

Differential pressure and flow rate input		
	50 … 5000 mbar	420 bar
	5 ... 500 kPa	42 MPa
	20.08 … 2008 inH_2O	6091 psi
	0.3 … 30 bar	420 bar
	0.03 ... 3 MPa	42 MPa
	4.35 … 435 psi	6091 psi
Lower measuring limit		
• Measuring cell with silicone oil filling	-100% of max. measuring range (-33 % for 30 bar /3 MPa /435 psi measuring cell) or 30 mbar a /3 kPa a /0.44 psi a	
• Measuring cell with inert liquid		
for process temperature -20°C < ϑ ≤ 60°C (-4°F < ϑ ≤ +140°F)	-100 % of max. measuring range (-33 % for 30 bar/3 MPa/435 psi measuring cell) or 30 mbar a/3 kPa a/0.44 psi a	
for process temperature 60°C < ϑ ≤ 100°C (max. 85°C for measuring cell 30 bar) (140°F < ϑ ≤ 212°F (max. 185°F for measuring cell 435 psi))	• -100% of max. measuring range (-33% for 30 bar/3 kPa/435 psi measuring cell) • 30 mbar a + 20 mbar a • (ϑ - 60 °C)/°C 3 kPa a + 2 kPa a • (ϑ - 60 °C)/°C 0.44 psi a + 0.29 psi a • (ϑ - 108 °F)/°F	
Upper measuring limit	100 % of max. span (for oxygen measurement: max. 100 bar/10 MPa/1450 psi and 60 °C ambient temperature/process temperature)	
Start of scale value	Between the measuring limits (fully adjustable)	

1) Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

Level input		
Measured variable	Level	
Span (continuously adjustable) or measuring range and max. operating pressure (in accordance with 97/23/EC Pressure Equipment Directive)	Span 1)	Maximum operating pressure MAWP (PS)
	25 … 250 mbar 2.5 ... 25 kPa 10 … 100 inH_2O	see the mounting flange
	25 … 600 mbar 2.5 ... 60 kPa 10 … 240 inH_2O	
	53 … 1600 mbar 5.3 ... 160 kPa 021 … 640 inH_2O	
	160 … 5000 mbar 16 ... 500 kPa 2.32 … 72.5 psi	

Level input	
Lower measuring limit	
• Measuring cell with silicone oil filling	-100% of max. measuring range or 30 mbar a/3 kPa a/0.44 psi a depending on the mounting flange
• Measuring cell with inert liquid	-100% of max. measuring range or 30 mbar a/3 kPa a/0.44 psi a depending on the mounting flange
Upper measuring limit	100% of maximum span
Start of scale value	between the measuring limits continuously adjustable

1) Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

11.3 SITRANS P410 input

Gauge pressure input			
Measured variable	Gauge pressure		
Span (continuously adjustable) or measuring range, max. operating pressure (in accordance with 97/23/EC Pressure Equipment Directive) and max. test pressure (in accordance with DIN 16086).	Span 1)	Maximum operating pressure MAWP (PS)	Maximum test pressure
	0.01 … 1 bar	4 bar	6 bar
	1 ... 100 kPa	400 kPa	0.6 MPa
	0.15 … 14.5 psi	58 psi	87 psi
	0.04 … 4 bar	7 bar	10 bar
	4 ... 400 kPa	0.7 MPa	1 MPa
	0.58 … 58 psi	102 psi	145 psi
	0.16 … 16 bar	21 bar	32 bar
	16 ... 1600 kPa	2.1 MPa	3.2 MPa
	2.3 … 232 psi	305 psi	464 psi
	0.63 … 63 bar	67 bar	100 bar
	63 ... 6300 kPa	6.7 MPa	10 MPa
	9.1 … 914 psi	972 psi	1450 psi
	1.6 … 160 bar	167 bar	250 bar
	0.16 ... 16 MPa	16.7 MPa	2.5 MPa
	23 … 2321 psi	2422 psi	3626 psi
Lower measuring limit			
• Measuring cell with silicone oil filling	30 mbar a/3 kPa a/0.44 psi a		
Upper measuring limit	100% of maximum span		
Start of scale value	Between the measuring limits (fully adjustable)		

1) Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

Differential pressure and flow rate input		
Measured variable	Differential pressure and flow rate	
Span (continuously adjustable) or measuring range and max. operating pressure (in accordance with 97/23/EC Pressure Equipment Directive)	Span [1]	Maximum operating pressure MAWP (PS)
	2.5 … 250 mbar	160 bar
	0.2 ... 25 kPa	16 MPa
	1.004 … 100.4 inH_2O	2320 psi
	6 … 600 mbar	160 bar
	0.6 ... 60 kPa	16 MPa
	2.409 … 240.9 inH_2O	2320 psi
	16 … 1600 mbar	160 bar
	1.6 ... 160 kPa	16 MPa
	6.424 … 642.4 inH_2O	2320 psi
	50 … 5000 mbar	160 bar
	5 ... 500 kPa	16 MPa
	20.08 … 2008 inH_2O	2320 psi
	0.3 … 30 bar	160 bar
	0.03 ... 3 MPa	16 MPa
	4.35 … 435 psi	2320 psi
	6 … 600 mbar	420 bar
	0.6 ... 60 kPa	42 MPa
	2.409 … 240.9 inH_2O	6091 psi
	16 … 1600 mbar	420 bar
	1.6 ... 160 kPa	42 MPa
	6.424 … 642.4 inH_2O	6091 psi
	50 … 5000 mbar	420 bar
	5 ... 500 kPa	42 MPa
	20.08 … 2008 inH_2O	6091 psi
	0.3 … 30 bar	420 bar
	0.03 ... 3 MPa	42 MPa
	4.35 … 435 psi	6091 psi
Lower measuring limit		
• Measuring cell with silicone oil filling	-100 % of max. measuring range (-33 % for 30 bar/3 MPa/435 psi measuring cell) or 30 mbar a/3 kPa a/0.44 psi a	
Upper measuring limit	100% of maximum span	
Start of scale value	Between the measuring limits (fully adjustable)	

[1] Order the nominal measuring range with the order option Y01 for PROFIBUS PA or FOUNDATION Fieldbus.

11.4 Output

Output		
	HART	**PROFIBUS PA and FOUNDATION Fieldbus**
Output signal	4 … 20 mA	Digital PROFIBUS PA or FOUNDATION™ Fieldbus signal
• Low saturation limit (fully adjustable)	3.55 mA, set to 3.84 mA in the factory	–
• High saturation limit (fully adjustable)	23 mA, set to 20.5 mA or optionally 22.0 mA in the factory	–
• Ripple (without HART communication)	I_{SS} ≤ 0.5 % of the max. output current	–
adjustable time constants damping coefficient	0 … 100 s, continuously adjustable	0 … 100 s, continuously adjustable
Adjustable time constants (T63) with local operation	0 … 100 s, in steps of 0.1 s Factory-set to 2 s	0 … 100 s, in steps of 0.1 s Factory-set to 2 s
• Current transmitter	3.55 … 23 mA	–
• Failure signal	3.55 … 23 mA	–
Load	Resistor R [Ω]	–
• Without HART communication	$R = \frac{U_H - 10{,}5\ V}{23\ mA}$ U_H Power supply in V	–
• With HART communication		–
HART communicator (Handheld)	R =230 … 1100 Ω	–
SIMATIC PDM	R =230 … 500 Ω	–
Characteristic curve	• Linearly increasing or linearly decreasing • Linear increase or decrease or root extraction increase (only for differential pressure and flow rate)	
Bus physics	–	IEC 61158-2
Polarity-independent	–	Yes

11.5 Measuring accuracy of SITRANS P DS III

Measuring accuracy (as per EN 60770-1) gauge pressure			
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)		
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range		
Conformity error at limit point setting, including hysteresis and repeatability			
• Linear characteristic curve	r ≤ 1.25		1.25 < r ≤ 30
250 mbar/25 kPa/3.6 psi	≤ 0.065%		≤ (0.008 • r + 0.055) %
• Linear characteristic curve	r ≤ 5		5 < r ≤ 100
1 bar/100 kPa/14.5 psi 4 bar/400 kPa/58 psi 16 bar/1.6 MPa/232 psi 63 bar/6.3 MPa/914 psi 160 bar/16 MPa/12321 psi	≤ 0.065%		≤ (0.004 • r + 0.045) %
• Linear characteristic curve	r ≤ 3	3 < r ≤ 10	10 < r ≤ 100
400 bar/40 MPa/5802 psi 700 bar/70 MPa/10152 psi	≤ 0.075%	≤ (0.0029 • r + 0.071) %	≤ (0.005 • r + 0.05) %
Effect of ambient temperature	In percent per 28 °C (50 °F)		
• 250 mbar/25 kPa/3.6 psi	≤ (0.16 • r + 0.1) %		
• 1 bar/100 kPa/14.5 psi	≤ (0.05 • r + 0.1) %		
• 4 bar/400 kPa/58 psi 16 bar/1.6 MPa/232 psi 63 bar/6.3 MPa/914 psi 160 bar/16 MPa/2321 psi 400 bar/40 MPa/5802 psi	≤ (0.025 • r + 0.125) %		
• 700 bar/70 MPa/10152 psi	≤ (0.08 • r + 0.16) %		
Long-term stability at ±30 °C (±54 °F)			
• 250 mbar/25 kPa/3.6 psi	Per year ≤ (0.25 • r) %		
• 1 bar/100 kPa/14.5 psi 4 bar/400 kPa/58 psi	In 5 years ≤ (0.25 • r) %		

Measuring accuracy (as per EN 60770-1) gauge pressure	
• 16 bar/1.6 MPa/232 psi 63 bar/6.3 MPa/914 psi 160 bar/16 MPa/2321 psi 400 bar/40 MPa/5802 psi	In 5 years ≤ (0.125 • r) %
• 700 bar/70 MPa/10152 psi	In 5 years ≤ (0.25 • r) %
Step response time T_{63} (without electrical damping)	Approx. 0.15 s
Effect of mounting position	≤ 0.05 mbar/0.005 kPa/0.000725 psi per 10° incline (zero-point correction is possible with position error compensation)
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

Gauge pressure measuring accuracy, with flush mounted diaphragm	
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range
Conformity error at limit point setting, including hysteresis and repeatability	
• Linear characteristic curve	
r ≤ 5	≤ 0.075 %
5 < r ≤ 100	≤ (0.005 • r + 0.05) %
Effect of ambient temperature	
In percent per 28 °C (50 °F)	≤ (0.08 • r + 0.16)
Effect of process temperature	In pressure per temperature change
• Temperature difference between medium temperature and ambient temperature	3 mbar per 10 K 0.3 kPa per 10 K 0.04 psi per 10 K
Long-term stability at ±30 °C (±54 °F)	In 5 years ≤ (0.25 • r) %
Step response time T_{63} without electrical damping	Approx. 0.2 s
Effect of mounting position	In pressure per change of angle 0.4 mbar/0.04 kPa/0.006 psi per 10° incline (zero-point correction is possible with position error compensation)

Gauge pressure measuring accuracy, with flush mounted diaphragm	
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

Absolute pressure measuring accuracy with flush diaphragm	
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range
Conformity error at limit point setting, including hysteresis and repeatability	
• Linear characteristic curve	
r ≤ 10	≤ 0.2%
10 < r ≤ 30	≤ 0.4%
Effect of ambient temperature	
In percent per 28 °C (50 °F)	≤ (0.16 • r + 0.24)
Effect of process temperature	In pressure per temperature change
• Temperature difference between medium temperature and ambient temperature	3 mbar per 10 K 0.3 kPa per 10 K 0.04 psi per 10 K
Long-term stability at ±30 °C (±54 °F)	In 5 years ≤ (0.25 • r) %
Step response time T_{63} without electrical damping	Approx. 0.2 s
Effect of mounting position	In pressure per change of angle 0.04 kPa/0.4 mbar/0.006 psi per 10° incline (zero-point correction is possible with position error compensation)
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured-value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

Measuring accuracy (according to EN 60770-1) of pressure transmitter with PMC connection	
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range
Conformity error at limit point setting, including hysteresis and repeatability	
• Linear characteristic curve	
r ≤ 5	≤ 0.075 %
5 < r ≤ 100	≤ (0.005 • r + 0.05) %
Effect of ambient temperature	
In percent per 28 °C (50 °F)	≤ (0.08 • r + 0.16)
Effect of process temperature	In pressure per temperature change
• Temperature difference between medium temperature and ambient temperature	3 mbar per 10 K 0.3 kPa per 10 K 0.04 psi per 10 K
Long-term stability at ±30 °C (±54 °F)	In 5 years ≤ (0.25 • r) %
Step response time T_{63} without electrical damping	Approx. 0.2 s
Effect of mounting position	In pressure per change of angle ≤ 0.1 mbar/0.01 kPa/0.00145 psi per 10° incline (zero point correction is possible with position error compensation)
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured-value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

Absolute pressure measuring accuracy (from gauge and differential pressure series)	
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range
Conformity error at limit point setting, including hysteresis and repeatability	

Absolute pressure measuring accuracy (from gauge and differential pressure series)	
• Linear characteristic curve	
r ≤ 10	≤ 0.1%
10 < r ≤ 30	≤ 0.2%
• Effect of ambient temperature	In percent per 28 °C (50 °F)
• 250 mbar/25 kPa/3.6 psi	≤ (0.15 • r + 0.1)
• 1300 mbar a/130 kPa a/18.8 psi a 5 bar a/500 kPa a/72.5 psi a 30 bar a/3000 kPa a/435 psi a 100 bar a/10 MPa a/1450.3 psi a 160 bar a/16 MPa a/2321 psi a 400 bar a/40 MPa a/5802 psi a 700 bar a/70 MPa a/10152.6 psi a	≤ (0.08 • r + 0.16)
Long-term stability at ±30 °C (±54 °F)	In 5 years ≤ (0.25 • r) %
Step response time T_{63} without electrical damping	Approx. 0.2 s
Effect of mounting position	In pressure per change of angle • for absolute pressure (from the gauge pressure series): ≤ 0.05 mbar/0.005 kPa/0.000725 psi per 10° incline • for absolute pressure (from the differential pressure series): 0.7 mbar/0.07 kPa/0.001015 psi per 10° incline (zero-point correction is possible with position error compensation)
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

Differential pressure and flow rate measuring accuracy	
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range
Conformity error at limit point setting, including hysteresis and repeatability	

Differential pressure and flow rate measuring accuracy			
• Linear characteristic curve	r ≤ 5	5 < r ≤ 10	10 < r ≤ 20
20 mbar/2 kPa/0.29 psi	≤ 0.075 %	≤ (0.0029 • r + 0.071) %	≤ (0.0045 • r + 0.071) %
• Linear characteristic curve	r ≤ 5		5 < r ≤ 60
60 mbar/6 kPa/0.87 psi	≤ 0.075 %		≤ (0.005 • r + 0.05) %
• Linear characteristic curve	r ≤ 5		5 < r ≤ 100
250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.065%		≤ (0.004 • r + 0.045) %
• Root extraction characteristic			
Flow > 50 %	r ≤ 5	5 < r ≤ 10	10 < r ≤ 20
• 20 mbar/2 kPa/0.29 psi	≤ 0.075 %	≤ (0.0029 • r + 0.071) %	≤ (0.0045 • r + 0.071) %
• Root extraction characteristic			
Flow > 50 %	r ≤ 5		5 < r ≤ 60
• 60 mbar/6 kPa/0.87 psi	≤ 0.075 %		≤ (0.005 • r + 0.05) %
• Root extraction characteristic			
Flow > 50 %	r ≤ 5		5 < r ≤ 100
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.065%		≤ (0.004 • r + 0.045) %
• Root extraction characteristic			
Flow 25 ... 50%	r ≤ 5	5 < r ≤10	10 < r ≤ 20
• 20 mbar/2 kPa/0.29 psi	≤ 0.15 %	≤ (0.0058 • r + 0.142) %	≤ (0.009 • r + 0.142) %
• Root extraction characteristic			
Flow 25 ... 50%	r ≤ 5		5 < r ≤ 60
• 60 mbar/6 kPa/0.87 psi	≤ 0.15 %		≤ (0.01 • r + 0.1) %
• Root extraction characteristic	r ≤ 5		5 < r ≤ 100
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.13%		≤ (0.008 • r + 0.9) %
Effect of ambient temperature	In percent per 28 °C (50 °F)		

Differential pressure and flow rate measuring accuracy	
• 20 mbar/2 kPa/0.29 psi	≤ (0.15 • r + 0.1) %
• 60 mbar/6 kPa/0.87 psi	≤ (0.075 • r + 0.1) %
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ (0.025 • r + 0.125) %
Effect of static pressure	
• At the start of scale value	
20 mbar/2 kPa/0.29 psi	≤ (0.15 • r) % per 32 bar (zero-point correction is possible with position error compensation)
60 mbar/6 kPa/0.87 psi 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi	≤ (0.1 • r) % per 70 bar (zero-point correction is possible with position error compensation)
5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ (0.2 • r) % per 70 bar (zero-point correction is possible with position error compensation)
• On the measuring span	
20 mbar/2 kPa/0.29 psi	≤ 0.2% per 32 bar
60 mbar/6 kPa/0.87 psi 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.14 % per 70 bar
Long-term stability at ±30 °C (±54 °F)	Static pressure max. 70 bar/7 MPa/1015 psi
• 20 mbar/2 kPa/0.29 psi	Per year ≤ (0.2 • r) %
• 60 mbar/6 kPa/0.87 psi 30 bar/3 MPa/435.11 psi	In 5 years ≤ (0.25 • r) %
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi	In 5 years ≤ (0.125 • r) %
Step response time T_{63} without electrical damping	
• 20 mbar/2 kPa/0.29 psi 60 mbar/6 kPa/0.87 psi	Approx. 0.3 s
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	Approx. 0.2 s

Differential pressure and flow rate measuring accuracy	
Effect of mounting position	In pressure per change of angle ≤ 0.7 mbar/0.07 kPa/0.028 inH_2O per 10° incline (zero-point correction is possible with position error compensation)
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured-value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

Level measuring accuracy				
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)			
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range			
Conformity error at limit point setting, including hysteresis and repeatability				
• Linear characteristic curve	r ≤ 5	5 < r ≤ 10	5 < r ≤ 25	5 < r ≤ 30
250 mbar/25 kPa/3.63 psi	≤ 0.125%	≤ (0.007 • r + 0.09) %		
600 mbar/60 kPa/8.70 psi	≤ 0.125%		≤ (0.007 • r + 0.09) %	
1600 mbar/160 kPa/23.21 psi	≤ 0.125%			≤ (0.007 • r + 0.09) %
5 bar/500 kPa/72.52 psi	≤ 0.125%			≤ (0.007 • r + 0.09) %
Effect of ambient temperature	In percent per 28 °C (50 °F)			
• 250 mbar/25 kPa/3.63 psi	≤ (0.4 • r + 0.16) %			
• 600 mbar/60 kPa/8.70 psi	≤ (0.24 • r + 0.16) %			
• 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi	≤ (0.2 • r + 0.16) %			
Effect of static pressure				
• At the start of scale value				
Measuring cell 250 mbar/25 kPa/3.63 psi	≤ (0.3 • r) % per nominal pressure			
Measuring cell 600 mbar/60 kPa/8.70 psi	≤ (0.15 • r) % per nominal pressure			

Level measuring accuracy	
Measuring cell 1600 mbar/160 kPa/23.21 psi Measuring cell 5 bar/500 kPa/72.52 psi	≤ (0.1 • r) % per nominal pressure
• On the measuring span	≤ (0.1 • r) % per nominal pressure
Long-term stability at ±30 °C (±54 °F)	in 5 years ≤ (0.25 • r) % static pressure max. 70 bar/7 MPa/1015 psi
Step response time T_{63} without electrical damping	Approx. 0.2 s
Effect of mounting position	depending on the fill fluid in the mounting flange
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

11.6 Measuring accuracy of SITRANS P410

Measuring accuracy (as per EN 60770-1) gauge pressure		
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)	
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range	
Conformity error at limit point setting, including hysteresis and repeatability		
• Linear characteristic curve	r ≤ 5	5 < r ≤ 100
1 bar/100 kPa/14.5 psi 4 bar400 kPa/58 psi 16 bar/1.6 MPa/232 psi 63 bar/6.3 MPa/914 psi 160 bar/16 MPa/2321 psi	≤ 0.04%	≤ (0.004 • r + 0.045) %
Effect of ambient temperature	In percent per 28 °C (50 °F)	
• 1 bar/100 kPa/14.5 psi	≤ (0.05 • r + 0.1) %	
• 4 bar/400 kPa/58 psi 16 bar/1.6 MPa/232 psi 63 bar/6.3 MPa/914 psi 160 bar/16 MPa/2321 psi	≤ (0.025 • r + 0.125) %	

Measuring accuracy (as per EN 60770-1) gauge pressure	
Long-term stability at ±30 °C (±54 °F)	
• 1 bar/100 kPa/14.5 psi 4 bar/400 kPa/58 psi	In 5 years ≤ (0.25 • r) %
• 16 bar/1.6 MPa/232 psi 63 bar/6.3 MPa/914 psi 160 bar/16 MPa/2321 psi	In 5 years ≤ (0.125 • r) %
Step response time T_{63} (without electrical damping)	Approx. 0.15 s
Effect of mounting position	≤ 0.05 mbar/0.005 kPa/0.02 inH_2O per 10° incline (zero point correction is possible with position error compensation)
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured value resolution for PROFIBUS PA or FOUNDATION Fieldbus	3 • 10^{-5} of the nominal measuring range

Differential pressure and flow rate measuring accuracy		
Reference conditions	• Rising characteristic curve • Start of scale value 0 bar/kPa/psi • Seal diaphragm stainless steel • Measuring cell with silicone oil filling • Room temperature 25 °C (77 °F)	
Measuring span ratio r (spread, Turn-Down)	r = max. measuring span/set measuring span and nominal measuring range	
Conformity error at limit point setting, including hysteresis and repeatability		
• Linear characteristic curve	r ≤ 5	5 < r ≤ 100
250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.04%	≤ (0.004 • r + 0.045) %
• Root extraction characteristic		
Flow > 50 %	r ≤ 5	5 < r ≤ 30
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.04%	≤ (0.004 • r + 0.045) %
Flow 25 ... 50%	r ≤ 5	5 < r ≤ 30

Differential pressure and flow rate measuring accuracy		
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.08%	≤ (0.008 • r + 0.09) %
Effect of ambient temperature	In percent per 28 °C (50 °F)	
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ (0.025 • r + 0.125) %	
Effect of static pressure		
• At the start of scale value		
250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi	≤ (0.1 • r) % per 70 bar (zero-point correction is possible with position error compensation)	
5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ (0.2 • r) % per 70 bar (zero-point correction is possible with position error compensation)	
• On the measuring span		
250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	≤ 0.14 % per 70 bar	
Long-term stability at ±30 °C (±54 °F)	Static pressure max. 70 bar/7 MPa/1015 psi	
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi	In 5 years ≤ (0.125 • r) %	
• 30 bar/3 MPa/435.11 psi	In 5 years ≤ (0.25 • r) %	
Step response time T_{63} without electrical damping		
• 250 mbar/25 kPa/3.63 psi 600 mbar/60 kPa/8.70 psi 1600 mbar/160 kPa/23.21 psi 5 bar/500 kPa/72.52 psi 30 bar/3 MPa/435.11 psi	Approx. 0.2 s	
Effect of mounting position	In pressure per change of angle ≤ 0.7 mbar/0.07 kPa/0.001015 psi per 10° incline (zero-point correction is possible with position error compensation)	

Differential pressure and flow rate measuring accuracy	
Effect of auxiliary power supply	In percent per change in voltage 0.005 % per 1 V
Measured value resolution for PROFIBUS PA or FOUNDATION Fieldbus	$3 \cdot 10^{-5}$ of the nominal measuring range

11.7 Operating conditions

Rated conditions for gauge pressure and absolute pressure (from the gauge pressure series)		
Installation conditions		
Ambient conditions		
• Ambient temperature		
Note	Observe the temperature class in hazardous areas.	
Measuring cell with silicone oil filling	-40 … +100 °C (-40 … +212 °F)	
Measuring cell with inert liquid	-20 … +85 °C (-4 … +185 °F)	
Measuring cell with inert filling liquid for gauge pressure measuring cells 1, 4, 16 and 63 bar	-40 ... +85°C (-40...+185°F)	
Display	-30 … +85 °C (-22 … +185 °F)	
Storage temperature	-50 … +85 °C (-58 … +185 °F)	
• Climate class		
Condensation	Permitted	
• Degree of protection in accordance with EN 60529	IP66, IP68	
• Degree of protection in accordance with NEMA 250	NEMA 4X	
• Electromagnetic compatibility		
Interference emission and interference immunity	In accordance with EN 61326 and NAMUR NE 21	
Process medium conditions		
• Process temperature		
Cell	*Pressure*	*Temperature range*
Measuring cell with silicone oil filling		-40 … +100 °C (-40 … +212 °F)

Rated conditions for gauge pressure and absolute pressure (from the gauge pressure series)		
Measuring cell with inert liquid	1 bar/100 kPa/3.6 psi	-40 … +100 °C (-40 … +212 °F)
	4 bar/400 kPa/58 psi	-40 … +100 °C (-40 … +212 °F)
	16 bar/1.6 MPa/232 psi	-40 … +100 °C (-40 … +212 °F)
	63 bar/6.3 MPa/914 psi	-40 … +100 °C (-40 … +212 °F)
	160 bar/16 MPa/2321 psi	-20 … +100 °C (-4 … +212 °F)
	400 bar/40 MPa/5802 psi	-20 … +100 °C (-4 … +212 °F)
	700 bar/70 MPa/10152 psi	-20 … +100 °C (-4 … +212 °F)
With extension to Zone 0		-20 … +60 °C (-4 … +140 °F)

Conditions of use for gauge pressure and absolute pressure with flush-mounted diaphragm		
Installation conditions		
Ambient temperature		
Note	Observe the temperature class in hazardous areas.	
• Measuring cell with silicone oil filling	-40 … +85 °C (-40 … +185 °F)	
• Measuring cell with inert liquid (various pressure classes)	1 bar/100 kPa/3.6 psi	-40 … +100 °C (-40 … +212 °F)
	4 bar/400 kPa/58 psi	-40 … +100 °C (-40 … +212 °F)
	16 bar/1.6 MPa/232 psi	-40 … +100 °C (-40 … +212 °F)
	63 bar/6.3 MPa/914 psi	-40 … +100 °C (-40 … +212 °F)
	160 bar/16 MPa/2321 psi	-20 … +100 °C (-4 … +212 °F)
	400 bar/40 MPa/5802 psi	-20 … +100 °C (-4 … +212 °F)
	700 bar/70 MPa/10152 psi	-20 … +100 °C (-4 … +212 °F)
• Measuring cell with Neobee (FDA-compliant)	-10 … +85 °C (14 … 185 °F)	
• Display	-30 … +85 °C (-22 … +185 °F)	
• Storage temperature	-50 … +85 °C (-58 … +185 °F) (with Neobee: -20 ... + 85 °C (-4 ... +185 °F)) (with high-temperature oil: -10 ... + 85 °C (14 ... 185 °F))	
Climate class		
Condensation	Permitted	
• Degree of protection in accordance with EN 60 529	IP66, IP68	
• Degree of protection in accordance with NEMA 250	NEMA 4X	
Electromagnetic compatibility		

Conditions of use for gauge pressure and absolute pressure with flush-mounted diaphragm	
• Interference emission and interference immunity	In accordance with EN 61326 and NAMUR NE 21
Process medium conditions	
Process temperature[1)]	
• Measuring cell with silicone oil filling	-40 … +150°C (-40 … +302 °F) -40 … +200°C (-40 … +392 °F) with cooling extension
• Measuring cell with inert liquid	-20 … +100 °C (-4 … +212 °F) -20 … +200°C (-4 … +392 °F) with cooling extension
• Measuring cell with Neobee (FDA-compliant)	-10 … +150°C (14 … 302 °F) -10 … +200°C (14 … 392 °F) with cooling extension
• Measuring cell with high-temperature oil filling	-10 ... +250 °C (14 ... 482 °F) with cooling extension

1) Observe the temperature limits in the process connection standards (e.g. DIN 32676 and DIN 11851) for the maximum process temperature for flush-mounted process connections.

Conditions of use for pressure transmitter with PMC connection	
Installation conditions	
Ambient temperature	
Note	Observe the temperature class in hazardous areas.
• Measuring cell with silicone oil filling	-40 … +85 °C (-40 … +185 °F)
• Display	-30 … +85 °C (-22 … +185 °F)
• Storage temperature	-50 … +85 °C (-58 … +185 °F)
Climate class	
Condensation	Permitted
• Degree of protection in accordance with EN 60529	IP66, IP68
• Degree of protection in accordance with NEMA 250	NEMA 4X
Electromagnetic compatibility	
• Interference emission and interference immunity	In accordance with EN 61326 and NAMUR NE 21
Process medium conditions	
• Process temperature	-40 … +100 °C (-40 … +212 °F)

Rated conditions for absolute pressure (from the differential pressure series), differential pressure and flow rate	
Installation conditions	
• Installation instruction	any
Ambient conditions	
• Ambient temperature	
Note	Observe the temperature class in hazardous areas.
Measuring cell with silicone oil filling	-40 … +85 °C (-40 … +185 °F)
• Measuring cell 30 bar (435 psi)	• -20 … +85 °C (-4 … +185 °F) • For flow: -20 … +85 °C (-4 … +185 °F)
Measuring cell with inert liquid	-20 … +85 °C (-4 … +185 °F)
Display	-30 … +85 °C (-22 … +185 °F)
Storage temperature	-50 … +85 °C (-58 … +185 °F)
• Climate class	
Condensation	Permitted
• Degree of protection in accordance with EN 60529	IP66, IP68
• Degree of protection in accordance with NEMA 250	NEMA 4X
• Electromagnetic compatibility	
Interference emission and interference immunity	In accordance with EN 61326 and NAMUR NE 21
Process medium conditions	
• Process temperature	
Measuring cell with silicone oil filling	-40 … +100 °C (-40 … +212 °F)
• Measuring cell 30 bar (435 psi)	-20 … +85 °C (-4 … +185 °F)
Measuring cell with inert liquid	-20 … +100 °C (-4 … +212 °F)
• Measuring cell 30 bar (435 psi)	-20 … +85 °C (-4 … +185 °F)
In conjunction with dust explosion protection	-20 … +60°C (-4 … +140°F)

Rated conditions for level	
Installation conditions	
• Installation instruction	specified through the flange
Ambient conditions	
• Ambient temperature	

Rated conditions for level	
Note	Observe the allocation of the max. permissible operating temperature to the max. permissible operating pressure of the relevant flange connection.
Measuring cell with silicone oil filling	-40 … +85 °C (-40 … +185 °F)
Display	-30 … +85 °C (-22 … +185 °F)
Storage temperature	-50 … +85 °C (-58 … +185 °F)
• Climate class	
Condensation	Permitted
• Degree of protection in accordance with EN 60529	IP66
• Degree of protection in accordance with NEMA 250	NEMA 4X
• Electromagnetic compatibility	
Interference emission and interference immunity	In accordance with EN 61326 and NAMUR NE 21
Process medium conditions	
• Process temperature	
Measuring cell with silicone oil filling	• Plus side: See mounting flange • Low-pressure side: -40 … +100 °C (-40 … +212 °F)

11.8 Construction

Construction for gauge pressure and absolute pressure (from the gauge pressure series)	
Weight	Approx. 1.5 kg (3.3 lb) for aluminum enclosure
Material	
• Wetted parts materials	
Process connection	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, material no. 1.4404/316L or Hastelloy C276, material no. 2.4819
• Non-wetted parts materials	
Electronics housing	• Copper-free die cast aluminum GD-AlSi 12 or stainless steel precision casting, mat. no. 1.4408 • Standard: Powder coating with polyurethane Option: 2 coats: Coat 1: epoxy-based; coat 2: polyurethane • Stainless steel nameplate
Mounting bracket	Steel or stainless steel

Construction for gauge pressure and absolute pressure (from the gauge pressure series)	
Measuring cell filling	• Silicone oil • Neobee M20 • Inert liquid (max. 120 bar g (2320 psi g) for oxygen measurement)
Process connection	G$^1/_2$B connection pin in accordance with DIN EN 837-1; female thread $^1/_2$-14 NPT or oval flange (PN 160 (MAWP 2320 psi g)) with M10 fastening screw thread in accordance with DIN 19213 or $^7/_{16}$-20 UNF in accordance with EN 61518. Male thread M20 x 1.5 and $^1/_2$-14 NPT
Electrical connection	Cable inlet using the following cable glands: • Pg 13.5 • M20 x 1.5 and ½-14 NPT or Han 7D/Han 8D connector[1)] – Cable diameter: 6 to 12 mm; types of protection "nA" and "ic" (Zone 2): 8 to 12 mm or a suitable cable gland for smaller diameters • M12 connector
Degree of protection for Han and M12 connectors	IP65

[1)] Han 8D is identical to Han 8U.

Construction for gauge pressure, with flush mounted diaphragm	
Weight	Approx 1.5 … 13.5 kg (3.3 … 30 lb) with aluminum enclosure
Material	
• Wetted parts materials	
Process connection	Stainless steel, mat. no. 1.4404/316L
Seal diaphragm	Stainless steel, mat. no. 1.4404/316L
• Non-wetted parts materials	
Electronics housing	• Non-copper aluminum die casting GD-AlSi 12 or stainless steel precision casting, mat. no. 1.4408 • Standard: Powder coating with polyurethane Option: 2 coats: Coat 1: epoxy-based; coat 2: polyurethane • Stainless steel nameplate
Mounting bracket	Steel or stainless steel
Measuring cell filling	• Silicone oil • Neobee M20 • Inert liquid
Process connection	• Flanges as per EN and ASME • F&B and Pharma flange, clamp and threaded connectors • NEUMO BioConnect/BioControl • PMC connections for the paper industry

Construction for gauge pressure, with flush mounted diaphragm	
Electrical connection	Cable inlet using the following cable glands: • Pg 13.5 • M20x1.5 • ½-14 NPT • Han 7D/Han 8D plug[1)] • M12 connector
Degree of protection for Han and M12 connectors	IP65

1) Han 8D is identical to Han 8U.

Construction of pressure transmitter with PMC connection	
Weight	Approx. 1.5 kg (3.3 lb) for aluminum enclosure
Material	
• Wetted parts materials	
Gasket (standard)	PTFE flat gasket
O-ring (minibolt)	• FPM (Viton) • FFPM or NBR (optional)
Seal diaphragm	Hastelloy C276, mat. No. 2.4819
• Non-wetted parts materials	
Electronics housing	• Non-copper aluminum die casting GD-AlSi 12 or stainless steel precision casting, mat. no. 1.4408 • Standard: Powder coating with polyurethane Option: 2 coats: Coat 1: epoxy-based; coat 2: polyurethane • Stainless steel nameplate
Mounting bracket	Steel or stainless steel
Measuring cell filling	• Silicone oil • Inert liquid
Process connection	
• Standard	• Flush mounted • 1 1/2" • PMC Standard design
• Minibolt	• Flush mounted • 1" • PMC Minibolt design

Construction of pressure transmitter with PMC connection	
Electrical connection	Cable inlet using the following cable glands: • Pg 13.5 • M20 x 1.5 • ½-14 NPT • Han 7D/Han 8D plug[1)] • M12 connector
Degree of protection for Han and M12 connectors	IP65

1) Han 8D is identical to Han 8U.

Design for absolute pressure (from the differential pressure series), differential pressure and flow rate	
Weight	Approx. 4.5 kg (9.9 lb) for aluminum enclosure
Material	
• Wetted parts materials	
Seal diaphragm	Stainless steel, mat. no. 1.4404/316L, Hastelloy C276, mat. no. 2.4819, Monel, mat. no. 2.4360, tantalum or gold
Pressure caps and locking screw	Stainless steel, mat. no. 1.4408 to PN 160, mat. no. 1.4571/316Ti for PN 420, Hastelloy C4, 2.4610 or Monel, mat. no. 2.4360
O-ring	FPM (Viton) or optionally: PTFE, FEP, FEPM and NBR
• Non-wetted parts materials	
Electronics housing	• Non-copper aluminum die casting GD-AlSi 12 or stainless steel precision casting, mat. no. 1.4408 • Standard: Powder coating with polyurethane Option: 2 coats: Coat 1: epoxy-based; coat 2: polyurethane • Stainless steel nameplate
Pressure cap screws	Stainless steel
Mounting bracket	Steel or stainless steel
Measuring cell filling	• Silicone oil • Neobee M20 • Inert liquid (max. 120 bar g (2320 psi g) for oxygen measurement)
Process connection	1/4-18 NPT female thread and flat connection with 7/16-20 UNF fastening screw thread in accordance with EN 61518 or M10 fastening screw thread in accordance with DIN 19213 (M12 for PN 420 (MAWP 6092 psi))

Design for absolute pressure (from the differential pressure series), differential pressure and flow rate	
Electrical connection	Screw terminals Cable inlet using the following cable glands: • Pg 13.5 • M20 x 1.5 • ½-14 NPT or Han 7D/Han 8D connector[1)] • M12 connector
Degree of protection for Han and M12 connectors	IP65

1) Han 8D is identical to Han 8U.

Construction for level	
Weight	
• as per EN (pressure transmitter with mounting flange, without tube)	approx 11 … 13 kg (24.2 … 28.7 lb)
• as per ASME (pressure transmitter with mounting flange, without tube)	approx 11 … 18 kg (24.2 … 39.7 lb)
Material	
• Wetted parts materials	
Plus side	
• Seal diaphragm on the mounting flange	Stainless steel, mat. no. 1.4404/316L, 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 surface	smooth as per EN 1092-1, form B1 or ASME B16.5 RF 125 … 250 AA for stainless steel 316L, EN 2092-1 form B2 or ASME B16.5 RFSF for the remaining materials
Sealing material in the pressure caps	
• for standard applications	Viton
• for underpressure applications on the mounting flange	Copper
Minus side	
• Seal diaphragm	Stainless steel, mat. no. 1.4404/316L
• Pressure caps and locking screws	Stainless steel, mat. no. 1.4408
• O-ring	FPM (Viton)
• Non-wetted parts materials	

Construction for level	
Electronics housing	• Non-copper aluminum die casting GD-AlSi 12 or stainless steel precision casting, mat. no. 1.4408 • Standard: Powder coating with polyurethane Option: 2 coats: Coat 1: epoxy-based; coat 2: polyurethane • Stainless steel nameplate
Pressure cap screws	Stainless steel
Measuring cell filling	Silicone oil
• Mounting flange fill fluid	Silicon oil or a different design
Process connection	
• Plus side	Flange as per EN and ASME
• Minus side	$^{1}/_{4}$-18 NPT female thread and flat connection with M10 fastening screw thread in accordance with DIN 19213 (M12 for PN 420 (MAWP 6092 psi)) or $^{7}/_{16}$-20 UNF in accordance with EN 61518
Electrical connection	Screw terminals Cable inlet using the following cable glands: • Pg 13.5 • M20 x 1.5 • ½-14 NPT or Han 7D/Han 8D connector[1)] • M12 connector
Degree of protection for Han and M12 connectors	IP65

[1)] Han 8D is identical to Han 8U.

Torques	
Cable glands/blanking plugs	
• Screw-in torque for plastic gland in all enclosures	4 Nm (3 ft lb)
• Screw-in torque for metal/stainless steel glands in aluminum/stainless steel enclosure	6 Nm (4.4 ft lb)
• Screw-in torque for NPT adapter made of metal/stainless steel in aluminum/stainless steel enclosure	15 Nm (11.1 ft lb)
• Screw-in torque for NPT gland in the NPT adapter NOTE: To avoid damage to the device, the NPT adapter must be held in place while the NPT gland is screwed into the NPT adapter.	68 Nm (50 ft lb)
• Tightening torque for union nut made of plastic	2.5 Nm (1.8 ft lb)

Torques	
• Tightening torque for union nut made of metal/stainless steel	4 Nm (3 ft lb)

11.9 Display, keyboard and auxiliary power

Display and user interface	
Keys	3 for on-site programming directly at the device
Display	• With or without integrated display (optional) • Cover with inspection window (optional)

Auxiliary power U_H		
	HART	**PROFIBUS PA or Foundation Fieldbus**
Terminal voltage on pressure transmitter	• DC 10.5 V … 45 V • In the case of intrinsically safe operation 10.5 V … 30 V DC	–
Ripple	U_{SS} ≤ 0.2 V (47 … 125 Hz)	–
Noise	U_{eff} ≤ 1.2 mV (0.5 … 10 kHz)	–
Auxiliary power	–	Bus-powered
Separate supply voltage	–	Not necessary
Bus voltage		
• Not	–	9 … 32 V
• For intrinsically safe operation	–	9 … 24 V
Current consumption		
• Max. basic current	–	12.5 mA
• Starting current ≤ basic current	–	Yes
• Max. current in event of fault	–	15.5 mA
Error shut-down electronics (FDE) present	–	Yes

11.10 Certificates and approvals

Certificates and approvals		
	HART	**PROFIBUS PA and FOUNDATION Fieldbus**
Classification according to Pressure Equipment Directive (PED 97/23/EC)	• for gases of Fluid Group 1 and liquids of Fluid Group 1; meets requirements of Article 3 Para. 3 (good engineering practice) • only for flow rate: for gases of Fluid Group 1 and liquids of Fluid Group 1; fulfills the basic safety requirements as per article 3, Para 1 (appendix 1); classified as category III, module H conformity evaluation by TÜV Nord	
Drinking water	Under development (for SITRANS P DS III)	
Explosion protection		
• Intrinsic safety "i"		
Designation	II 1/2 G Ex ia/ib IIC T4/T5/T6 Ga/Gb	
Permissible ambient temperature	-40 … +85 °C (-40 … +185 °F) temperature class T4 -40 … +70 °C (-40 … +158 °F) temperature class T5 -40 … +60 °C (-40 … +140 °F) temperature class T6	
Connection	To a certified intrinsically safe circuit with the max. values: U_i = 30 V, I_i = 100 mA, P_i = 750 mW, R_i = 300 Ω	FISCO supply unit U_0 = 17.5 V, I_0 = 380 mA, P_0 = 5.32 W Linear barrier U_0 = 24 V, I_0 = 174 mA, P_0 = 1 W
Effective inner capacitance	C_i = 6 nF	C_i = 1.1 nF
Effective inner inductance	L_i = 0.4 mH	L_i = 7 µH
• Flameproof enclosure encapsulation "d"		
Designation	II 1/2 G Ex d IIC T4, T6 Ga/Gb	
Permissible ambient temperature	-40 … +85 °C (-40 … +185 °F) temperature class T4 -40 … +60 °C (-40 … +140 °F) temperature class T6	
Connection	To a circuit with the operating values: U_H = 10.5 … 45 V DC	To a circuit with the operating values: U_H = 9 … 32 V DC
• Dust explosion protection for Zone 20 and 20/21		
Designation	II 1 D Ex ta IIIC T120°C Da II 1/2 D Ex ta/tb IIIC T120°C Da/Db	
Permissible ambient temperature	-40 ... +85 °C (-40 ... +185 °F)	
max. surface temperature	120°C (248°F)	
Connection	To a certified intrinsically safe circuit with the max. values: U_i = 30 V, I_i = 100 mA, P_i = 750 mW, R_i = 300 Ω	FISCO supply unit U_0 = 17.5 V, I_0 = 380 mA, P_0 = 5.32 W Linear barrier U_0 = 24 V, I_0 = 250 mA, P_0 = 1.2 W
Effective inner capacitance	C_i = 6 nF	C_i = 1.1 nF
Effective inner inductance	L_i = 0.4 mH	L_i = 7 µH

Certificates and approvals		
	HART	**PROFIBUS PA and FOUNDATION Fieldbus**
• Dust explosion protection for Zone 22		
Designation	Ⓔx II 2 D Ex tb IIIC T120°C Db	
Connection	To a circuit with the operating values: U_H = 10.5 … 45 V DC; P_{max} = 1.2 W	To a circuit with the operating values: U_H = DC 9 … 32 V; P_{max} = 1.2 W
• Type of protection "n" (Zone 2)		
Designation	Ⓔx II 2/3 G Ex nA IIC T4/T5/T6 Gc Ⓔx II 2/3 G Ex ic IIC T4/T5/T6 Gc	
Connection "nA"	U_n = 45 V	U_m = 32 V
Connection "ic"	To a circuit with the operating values: U_i = 45 V	FISCO supply unit U_O =17.5 V, I_O = 570 mA Linear barrier U_0 = 32 V, I_0 = 132 mA, P_0 = 1 W
Effective inner capacitance	C_i = 6 nF	C_i = 1.1 nF
Effective inner inductance	L_i = 0.4 mH	L_i = 7 µH
• Explosion protection in accordance with FM	Certificate of Compliance 3008490	
Designation (XP/DIP) or IS; NI; S	CL I, DIV 1, GP ABCD T4 ... T6; CL II, DIV 1, GP EFG; CL III; CL I, ZN 0/1 AEx ia IIC T4 ... T6; CL I, DIV 2, GP ABCD T4 ... T6; CL II, DIV 2, GP FG; CL III	
Permissible ambient temperature	T_{amb} = T4: -40 ... +85 °C (-40 ... +185 °F) T_{amb} = T5: -40 ... +70 °C (-40 ... +158 °F) T_{amb} = T6: -40 ... +60 °C (-40 ... +140 °F)	
• Explosion protection as per CSA	Certificate of Compliance 1153651	
Designation (XP/DIP) or (IS)	CL I, DIV 1, GP ABCD T4 ... T6; CL II, DIV 1, GP EFG; CL III; Ex ia IIC T4 ... T6: CL I, DIV 2, GP ABCD T4 ... T6; CL II, DIV 2, GP FG; CL III	
Permissible ambient temperature	T_{amb} = T4: -40 ... +85 °C (-40 ... +185 °F) T_{amb} = T5: -40 ... +70 °C (-40 ... +158 °F) T_{amb} = T6: -40 ... +60 °C (-40 ... +140 °F)	

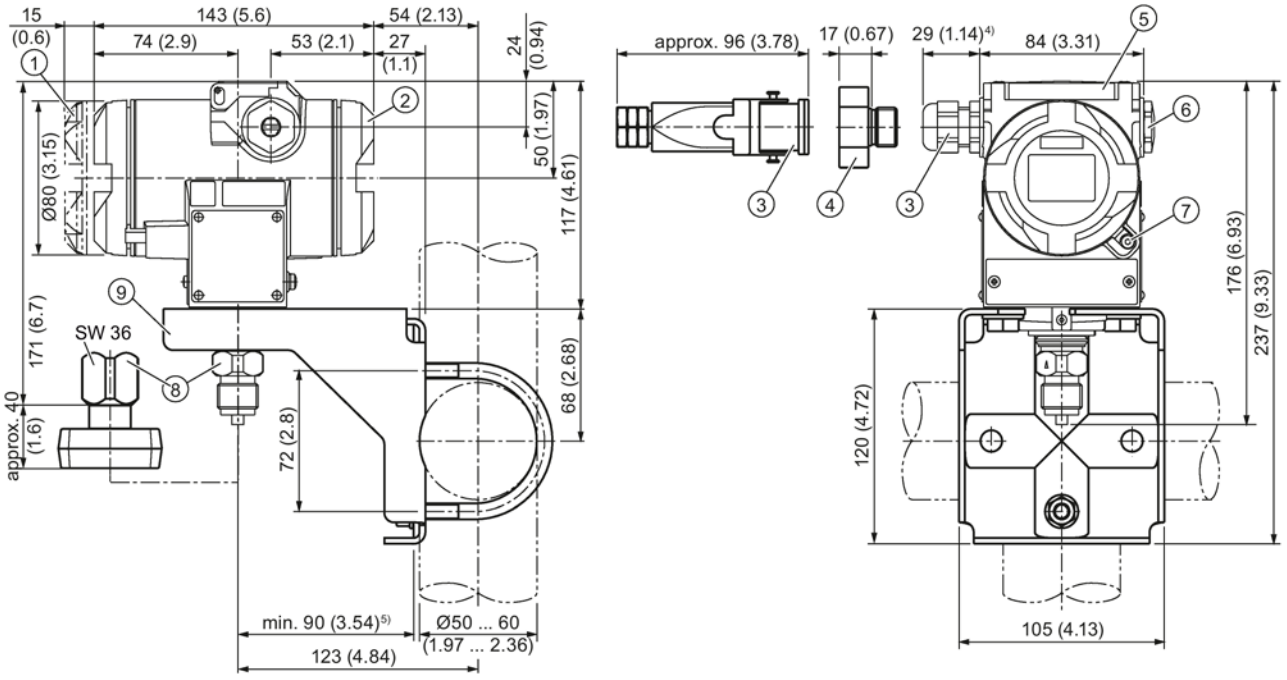
11.11 Communication FOUNDATION™ Fieldbus

Communication FOUNDATION™ Fieldbus	
Function blocks	3 function blocks analog input, 1 function block PID
• Analog input	
Adaptation to user-specific process variable	Yes, linearly rising or falling characteristic
Electrical damping adjustable	0 ... 100 s

Communication FOUNDATION™ Fieldbus	
Simulation function	Output/input point (can be interlocked with a bridge within the device)
Response to failure	Configurable in: • Last good value • Substitute value • Bad value
Limit monitoring	Yes, high and low warning and alarm limits
Square-rooted characteristic for flow measurement	Yes
• PID	Standard FF function block
• Physical block	1 resource block
Transducer blocks	1 transducer block, pressure with calibration, 1 LCD transducer block
• Pressure transducer block	
Can be calibrated by applying two pressures	Yes
Monitoring of sensor limits	Yes
Simulation function:	
• Measured pressure	• Constant value • Configurable ramp function
• Sensor temperature	• Constant value • Configurable ramp function
• Electronics temperature	• Constant value • Configurable ramp function

12 Dimensional drawings

12.1 SITRANS P, DS III/P410 for gauge pressure and absolute pressure from the gauge pressure series



① Electronics side, display
(longer for cover with inspection window)[1)]

② Connection side[1)]

③ Electrical connection:

- Pg 13.5 gland (adapter)[2)3)]
- M20 x 1.5 gland[3)]
- ½-14 NPT gland
- Han 7D/Han 8D plug[2) 3)]

④ Harting adapter

⑤ Protective cap of the operating buttons

⑥ Blanking plug

⑦ Safety catch
(only for flameproof encapsulation, not shown in the drawing)

⑧ Process connection: G½B connection pin or oval flange

⑨ Mounting bracket (optional)

1) Take an additional 20 mm (0.79 inches) thread length into account

2) Not with "flameproof enclosure" type of protection

3) Not for "FM + CSA [is + XP]" type of protection

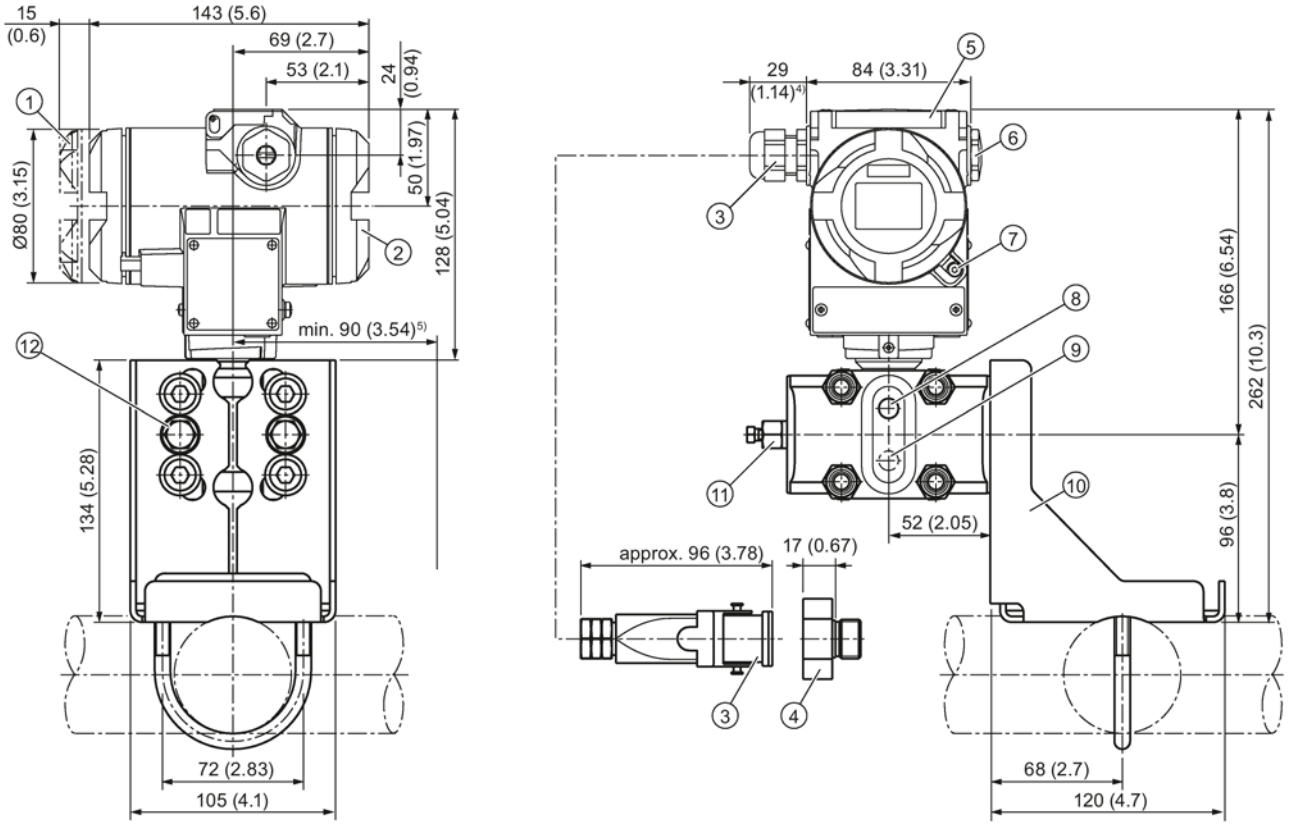
4) For Pg 13.5 with adapter, approx 45 mm (1.77 inches)

5) Minimum distance for rotating

6) SITRANS P410 is only available as gauge pressure and differential pressure version.

Image 12-1 Pressure transmitter SITRANS P DS III/P410 for absolute pressure, from the gauge pressure series, dimensions in mm (inches)

12.2 SITRANS P DS III/P410 for differential pressure, flow rate and absolute pressure from the differential pressure series



① Electronics side, display
(longer for cover with inspection window)[1)]

② Connection side[1)]

③ Electrical connection:

- Pg 13.5 gland (adapter)[2)3)]
- M20 x 1.5 gland
- ½-14 NPT gland
- Han 7D/Han 8D plug[2)3]

④ Harting adapter

⑤ Protective cap of the operating buttons

⑥ Blanking plug

⑦ Safety catch
(only for "flameproof enclosure" type of protection, not shown in the drawing)

⑧ Lateral ventilation for liquid measurement (standard)

⑨ Lateral ventilation for gas measurement (addition H02)

⑩ Mounting bracket (optional)

⑪ Sealing plug, with valve (optional)

⑫ Process connection: $^1/_4$-18 NPT (EN 61518)

1) Take an additional 20 mm (0.79 inches) thread length into account

2) Not with "flameproof enclosure" type of protection

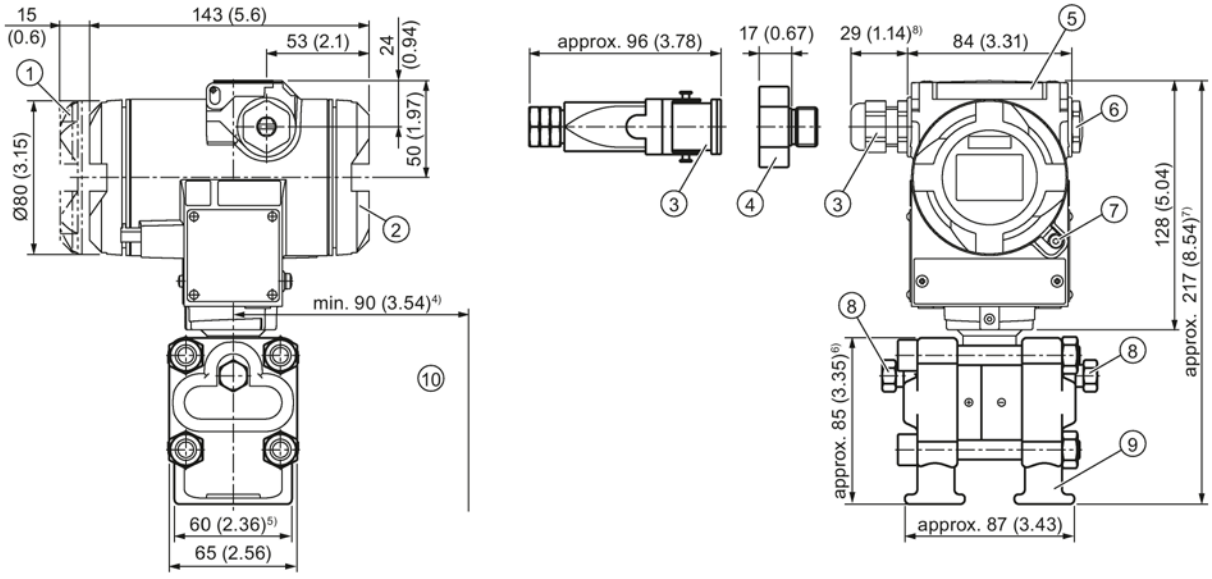
3) Not for "FM + CSA [IS + XP]" type of protection

4) For Pg 13.5 with adapter, approx 45 mm (1.77 inches)

5) 92 mm (3.62 inch) minimum distance for rotating the pointer

6) SITRANS P410 is only available as gauge pressure and differential pressure version.

Image 12-2 Pressure transmitter SITRANS P DS III/P410 for differential pressure and flow rate, dimensions in mm (inches)



① Electronics side, display
(longer for cover with inspection window)[1)]

② Connection end

③ Electrical connection:

- Pg 13.5 gland (adapter)[2)3)]
- M20 x 1.5 gland
- ½-14 NPT gland
- Han 7D/Han 8D plug[2)3]

④ Harting adapter

⑤ Protective cap of the operating buttons

⑥ Blanking plug

⑦ Safety catch
(only for "flameproof enclosure" type of protection, not shown in the drawing)

⑧ Sealing plug, with valve (optional)

⑨ Process connection: ¼-18 NPT (IEC 61518)

⑩ Clearance for rotating the enclosure

1) Take an additional 20 mm (0.79 inches) thread length into account

2) Not with "flameproof enclosure" type of protection

3) Not for "FM + CSA [is + XP]" type of protection

4) 92 mm (3.6 inch) minimum distance for rotating the pointer

5) 74 mm (2.9 inch) for PN ≥ 420 (MAWP ≥ 6092 psi)

6) 91 mm (3.6 inch) for PN ≥ 420 (MAWP ≥ 6092 psi)

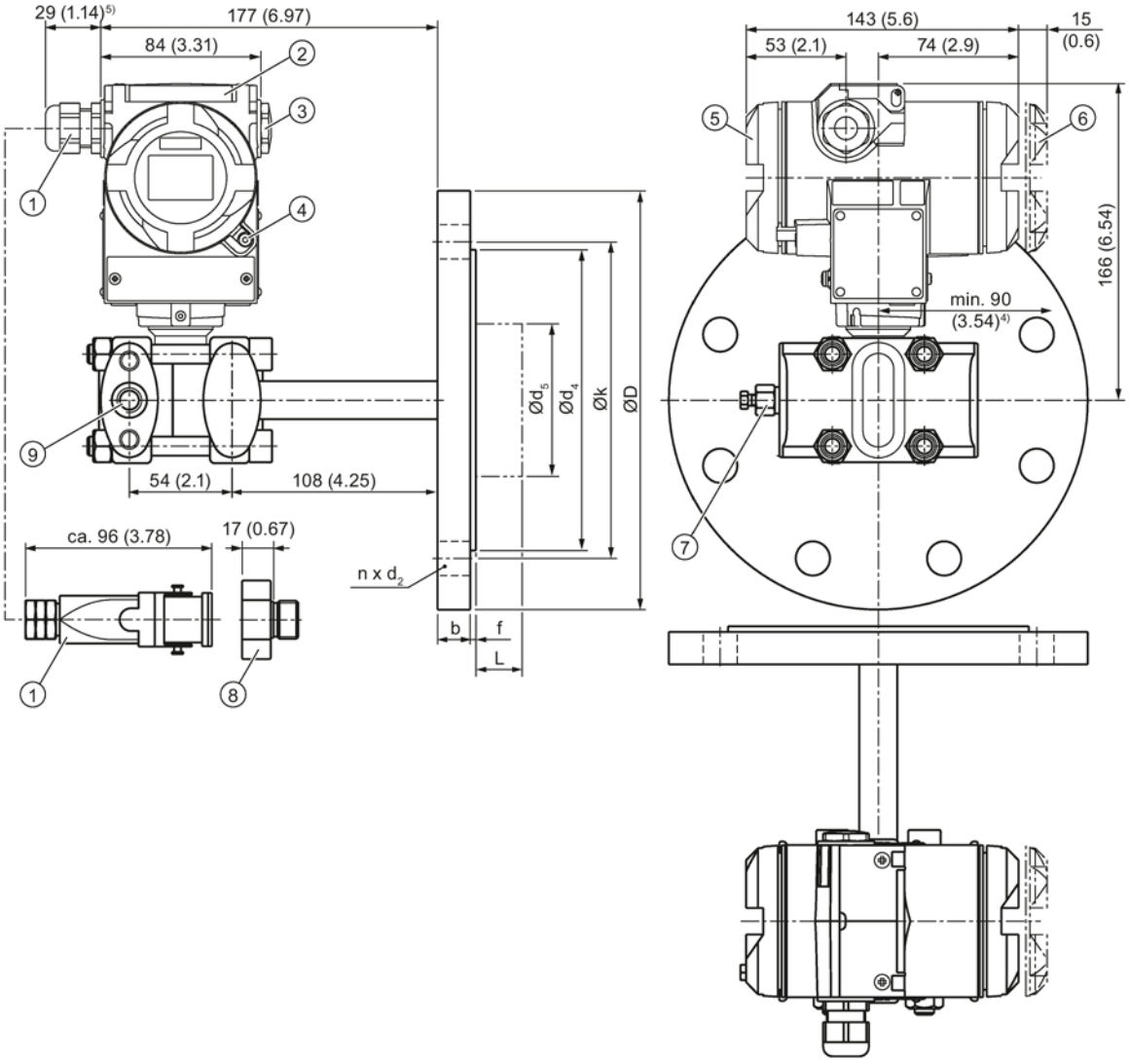
7) 219 mm (8.62 inch) for PN ≥ 420 (MAWP ≥ 6092 psi)

8) For Pg 13.5 with adapter approx. 45 mm (1.77 inches)

9) SITRANS P410 is only available as gauge pressure and differential pressure version.

Image 12-3 Pressure transmitter SITRANS P DS III/P410 for differential pressure and flow rate with caps for vertical differential pressure lines, dimensions in mm (inches)

12.3 SITRANS P DS III/P410 for level



① Electrical connection:
- Pg 13.5 gland (adapter)[2)3)]
- M20 x 1.5 gland
- ½-14 NPT gland
- Han 7D/Han 8D plug[2) 3)]

② Protective cap of the operating buttons

③ Blanking plug

④ Safety catch
(only for "flameproof enclosure" type of protection, not shown in the drawing)

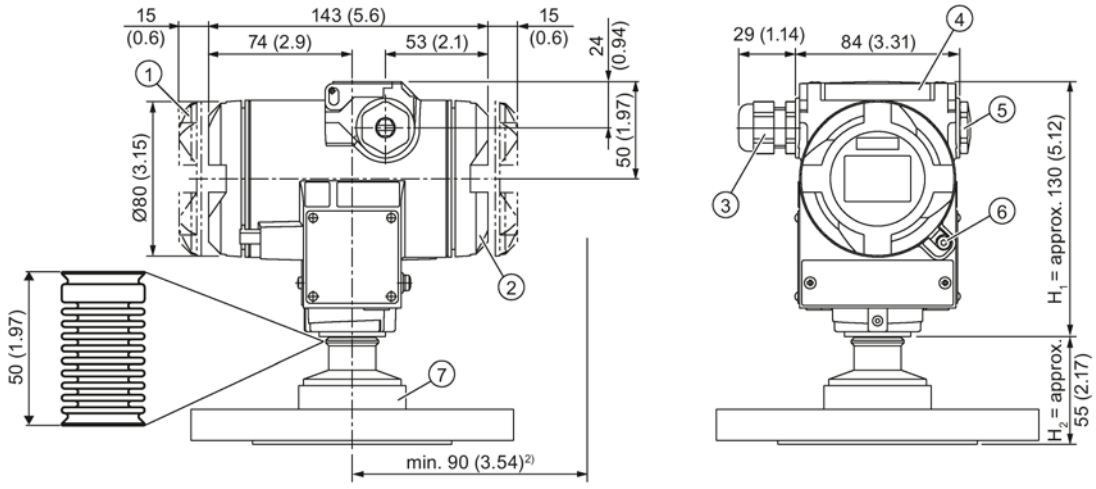
⑤ Connection side[1)]

⑥ Electronics side, display
(longer for cover with inspection window)[1)]

⑦ Locking screw with valve (option)
⑧ Harting adapter
⑨ Process connection: Minus side ¼-18 NPT (IEC 61518)
1) Take an additional 20 mm (0.79 inches) thread length into account
2) Not with "flameproof enclosure" type of protection
3) Not for "FM + CSA [is + XP]" type of protection
4) 92 mm (3.62 inches) minimum distance for rotating the enclosure with pointer
5) For Pg 13.5 with adapter, approx 45 mm (1.77 inches)
6) SITRANS P410 is only available as gauge pressure and differential pressure version.

Image 12-4 Pressure transmitter SITRANS P DS III/P410 for level, including mounting flange, dimensions in mm (inches)

12.4 SITRANS P DS III (flush-mounted)



① Electronics side, display
(longer for cover with inspection window)1)
② Connection side1)
③ Electrical connection:
- M20 x 1.5 gland
- ½-14 NPT gland
- M12 connector

④ Protective cap of the operating buttons
⑤ Blanking plug
⑥ Safety catch
(only for "flameproof enclosure" type of protection, not shown in the drawing)
⑦ Process connection: see Flange table
1) In addition, allow approx. 20 mm (0.79 inch) for the thread length
2) 92 mm (3.6 inches) minimum distance for rotating the enclosure with display
3) SITRANS P410 is only available as gauge pressure and differential pressure version.

Image 12-5 SITRANS P DS III/P410 (flush mounted)

12.4.1 Note 3A and EHDG

Note

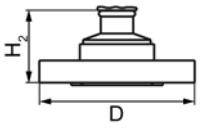
Approvals

The references to the approvals for "EHEDG" and "3A" refer to the respective process connections and are not device-specific. Please refer to the technical specifications of the respective pressure transmitter to see whether the desired certificate is available for your device/flange combination.

12.4.2 Connections as per EN and ASME

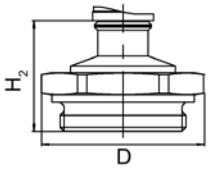
Flange as per EN

EN 1092-1

	DN	PN	⌀D	H_2
	25	40	115 mm (4.5")	Approx. 52 mm (2")
	25	100	140 mm (5.5")	
	40	40	150 mm (5.9")	
	40	100	170 mm (6.7")	
	50	16	165 mm (6.5")	
	50	40	165 mm (6.5")	
	80	16	200 mm (7.9")	
	80	40	200 mm (7.9")	

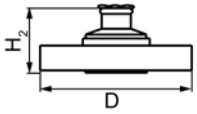
Threaded connections

G3/4", G1" and G2" In accordance with DIN 3852

	DN	PN	⌀D	H_2
	¾"	63	37 mm (1.5")	Approx. 45 mm (1.8")
	1"	63	48 mm (1.9")	Approx. 47 mm (1.9")
	2"	63	78 mm (3.1")	Approx. 52 mm (2")

Flanges as per ASME

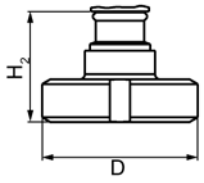
ASME B 16.5

	DN	CLASS	⌀D	H_2
	1"	150	110 mm (4.3")	Approx. 52 mm (2")
	1"	300	125 mm (4.9")	
	1½"	150	130 mm (5.1")	
	1½"	300	155 mm (6.1")	
	2"	150	150 mm (5.9")	
	2"	300	165 mm (6.5")	
	3"	150	190 mm (7.5")	
	3"	300	210 mm (8.1")	
	4"	150	230 mm (9.1")	
	4"	300	255 mm (10.0")	

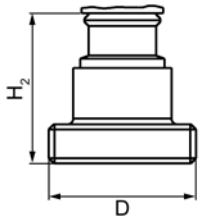
12.4.3 F&B and pharma flange

Connections as per DIN

DIN 11851

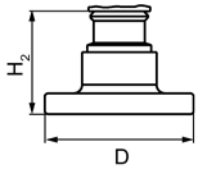
	DN	PN	⌀D	H_2
	50	25	92 mm (3.6")	Approx. 52 mm (2")
	80	25	127 mm (5.0")	

DIN 11864-1 Form A - sterile threaded sockets

	DN	PN	⌀D	H_2
	25	40	52 mm (2")	Approx. 52 mm (2")
	40	40	65 mm (2.6")	
	50	40	78 mm (3.1")	
	100	40	130 mm (5.1")	

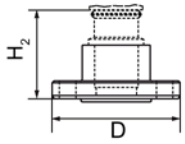
Approvals	EHEDG

DIN 11864-2 Form A - sterile collar flange

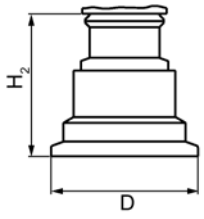
	DN	PN	⌀D	H_2
	50	16	94 mm (3.7")	Approx. 52 mm (2")
	65	16	113 mm (4.4")	
	80	16	133 mm (5.2")	
	100	16	159 mm (6.3")	

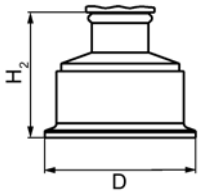
Approvals	EHEDG

DIN 11864-2 Form A - sterile groove flange

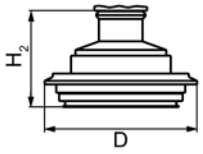
	DN	PN	⌀D	H_2
	50	16	94 mm (3.7")	Approx. 52 mm (2")
	65	16	113 mm (4.4")	
	80	16	133 mm (5.2")	
	100	16	159 mm (6.3")	
Approvals	EHEDG			

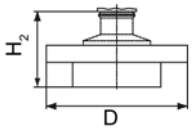
DIN 11864-3 Form A - sterile collar sockets

	DN	PN	⌀D	H_2
	50	25	77.5 mm (3.1")	Approx. 52 mm (2")
	65	25	91 mm (3.6")	
	80	16	106 mm (4.2")	
	100	16	130 mm (5.1")	
Approvals	EHEDG			

Tri-Clamp as per DIN 32676				
	DN	**PN**	**⌀D**	**H_2**
	50	16	64 mm (2.5")	Approx. 52 mm (2")
	65	16	91 mm (3.6")	

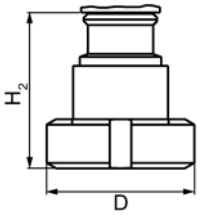
Other connections

Varivent® connector				
	DN	**PN**	**⌀D**	**H_2**
	40-125	40	84 mm (3.3")	Approx. 52 mm (2")
				
Approvals	EHEDG			

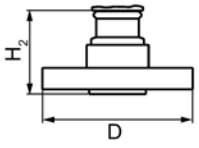
Connection in accordance with DRD				
	DN	**PN**	**⌀D**	**H_2**
	65	40	105 mm (4.1")	Approx. 52 mm (2")
				

BioConnect™ connectors

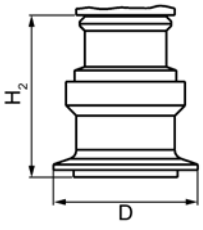
BioConnect™ screwed joint

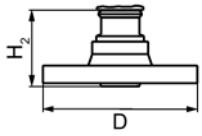
	DN	PN	⌀D	H_2
	50	16	82 mm (3.2")	Approx. 52 mm (2")
	65	16	105 mm (4.1")	
	80	16	115 mm (4.5")	
	100	16	145 mm (5.7")	
	2"	16	82 mm (3.2")	
	2½"	16	105 mm (4.1")	
	3"	16	105 mm (4.1")	
	4"	16	145 mm (5.7")	
Approvals	EHEDG			

BioConnect™ flange connector

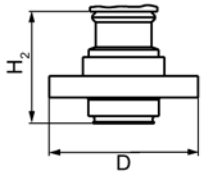
	DN	PN	⌀D	H_2
	50	16	110 mm (4.3")	Approx. 52 mm (2")
	65	16	140 mm (5.5")	
	80	16	150 mm (5.9")	
	100	16	175 mm (6.9")	
	2"	16	100 mm (3.9")	
	2½"	16	110 mm (4.3")	
	3"	16	140 mm (5.5")	
	4"	16	175 mm (6.9")	
Approvals	EHEDG			

BioConnect™ clamp connector

	DN	PN	⌀D	H_2
	50	16	77.4 mm (3.0")	Approx. 52 mm (2")
	65	10	90.9 mm (3.6")	
	80	10	106 mm (4.2")	
	100	10	119 mm (4.7")	
	2"	16	64 mm (2.5")	
	2½"	16	77.4 mm (3.0")	
	3"	10	90.9 mm (3.6")	
	4"	10	119 mm (4.7")	
Approvals	EHEDG			

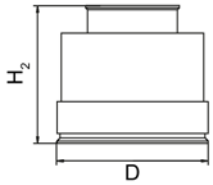
Connect S™ flanged joint				
	DN	**PN**	**⌀D**	**H_2**
	50	16	125 mm (4.9")	Approx. 52 mm (2")
	65	10	145 mm (5.7")	
	80	10	155 mm (6.1")	
	100	10	180 mm (7.1")	
	2"	16	125 mm (4.9")	
	2½"	10	135 mm (5.3")	
	3"	10	145 mm (5.7")	
	4"	10	180 mm (7.1")	
Approvals	EHEDG			

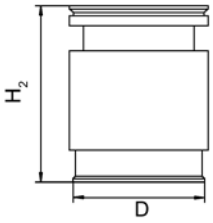
Other connections

BioControl™ connector				
	DN	**PN**	**⌀D**	**H_2**
	50	16	90 mm (3.5")	Approx. 52 mm (2")
	65	16	120 mm (4.7")	
Approvals	EHEDG			

12.4.4 PMC Style

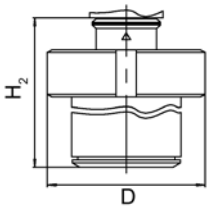
Connections for the paper industry

PMC Style Standard				
	DN	**PN**	**⌀D**	**H_2**
	–	–	40.9 mm (1.6")	Approx. 36.8 mm (1.4")
	M44x1.25 cap nut			

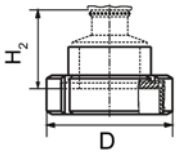
PMC-Style Minibolt				
	DN	**PN**	**⌀D**	**H_2**
	–	–	26.3 mm (1.0")	Approx. 33.1 mm (1.3")

12.4.5 Special connections

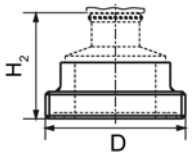
Tank connection

TG52/50 and TG52/150				
	DN	**PN**	**⌀D**	**H_2**
	TG52/50			
	43.5 mm	10	63 mm (2.5")	Approx. 63 mm (2.5")
	TG52/150			
	43.5 mm	10	63 mm (2.5")	Approx. 170 mm (6.7")

SMS connectors

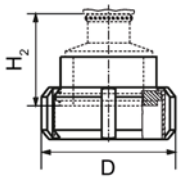
SMS sockets with union nut				
	DN	**PN**	**⌀D**	**H_2**
	2"	25	84 mm (3.3")	Approx. 52 mm (2.1")
	2½"	25	100 mm (3.9")	
	3"	25	114 mm (4.5")	

SMS threaded sockets

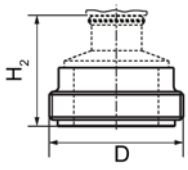
	DN	PN	⌀D	H_2
	2"	25	70 x 1/6 mm (2.8")	Approx. 52 mm (2.1")
	2½"	25	85 x 1/6 mm (3.3")	
	3"	25	98 x 1/6 mm (3.9")	

IDF connectors

IDF sockets with union nut

	DN	PN	⌀D	H_2
	2"	25	77 mm (3.0")	Approx. 52 mm (2.1")
	2½"	25	91 mm (3.6")	
	3"	25	106 mm (4.2")	

IDF threaded sockets

	DN	PN	⌀D	H_2
	2"	25	64 mm (2.5")	Approx. 52 mm (2.1")
	2½"	25	77.5 mm (3.1")	
	3"	25	91 mm (3.6")	

Spare parts/accessories

13

13.1 Order data

In order to ensure that the ordering data you are using is not outdated, the latest ordering data is always available on the Internet:

Process instrumentation catalog (http://www.siemens.com/processinstrumentation/catalogs)

Selection and order data	Order no.
CD "sitrans p - pressure transmitters" with documentation in German/English/French/Spanish/Italian, etc.	A5E00090345
HART modem	
• With USB interface	7MF4997-1DB[1) D)]
Weld-in support for PMC connection	
For Series SITRANS P DS III and SITRANS P300	
• PMC Style Standard: Thread 1½"	7MF4997-2HA
• PMC-Style Minibolt: flush mounted 1"	7MF4997-2HB
Gaskets for PMC connection, (1 set = 5 pieces)	
• PTFE gasket for PMC Style Standard: Thread 1½"	7MF4997-2HC
• Viton gasket for PMC Style Minibolt: flush mounted 1"	7MF4997-2HD
Weld-in adapter for PMC connection	
For connection of weld-in support delay during welding for:	
• PMC Style Standard: Thread 1½"	7MF4997-2HE
• PMC-Style Minibolt: flush mounted 1"	7MF4997-2HF

1) Available from stock

D) Subject to export regulations AL: N, ECCN, EAR99H

13.2 Spare parts/accessories for SITRANS P DS III

Selection and order data	Order no.
Mounting bracket and fastening parts	
For SITRANS P DS III, DS III PA and DS III FF	
For gauge pressure transmitter (7MF403.-.....-..C.)	
For absolute pressure transmitter (7MF423.-.....-..C.)	
• Made of steel	7MF4997-1AB
• Made of stainless steel	7MF4997-1AH
Mounting bracket and fastening parts	
For SITRANS P DS III, DS III PA and DS III FF	
For gauge pressure transmitter (7MF403.-.....-..A., -..B. and -..D.)	
For absolute pressure transmitter (7MF423.-.....-..A., -..B. and -..D.)	
• Made of steel	7MF4997-1AC
• Made of stainless steel	7MF4997-1AJ
Mounting bracket and fastening parts	
For SITRANS P DS III, DS III PA and DS III FF	
Differential pressure transmitter with flange thread	
• Made of steel	
For thread M10 (7MF433.-... and 7MF443.-...)	7MF4997-1AD
For thread M12 (7MF453.-...)	7MF4997-1AE
• Made of stainless steel	
For thread M10 (7MF433.-... and 7MF443.-...)	7MF4997-1AK
For thread M12 (7MF453.-...)	7MF4997-1AL
Mounting bracket and fastening parts	
For SITRANS P DS III, DS III PA and DS III FF	
Differential and absolute pressure transmitter with flange thread 7/16-20 UNF (7MF433.-..., 7MF443.-... and 7MF453.-...)	
• Made of steel	7MF4997-1AF
• Made of stainless steel	7MF4997-1AM
Cover	
For SITRANS P DS III, DS III PA and DS III FF	
• Made of aluminum die casting, including gasket	
Without inspection window	7MF4997-1BB
With inspection window	7MF4997-1BE
• Made of stainless steel, including gasket	
Without inspection window	7MF4997-1BC
With inspection window	7MF4997-1BF
Digital display	

Selection and order data	Order no.
For SITRANS P DS III, DS III PA and DS III FF	
Including the fastening material	7MF4997-1BR
Measuring point label	
• not labeled (five pieces)	7MF4997-1CA
• labeled (1 unit) Specifications as per Y01 or Y02, Y15 and Y16 (refer to SITRANS P pressure transmitter)	7MF4997-1CB-Z Y..: .....
Fastening screws, 50 pieces for: • Measuring point label • Earthing and connecting terminals • Digital display	7MF4997-1CD
Locking screws, (1 set = 2 pieces) for pressure cap	
• Made of stainless steel	7MF4997-1CG
• Made of Hastelloy	7MF4997-1CH
Vent valves, complete (1 set = 2 pieces)	
• Made of stainless steel	7MF4997-1CP
• Made of Hastelloy	7MF4997-1CQ
Electronics	
• For SITRANS P DS III	7MF4997-1DK
• For SITRANS P DS III PA	7MF4997-1DL
• For SITRANS P DS III FF	7MF4997-1DM
Network card	
• For SITRANS P DS III	7MF4997-1DN
• For SITRANS P DS III PA and DS III FF	7MF4997-1DP
Sealing rings for pressure caps made of	
• FPM (Viton)	7MF4997-2DA
• PTFE (Teflon)	7MF4997-2DB
• FEP (with silicon core, suitable for food)	7MF4997-2DC
• FFPM (Kalrez, Compound 4079)	7MF4997-2DD
• NBR (Buna N)	7MF4997-2DE

13.3 Order data for SIMATIC PDM

You can find ordering data in the Catalog FI 01 "Field devices for process automation in the Chapter "Communication and software > Software > SIMATIC PDM - Process Device Manager".

See also

Process instrumentation catalog (http://www.siemens.com/processinstrumentation/catalogs)

13.4 Order data for FOUNDATION™ Fieldbus accessories

You can find more accessories for communication with our devices and FOUNDATION™ Fieldbus in the IK PI catalog.

See also

IK PI Catalog (http://www.automation.siemens.com/net/html_76/support/printkatalog.htm)

Appendix

A

A.1 Certificate

The certificates can be found on the enclosed CD and on the Internet under:

Certificates (http://www.siemens.com/processinstrumentation/certificates)

A.2 Certificates (China)

Additional information for China

The product is based on the standards QDSSC 001-2013, QDSSC 002-2013, QDSSC 003-2013 and meets the requirements of CMC and CPA.

CMC

辽制 02000001 号

CPA

中华人民共和国

计量器具型式批准证书

西门子传感器与通讯有限公司：

根据中华人民共和国计量法第十三条和中华人民共和国计量法实施细则有关规定，对你单位申请型式批准的计量器具新产品经审查合格，现予批准，并可使用以下标志和编号：

PA

07F208-21

批准日期：2007.6.21

批准人签名：许国芳

经批准的计量器具新产品（名称、类别、型号）：

名　称：压力变送器

型　号：7MF4033 系列

名　称：压力变送器

型　号：7MF4034 系列

其技术指标为：

最大允许误差：±0.075%FS

最大允许误差：±0.075%FS

批准部门

（盖章）

中华人民共和国

计量器具型式批准证书

西门子传感器与通讯有限公司：

根据中华人民共和国计量法第十三条和中华人民共和国计量法实施细则有关规定，对你单位申请型式批准的计量器具新产品经审查合格，现予批准，并可使用以下标志和编号：

PA

07F209-21

批准日期：2007.6.21

批准人签名：许国荣

经批准的计量器具新产品（名称、类别、型号）：

名　称：绝压变送器

型　号：7MF4233 系列

7MF4333 系列

名　称：绝压变送器

型　号：7MF4234 系列

7MF4334 系列

其技术指标为：

最大允许误差：±0.075%FS

最大允许误差：±0.075%FS

批准部门（盖章）

中华人民共和国

计量器具型式批准证书

西门子传感器与通讯有限公司

：

根据中华人民共和国计量法第十三条和中华人民共和国计量法实施细则有关规定，对你单位申请型式批准的计量器具新产品经审查合格，现予批准，并可使用以下标志和编号：

PA

07F210-21

批准日期：2007.6.21

批准人签名：许国荣

经批准的计量器具新产品（名称、类别、型号）：

名　称：　差压变送器

型　号：　7MF4133 系列

7MF4533 系列

名　称：　差压变送器

型　号：　7MF4134 系列

7MF4534 系列

其技术指标为：

最大允许误差：±0.075%FS

最大允许误差：±0.075%FS

批准部门

（盖章）

中华人民共和国

计量器具型式批准证书

西门子传感器与通讯有限公司

根据中华人民共和国计量法第十三条和中华人民共和国计量法实施细则有关规定，对你单位申请型式批准的计量器具新产品经审查合格，现予批准，并可使用以下标志和编号：

PA
07F211-21

批准日期: 2007.5.24

批准人签名: 许.国元

经批准的计量器具新产品(名称、类别、型号):

名 称: 液位差压变送器
型 号: 7MF4633 系列

名 称: 液位差压变送器
型 号: 7MF4634 系列

其技术指标为:

基本误差: ±0.15%FS
基本误差: ±0.15%FS

批准部门
(盖章)

A.3 Literature and standards

No.	Standard	Description
/1/	IEC 61508 Section 1-7	Functional safety of following systems: • Safety-instrumented • Electrical • Electronic • Programmable Target group: Manufacturers and suppliers of equipment
/2/	IEC 61511 Section 1-3	Functional safety - Safety systems for the process industry Target group: Planners, constructors and users

A.4 Literature and catalogs

Table A- 1

No.	Title	Publisher	Order no.
/1/	Catalog ST 70 Components for Totally Integrated Automation	Siemens AG	E86060-K4670-A111
/2/	Catalog ST 80 SIMATIC Human Machine Interface Systems	Siemens AG	E86060-K4680-A101
/3/	FIELDBUS ONLINE Information about FOUNDATION™ Fieldbus	Fieldbus Foundation	www.fieldbus.org

A.5 Technical support

Technical Support

If this documentation does not provide complete answers to any technical questions you may have, contact Technical Support at:

- Support request (http://www.siemens.com/automation/support-request)
- More information about our Technical Support is available at Technical support (http://www.siemens.com/automation/csi/service)

Internet Service & Support

In addition to our documentation, Siemens provides a comprehensive support solution at:

- Service&Support (http://www.siemens.com/automation/service&support) where you will find support news, support documents including EDDs and software, and also support from experts.

Additional Support

If you have additional questions about the device, please contact your local Siemens representative.

Find your local contact partner at:

- Partner (http://www.automation.siemens.com/partner)

Documentation for various products and systems is available at:

- Instructions and manuals (http://www.siemens.com/processinstrumentation/documentation)

See also

Product information on SITRANS P in the Internet (http://www.siemens.com/sitransp)

Process instrumentation catalog (http://www.siemens.com/processinstrumentation/catalogs)

E-mail (mailto:support.automation@siemens.com)

List of abbreviations

B

B.1 Pressure transmitter

List of abbreviations

Table B- 1 Tags

Abbreviation	In full	Meaning
OUT	Output	
PRIM	Primary variable	
SEC	Secondary variable	
SENS	Raw pressure value	
TMP E	Electronics temperature	
TMP S	Sensor temperature	
TOTAL	Totalizer output	

Table B- 2 Units

Abbreviation	In full	Meaning
bar a	Bar absolute	Pressure unit for absolute pressure
bar g	Bar gauge	Pressure unit for gauge pressure
lb	Pound	Unit of weight
psi a	psi absolute	Pressure unit for absolute pressure
psi g	psi gauge	Pressure unit for gauge pressure
mbar	Millibar	Unit for pressure
Pa	Pascal	Unit for pressure
hPa	Hectopascal	Unit for pressure
psi	Pound per square inch	Unit for pressure
g/cm²	Gram per square centimeter	Unit for pressure
kg/cm²	Kilogram per square centimeter	Unit for pressure
mmH_2O	Millimeter water column	Unit for pressure
inH_2O	Inch water column	Unit for pressure
ftH2O	Foot water column	Unit for pressure
mmHg	Millimeter mercury [column]	Unit for pressure
inHg	Inch mercury [column]	Unit for pressure
l	Liter	Unit for volume
norml	Standard liter	Unit for volume
m^3	Cubic meter	Unit for volume
$normm^3$	Standard cubic meter	Unit for volume
Hl	Hectoliter	Unit for volume
$inch^3$	Cubic inch	Unit for volume

Abbreviation	In full	Meaning
stdft³	Standard cubic foot	Unit for volume
ft³	Cubic foot	Unit for volume
yd³	Cubic yard	Unit for volume
gal	Gallon (USA)	Unit for volume
Imp. gallon	Imperial gallon	Unit for volume
Bushel	Bushel	Unit for volume
bl	Barrel	Unit for volume
Barrel liquid	Barrel liquid	Unit for volume
s	Second	Unit for time
min	Minute	Unit for time
h	Hour	Unit for time
d	Day	Unit for time
K	Kelvin	Temperature unit
°C	degrees Celsius	Temperature unit
°F	degrees Fahrenheit	Temperature unit
°R	degrees Rankine	Temperature unit

Table B- 3 Other abbreviations

Abbreviation	In full	Meaning
CLASS		Term for nominal pressure measured in psi
PED	Pressure Equipment Directive	
DN	Diameter Nominal	Nominal diameter measured in mm
DP	Distributed I/O	Protocol for the transmission of information between field device and automation system over PROFIBUS.
FDE	Fault disconnection electronics	
FISCO	Fieldbus Intrinsically Safety Concept	
GSD	Device master data	
HART	Highway Addressable Remote Transducer	Standard protocol for the transmission of information between field device and automation system.
F&B	Food and beverage industry	
PA	Process automation	Protocol for the transmission of information between field device and automation system over PROFIBUS.
PDM	Process Device Manager	
PN	Pressure Nominal	Nominal pressure measured in bar
PNO	PROFIBUS User Organization	
PROFIBUS	Process Field Bus	Manufacturer-independent standard for the networking of field devices, e.g. PLC, drives, or sensors. PROFIBUS can be used with the DP and PA protocols.
SELV	Safety extra-low voltage Safety extra-low-voltage	

B.2 Abbreviations

Abbreviation	Full term in English	Meaning
LAS	Link Active Scheduler	Controls the allocation of the FOUNDATION™ Fieldbus in the Link Master

Glossary

Coupler

Connects FOUNDATION™ Fieldbus devices with other bus systems, such as PROFIBUS DP or control systems such as SIMATIC PCS7

Dangerous failure

Failure with the potential to switch a safety-instrumented system to a hazardous or non-functioning safety state.

Diameter nominal

The diameter nominal is specified according to DIN EN ISO 6708 by the term DN followed by a dimensionless number approximating the inner diameter in millimeters. According to DIN 2440 (medium-weight threaded pipe), a DN 50 pipe, for example, identifies a pipe with an outer diameter of 60.3 mm and a wall thickness of 3.65 mm (inner diameter therefore 53 mm).

EEPROM

EEPROM (Electrically Erasable Programmable Read-Only Memory) is a non-volatile, electronic memory chip.

EEPROM are often used when individual data bytes change over long intervals and need to be stored and retained if there is a network failure, for example configuration data or operating hours counters.

Failure/Fault/Error

Failure:
A resource is no longer capable of executing a required function.

Fault/Error:
Undesired state of a resource indicated by its incapability of executing a required function.

Fault/Error

→ *Failure/Fault/Error*

Final controlling element

Converter that converts electrical signals into mechanical or other non-electric variables.

Firmware

Firmware is a type of software that is embedded in a chip in electronic devices in contrast to software proper that is stored on hard disks or other media. Today, firmware is usually stored in a flash memory or EEPROM.

The firmware usually contains elementary functions for controlling the device or input and output routines.

Frequency shift keying

Frequency shift keying is a simple modulation method in which the digital values 0 and 1 are represented by two different frequencies.

Frequency shift keying (FSK)

→ *Frequency shift keying*

Function block

A named block consisting of one or more inputs, outputs, and included parameters.

Function blocks represent the basic automation functions executed by an application in a way as independent as possible from the details of I/O devices and the network. Each function block processes input parameters using a specified algorithm and a set of internally stored parameters. They produce output parameters which are available for use inside the same function block application or by other function block applications.

Generic Station Description

The generic station description (GSD) contains the information necessary for the control system to establish communication.

GSD

→ *Generic Station Description*

Link

is a coupler with a variable transmission speed. The transmission speed is a maximum of 12 Mbps (DP) to 31.25 kbps (PA).

Non-volatile memory

→ *EEPROM*

Risk

Combination of the probability of damage occurring and the extent of the damage.

Safety function

Defined function executed by a safety-instrumented system with the objective of attaining or maintaining a safe system state by taking a defined hazardous incident into account.

Example:
Limit pressure monitoring

Safety Integrity Level

→ *SIL*

Safety-instrumented system

A safety-instrumented system (SIS) executes the safety functions that are required to achieve or maintain a safe state in a system. It consists of a sensor, logic unit/control system and final controlling element.

Example:
A safety-instrumented system is made up of a pressure transmitter, a limit signal sensor and a control valve.

Sensor

Converter that converts mechanical or other non-electric variables into electrical signals.

SIL

The international standard IEC 61508 defines four discrete safety integrity levels (SIL) from SIL 1 to SIL 4. Each level corresponds to a probability range for the failure of a safety function. The higher the SIL of the safety-instrumented system, the higher the probability that the required safety function will work.

The SIL which can be achieved is determined by the following safety-instrumented characteristics:

- Average probability of failure on demand (PFD_{AVG})
- Hardware fault tolerance (HFT)
- Safe failure fraction (SFF)

srli2

→ *srlin2*

srlin2

"srli2" or "srlin2" is a type of square root extracting characteristic curve for the output current. This characteristic curve type is proportional to the flow rate, linear in two levels up to the application point and has a pre-defined application point of 10%.

"srli2" or "srlin2" are synonymous and technically there is no difference between them. The abbreviation "srli2" is used in sections that refer to the on-site operation of the pressure transmitter. The reason for the abbreviation is that the pressure transmitter display is restricted to five characters. The abbreviation "srlin2" is used for HART operation.

Zero point adjustment

After the following functions, the measuring range will have changed:

- Zero point calibration
- LO calibration
- HI calibration

If you have used one of these functions, the measuring range will have changed. This changed, remaining measuring range is called the zero point offset.

Refer to the **Operation** section for the corresponding modes of these functions.

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