

# Pressure transmitter

SITRANS P500 with HART

Service Manual · 09/2010



SITRANS

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## SITRANS

### Pressure transmitter SITRANS P500

#### Service Manual

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7MF5\*\*3

09/2010

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## 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.

<b>⚠ DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.
<b>⚠ WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.
<b>⚠ CAUTION</b>
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.
<b>CAUTION</b>
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.
<b>NOTICE</b>
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

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 for the specific task, 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:

<b>⚠ WARNING</b>
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 adhered to. The information in the relevant documentation must be observed.

### Trademarks

All names identified by ® are registered trademarks of the 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 Purpose of this documentation

These instructions contains all information that you will require to replace the connection board, pushbutton module, display, application electronics, and measuring cell of the device.

For information about the safe usage of the device, refer to the detailed version of these instructions and corresponding safety instructions on the electronic data medium.

Read these instructions carefully before you start any service and maintenance work. In order to use the device correctly, first make yourself acquainted with its principle of operation.

Readership of these instructions are service and maintenance technicians.

## 1.2 History

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

The documentation of this edition is applicable for the following firmware:

Version	Firmware and hardware identity nameplate	System integration	Installation path for PDM	Note
01				Unpublished version of the operating instructions
02 09/2010	FW: 35.01.00 HW: 11.01.01	PDM 6.0 <sup>1)</sup> ; Dev. R.3 DD; 01.00.00 Rev.1	SitransP500	

<sup>1)</sup> to SP05

## 1.3 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 AG 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.

## 1.4 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 specification sheet with the ordering data, the Software Device Install for SIMATIC PDM for additional installation, and the required software.

### See also

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

Catalog process instrumentation (<http://www.siemens.com/processinstrumentation/catalogs>)

## 1.5 Conformity with European directives

The CE mark on the device shows conformity with the provisions of the following European Directives:

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.

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.

DGRL  
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 and their associated versions can be found in the enclosed EC Declaration of Conformity.



# Fundamental safety instructions

## 2.1 General information

This device left the factory free from safety problems. In order to maintain this status and to ensure safe operation of the device, please observe the safety information and warnings contained in these instructions.

Safety information and symbols must be observed without exception. They must not be removed and must be maintained in legible condition at all times.

## 2.2 Correct usage

The device may only be used for the purposes specified in these instructions.

Insofar as they are not expressly stated in these instructions, all changes to the device are the sole responsibility of the user.

## 2.3 Laws and directives


Disregard of provisions and laws during connection and installation increases the risk of explosions and leaks due to improper application. To avoid these risks during connection and installation, you should comply with the test certifications, provisions and laws applicable in your country.

For hazardous areas, these are for example:

- IEC 60079-14 (international)
- National Electrical Code (NEC - NFPA 70) (USA)
- Canadian Electrical Code (CEC) (Canada)
- EN 60079-14 (previously VDE 0165, part 1) (EU)
- Working reliability regulation (Germany)


## 2.4 Checking the consignment


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


 <b>WARNING</b>
<b>Using a damaged or incomplete device</b> Danger of explosion. <ul style="list-style-type: none"><li>• Do not start up any damaged or incomplete devices.</li></ul>

## 2.5 Measures

For the sake of safety, the following precautions must be observed:

 <b>WARNING</b>
<b>"Flameproof enclosure" type of protection</b> Only open devices with type of protection "Flameproof enclosure" in hazardous areas when the power to the device is turned off, otherwise there is a risk of explosion.

 <b>WARNING</b>
<b>"Intrinsic safety" protection type</b> Only connect the device to certified intrinsically safe circuits. These circuits must comply with the technical data indicated on the nameplate or in the certificates and approvals. If the circuits do not comply with the information in the certificates and approvals, the safety required for the approval is longer guaranteed. The "ia" protection level of the device is decreased to the "ib" protection level when intrinsically safe circuits having the "ib" protection level are connected.

 <b>WARNING</b>
<b>Type of protection "limited energy" nL (zone 2)</b> Devices with "limited energy" type of protection may be connected and disconnected while in operation.
<b>Type of protection "non-sparking" nA (zone 2)</b> Devices with "non-sparking" protection may only be connected and disconnected when off circuit.

 **WARNING****Exposure to aggressive and hazardous process media**

The device can be operated both at high pressure and with aggressive and hazardous process media. Therefore, improper use of this device may lead to serious injury and or considerable damage to property. Above all, it must be noted when the device was in use and is to be exchanged.

 **WARNING****Explosion hazard through electrostatic charging**

To prevent electrostatic charges building up in a hazardous environment, the key cover must be closed during operation and the screws must be tightened.

Temporary opening of the key cover for purposes of operating the transmitter may be performed at any time, even during operation; after which the screws should be tightened again.

**CAUTION****Electrostatic Sensitive Devices (ESD)**

This device contains electrostatic sensitive devices. Electrostatic sensitive devices may be destroyed by voltages that are undetectable to a human. Voltages of this kind occur as soon as a component or an assembly is touched by a person who is not grounded against static electricity. The damage to a module as a result of overvoltage cannot usually be detected immediately. It may only become apparent after a long period of operation.

Protective measures against discharge of static electricity:

- Make sure that no power is applied.
- Before you work with modules, first discharge any static charges 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.

## **2.6 Qualified Personnel**

Qualified personnel are people who are familiar with the installation, mounting, commissioning, and operation of the product. These people have the following qualifications:

- They are authorized, trained or instructed in operating and maintaining devices and systems according to the safety regulations for electrical circuits, high pressures and aggressive as well as hazardous media.
- For explosion-proof devices: 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 safety regulations.

## Description

### 3.1 Structure

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

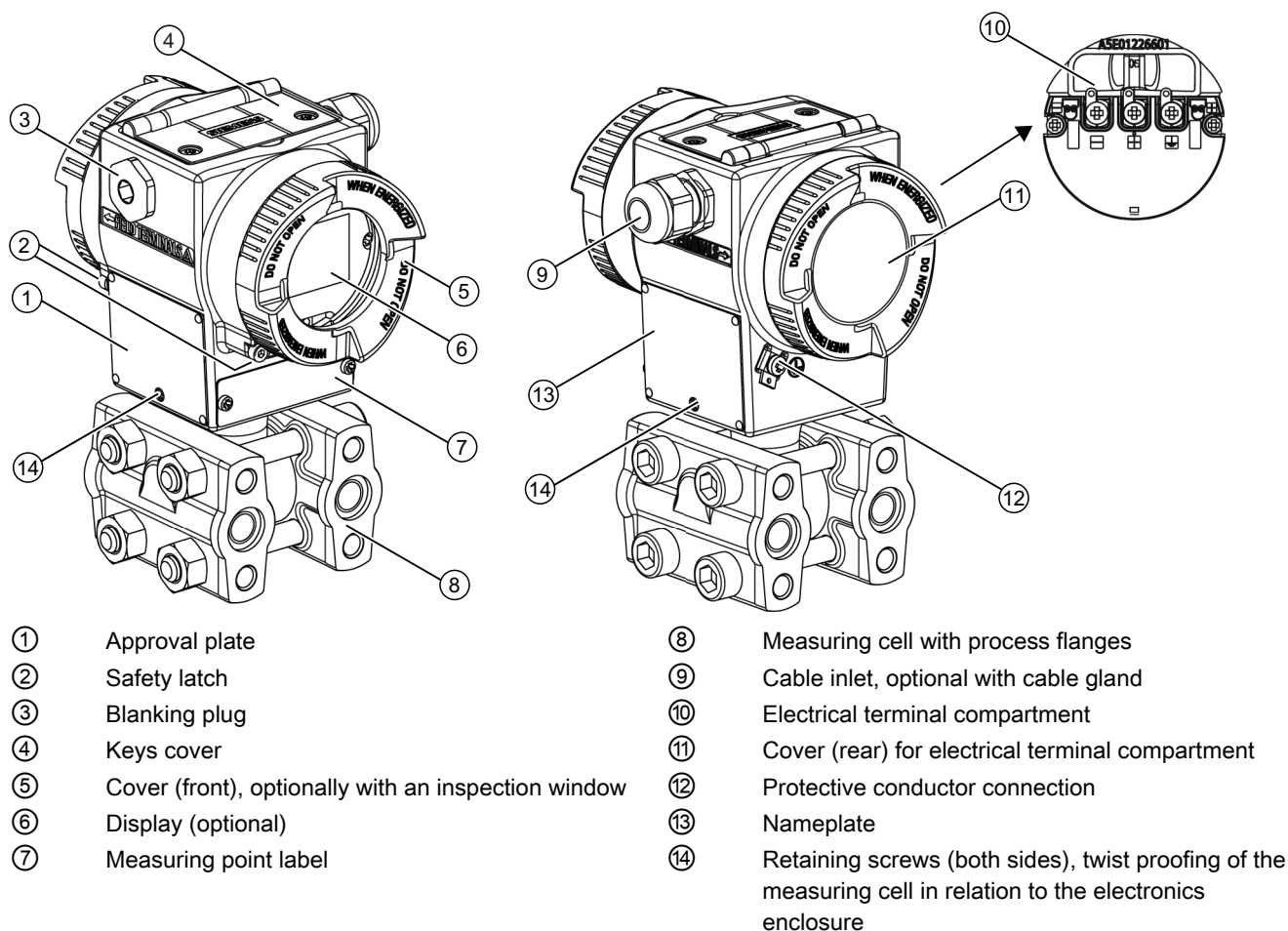


Figure 3-1 Device view of the transmitter

- The electronic enclosure is made of aluminum die casting.
- The enclosure has a removable circular cover at the front and the back.
- Depending on the device version, the cover ⑤ is provided with an inspection window. Through the inspection window, the measured values can be read from the display (optional) ⑥.
- The user must not use the service connector located behind the display ⑥. The service plug is for the exclusive use of the manufacturer.

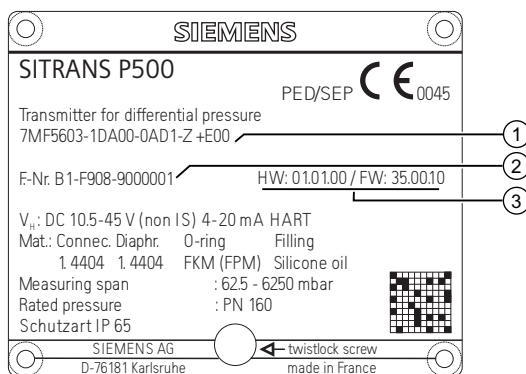
3.2 Structure of the nameplate and approval plate

- The cable inlet ⑨ to the electrical terminal compartment on the left or right side can be used selectively. The corresponding unused opening is closed with a blanking plug ③.
- The protective conductor terminal ⑫ is located on the rear of the housing.
- The electrical terminal compartment ⑩ for power supply and shield is accessible when you unscrew the cover ⑪.
- Underneath the electronics housing is the measuring cell with its pressure caps on which the process connections ⑧ are located. The modular structure of the pressure transmitter allows you to replace the measuring cell, application electronics, connection board, pushbutton module, and the optional display when required.
- On the upper face of the enclosure you can see crosshead screws which secure the cover ④, under which the 3 keys for local operation are located.

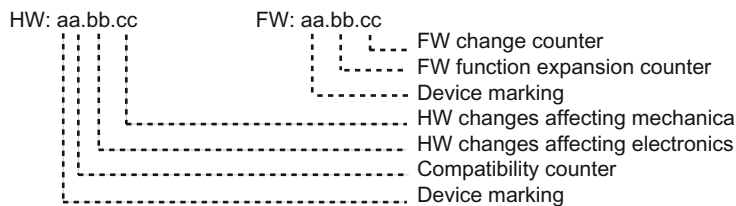
### 3.2 Structure of the nameplate and approval plate

#### Nameplate structure

The nameplate with the order number and other important data, such as the design details and technical data can be found on the side of the enclosure.



- ① Order number
- ② Serial number
- ③ Firmware (FW) and hardware (HW) numbers



#### Example of a nameplate

### Structure of the approval plate

The approval plate is located on the side opposite the nameplate. For the Ex-version of the transmitter, the information on the respective certificate is also listed.

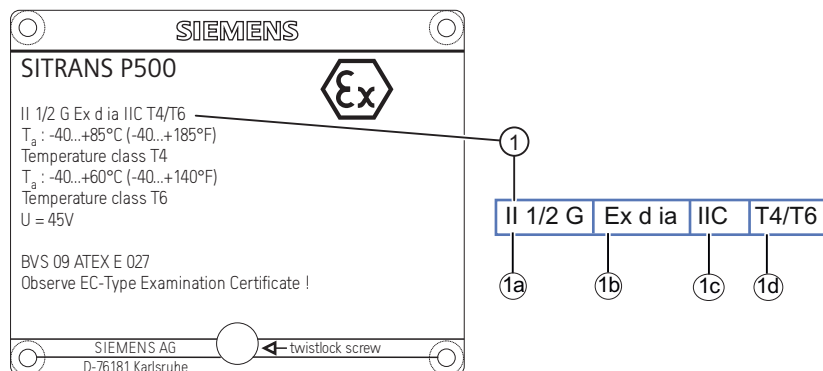


Figure 3-2 Example of an approval plate

- ① Characteristics of the hazardous area
- ①a Category of the operating range
- ①b Type of protection
- ①c Group (gas, dust)
- ①d Maximum surface temperature (temperature class)

*Description*

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*3.2 Structure of the nameplate and approval plate*



## Service and maintenance

### 4.1 Safety notice for maintenance

For all devices

<b>⚠ WARNING</b>
<p>This device is designed to operate with high pressure and / or hazardous media. For this reason, repair and maintenance work performed on this device with connected supply lines can result in the leakage of hazardous substances from these lines.</p> <p>Therefore you must ensure that substances cannot leak prior to opening or dismantling the device, e.g. block the line or separate the line from the device.</p>

<b>⚠ WARNING</b>
<p>If you are unable to eliminate faults, place the device out of service and protect it against inadvertent commissioning.</p>

<b>CAUTION</b>
<p>If the membrane of the pressure connection is cleaned with pointed or hard objects, you can destroy the membrane.</p> <p>Therefore, do not use pointed or hard objects to clean the membrane.</p>

<b>NOTICE</b>
<p>Depending on the use of the device and certain empirical values, determine a maintenance interval for the tests to be carried out repeatedly.</p> <p>The maintenance interval is also influenced by the corrosion resistance depending on the site of use.</p>

### General explosion protection

<b>⚠ WARNING</b>
<p>An explosion hazard exists when the device is repaired or serviced in explosive atmospheres.</p> <p>Before opening the device, ensure that the surrounding atmosphere is not potentially explosive.</p>

 **WARNING**

So as to ensure the safety of the explosion protection, the device may be repaired only by repair shops authorized by the manufacturer.

## 4.2 Notes for servicing

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**Note**

**Checking the gaskets**

At regular intervals, check that the enclosure seals of the pressure transmitter satisfy IP66 / IP68. Grease or replace the gaskets if required.

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## 4.3 Notes for servicing of the remote seal

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 soft brush and 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.

## 4.4 Modular structure

### Safety note

**NOTICE****Improper replacement of components**

The structure of the device is modular. This makes it easy to replace various components with original spare parts.

- When replacing an item, please adhere to all installation and safety notices which are attached to the replacement part.
- in particular for devices which are used in areas that present an explosion hazard.

### Related

The two individual components of measuring cell and application electronics both contain a non-volatile memory (EEPROM).

Measuring cell data (e.g.: The measuring range, measuring cell material (oil filling) and application-specific data of the application electronics (such as: down-scaling, additional electrical damping) are stored in the EEPROM in the measuring cell. When the measuring cell is replaced, the application-specific data are lost. When the application electronics are replaced, no data are lost.

Before replacing the measuring cell, you have the option of saving the application-specific data and then reloading it after the replacement. For this you should use an input device which supports the HART protocol. (e.g. HART Communicator, PC with HART modem and HART software or PC with HART modem and PDM software). If the application-specific data was not saved before the measuring cell was replaced, following the replacement the factory settings will be used.

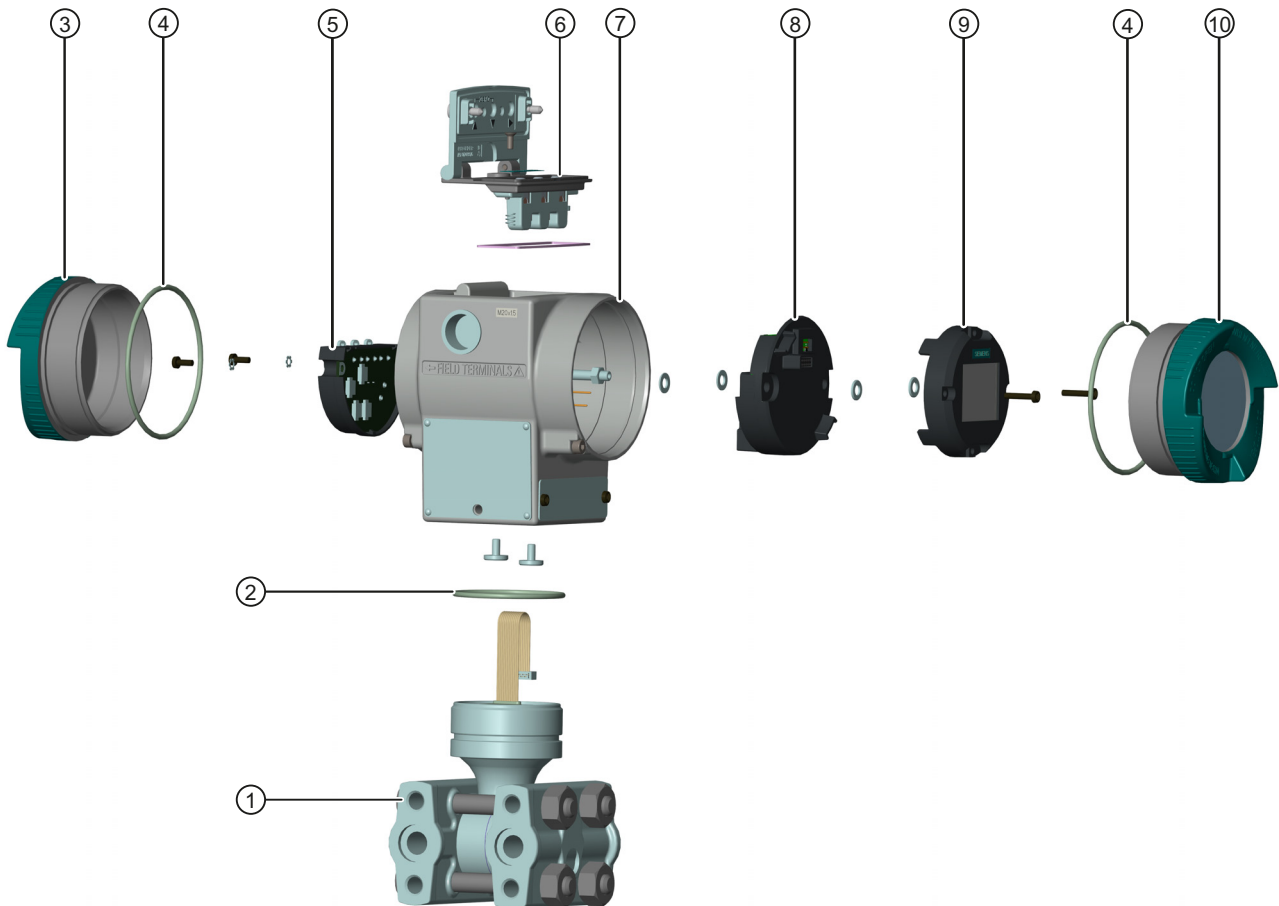
Further technical developments enable the implementation of extended functions in the firmware of the measuring cell or the application electronics. Further technical developments are indicated by changes to the firmware versions (FW). The firmware version does not affect the facility to replace modules. The functional scope is however restricted to the functionality of the components that are fitted.

If for technical reasons the combination of certain firmware versions of the measuring cell and application electronics is not compatible, the device detects this and switches to "fault current" mode. This information is provided via the HART interface.

## 4.5 Replacing parts

### 4.5.1 Exploded view of the device

The device consists of different components, depending on the customer's order. The next chapters show you how to replace the components.



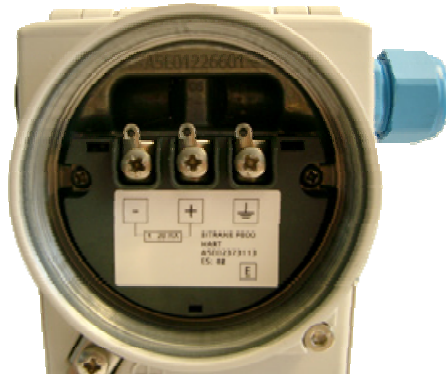
- |   |   |   |  |
|---|---|---|--|
| ① | Measuring cell with process flanges                 | ⑥ | Pushbutton module                                |
| ② | Sealing ring between the measuring cell and housing | ⑦ | Housing  |
| ③ | Cover (rear) for electronic terminal compartment    | ⑧ | Application electronics                          |
| ④ | Sealing ring between the cover and housing          | ⑨ | Display (optional)                               |
| ⑤ | Connection board                                    | ⑩ | Cover (front), optionally with inspection window |

Figure 4-1 Exploded view of the transmitter

## 4.5.2 Replacing the connection board

### Procedure for replacing the connection board

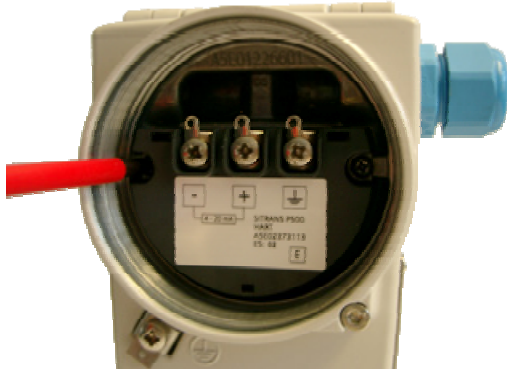
1. Isolate the device from power.
2. Open the cover of the electronic connection compartment.



3. Disconnect the cables from the connection board.

4.5 Replacing parts

4. On the left and right side, remove the recessed-head screws that hold the connection board to the enclosure.

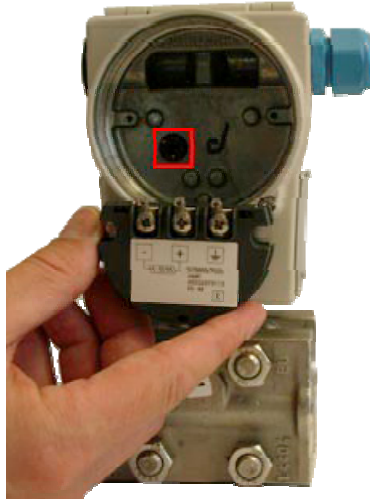


5. Remove the connection board.



**To install the connection board, proceed as follows**

1. Insert the new connection board so that its contact pins on rear side mate the contacts in the housing.



2. Work in the reverse order as described in "Procedure for replacing the connection board".

**See also**

Structure (Page 11)

Exploded view of the device (Page 18)

### 4.5.3 Replacing the pushbutton module

**Procedure**

1. Isolate the device from power.
2. To open the pushbutton cover, remove both recessed-head screws from the outside of the cover.



3. Using a TX9 torx screwdriver, remove the three screws you can now see.



4. Remove the pushbutton module from the housing.



5. To install the new pushbutton module, carry out the same steps in the reverse order.
6. When inserting the new pushbutton module, make sure that the seals are sitting properly.

### See also

Structure (Page 11)

Exploded view of the device (Page 18)



#### 4.5.4 Replacing the display

##### Procedure for replacing the display

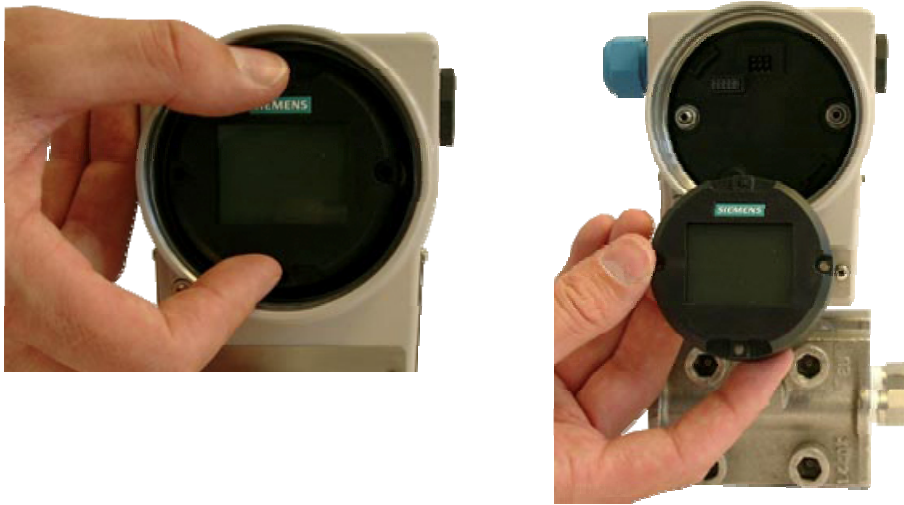
1. Open the front cover (optional with inspection window).



2. Remove the recessed-head screws on the left and right side.



3. Pull the display out of the housing.



#### Procedure for installing the display

1. Insert the new display so that the the contact pins on its rear side mate the socket strip.
2. You can also turn the mounting position of the display by 90 °, 180 °, or 270 °.
3. Work in the reverse order as described in "Procedure for replacing the display".

#### See also

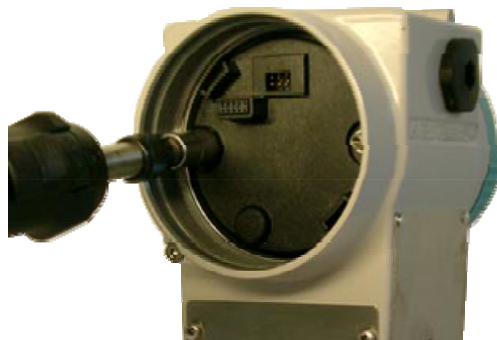
Structure (Page 11)

Exploded view of the device (Page 18)

## 4.5.5 Replacing the application electronics

### Procedure for replacing the application electronics

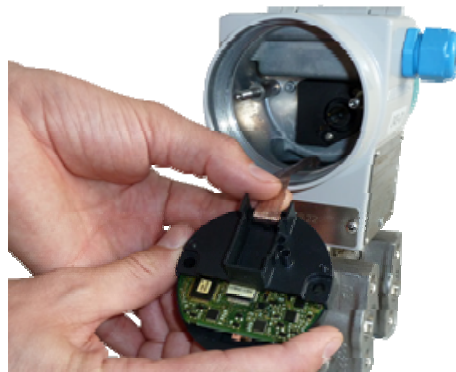
1. Isolate the device from power.
2. Open the front cover of the display (optional with inspection window).
3. Remove the display. See Section Replacing the display (Page 23).
4. Using an 8 mm socket wrench, remove the hexagon nuts from the left and right side.



5. Remove the application electronics.

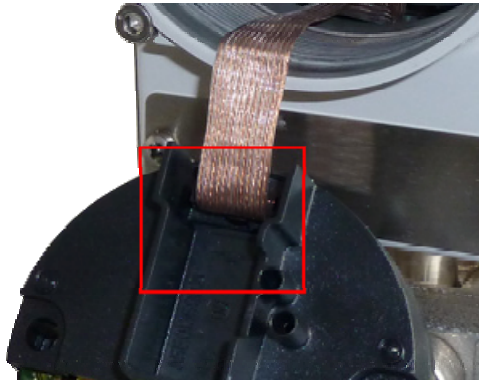


6. Disconnect the ribbon cable from the application electronics.



**Procedure for installing the application electronics**

1. Connect the ribbon cable to the application electronics so that the coding notch of the connector faces upward. Compare the corresponding marking on the application electronics with the photo image.
2. Do not kink, pinch, or twist the ribbon cable when plugging it onto the application electronics.



3. Work in the reverse order as described in "Procedure for replacing the application electronics".

**See also**

Structure (Page 11)

Exploded view of the device (Page 18)

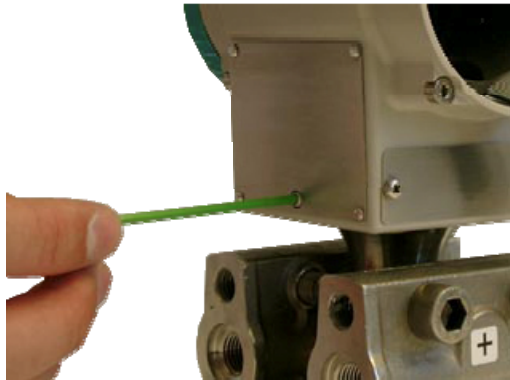
## 4.5.6 Replacing the measuring cell

### Procedure

1. Isolate the device from power.
2. Open the display cover (optional with inspection window).
3. Remove the display. See Section Replacing the display (Page 23).
4. Remove the application electronics. See Section Replacing the application electronics (Page 25).

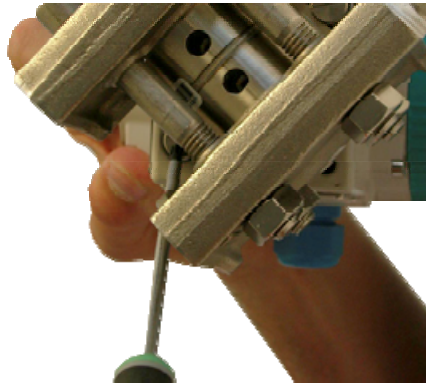


5. Using a hexagonal socket wrench size 2.5 mm, remove the lock screws from **both sides** of the housing.



6. Turn the measuring cell clockwise by a small distance so that you can access the screws underneath the housing.

7. Using a TX20 torx screwdriver, remove both screws from the bottom of the housing.



**CAUTION**

**Damage to the ribbon cable**

To avoid damage to the ribbon cable when installing or removing the measuring cell, do not kink, pinch, or twist it.

- Do not kink, pinch, or twist the ribbon cable.

8. Turn the measuring cell counter-clockwise to remove it from the housing.



1. To install the new measuring cell, carry out the same steps in the reverse order.

**See also**

Structure (Page 11)

Exploded view of the device (Page 18)

## 4.6 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 goods delivery note (<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.

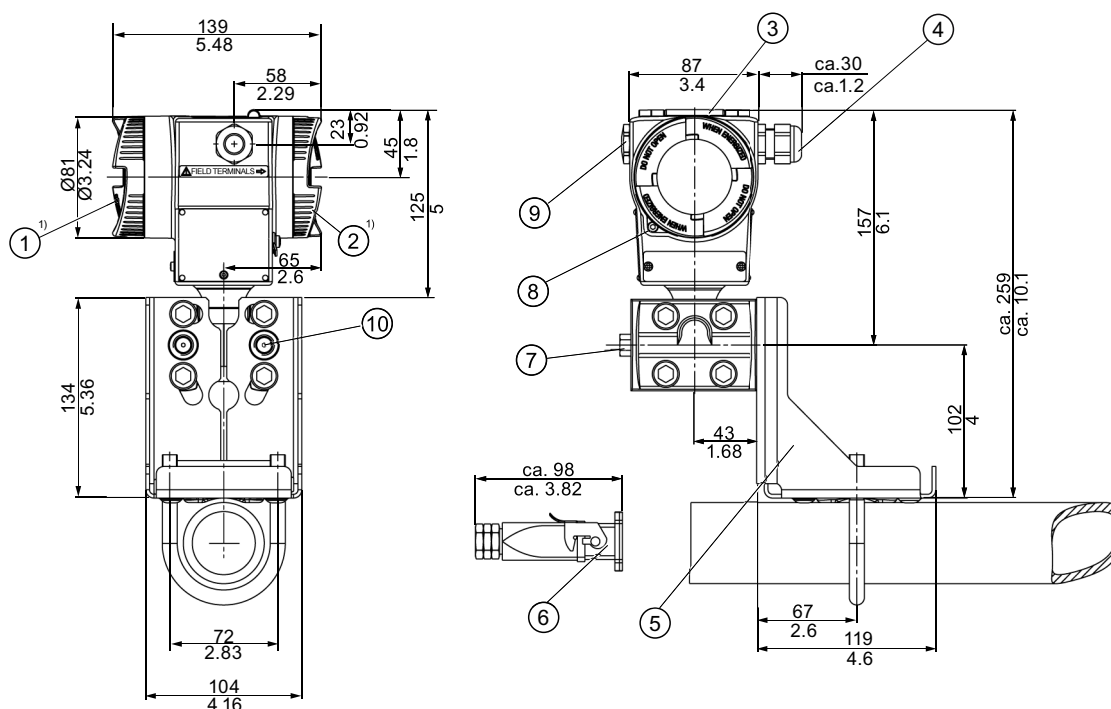
The forms can be found on the Internet as well as in the documentation which comes with the device.





## Dimension drawings

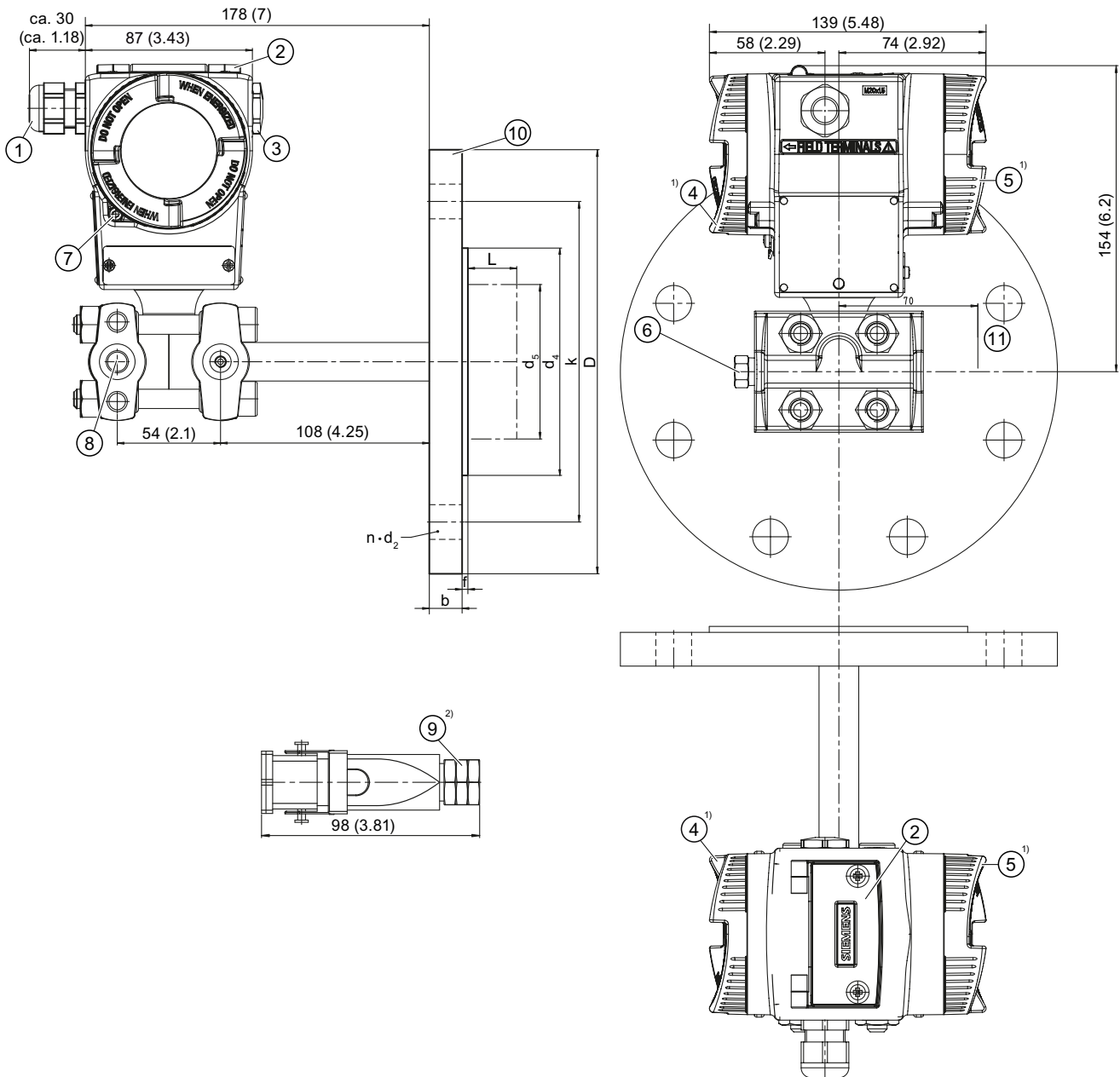
### 5.1 SITRANS P500 for differential pressure, flow rate and absolute pressure from the differential pressure series



- ① Electronics side, display
  - ② Connection side
  - ③ Keys cover
  - ④ Electrical connection:
    - Screw gland M20 x 1.5 or 1/2-14 NPT
    - Han 7D/Han 8U plug<sup>2)3)</sup> or M12<sup>3)</sup>
  - ⑤ Mounting bracket (optional)
  - ⑥ Electrical connection:
    - Han 7D/Han 8D plug<sup>2)3)</sup>
  - ⑦ Process connection, with valve (optional) or screwed joint (optional)
  - ⑧ Screw lid - safety bracket
  - ⑨ Screw-type blank cap
  - ⑩ Process connection: 1/4-18 NPT (IEC 61518)
- 1) In addition, allow approx. 20 mm (0.79 inch) for the thread length
- 2) Not with "Explosion-proof" type of protection
- 3) Not for "FM + CSA [is + XP]" type of protection

Figure 5-1 SITRANS P500 pressure transmitter for differential pressure and flow rate, measurements in mm (inch): Order No.: 7MF54\*\*

## 5.2 SITRANS P500 for level



- ① Electrical connection:
  - Screw gland M20 x 1.5<sup>3)</sup> or 1/2-14 NPT
  - Han 7D/Han 8D plug<sup>2)3)</sup> or M12
- ② Keys cover
- ③ Screw-type blank cap
- ④ Connection side
- ⑤ Electronics side, display
- ⑥ Process connection, negative side with valve (optional) or screw gland (optional)
- ⑦ Screw lid - safety bracket

- ⑧ Process connection: Negative side  $\frac{1}{4}$ -18 NPT (IEC 61518)
  - ⑨ Electrical connection:
    - Han 7D/Han 8D plug<sup>2) 3)</sup>
  - ⑩ Mounting flange as per EN1092-1 or ASME B16.5
  - ⑪ Free space for turning housing
- 1) In addition, allow approx. 20 mm (0.79 inch) for the thread length
- 2) Not with "Explosion-proof" type of protection
- 3) Not for "FM + CSA [is + XP]" type of protection

Figure 5-2 SITRANS P500 pressure transmitter for level, including mounting flange, measurements in mm (inch): Order No.: 7MF56\*\*



## Ordering data for spare parts/accessories

Selection and Ordering data		Order code
<b>Supplementary electronics for 4-wire connection</b>		V ■■
Order No. of the transmitter <b>7MF54..-.....-.....</b> or <b>7MF56..-.....-.....</b> add "-Z" and Order code.		
<b>Power supply</b>	<b>Electrical connection</b>	
24 V AC/DC	Terminals; 2 Pg screwed glands, to left	1
	2 Han 7D/Han 8U plugs incl. mating connector, to left	3
	1 Han 7D plug incl. mating connector, angled	5
	Terminals; 1 Pg screwed gland, downwards	6
	1 Han 8U plug incl. mating connector, downwards (observe arrangement of plug and differential pressure line)	9
230 V AC	Terminals; 2 Pg screwed glands, to left	7
	2 Han 7D plugs incl. mating connector, to left	8
<b>Output current</b>		
0 ... 20 mA		0
4 ... 20 mA		1
Selection and Ordering data		Order No.
<b>Accessories</b>		
<b>Instruction Manual</b> German/English		<b>A5E00322799</b>

Selection and ordering data		Order No.
<b>Replacement measuring cells for differential pressure</b>		<b>7MF5994 -</b>
SITRANS P pressure transmitters for differential pressure and flow, P500 HART PN 160 series (MWP 2320 psi)		
<b>Measuring cell filling</b>	<b>Measuring cell cleaning</b>	■ ■ ■ ■ 1
Silicone oil	normal	1
<b>Measuring span</b>		
1.25 ... 250 mbar	(0.5 ... 100.4 inH <sub>2</sub> O)	D
6.25 ... 1250 mbar	(2.5 ... 502 inH <sub>2</sub> O)	E
<b>Wetted parts materials</b> (stainless steel process flanges)		
Seal diaphragm	Parts of measuring cell	
stainless steel	stainless steel	A
<b>Process connection</b>		
Female thread 1/4-18 NPT		
• Sealing screw opposite process connection		
- Mounting thread 7/16-20 UNF to EN 61518		0
- Mounting thread M10 to DIN 19213		1
• Vent on side of process flange		
- Mounting thread 7/16-20 UNF to EN 61518		4
- Mounting thread M10 to DIN 19213		5
<b>Further designs</b>		Order code
Add "-Z" to Order No. and specify Order Code.		
<b>Acceptance test certificate</b>		<b>C12</b>
Acc. to EN 10204-3.1		
Without process flanges		<b>K00</b>
Vent on side for gas measurements <sup>1)</sup>		<b>L32</b>
Process flanges, O-rings made of NBR Standard: Viton (FKM (FPM))		<b>L63</b>

<sup>1)</sup> Only in conjunction with process connection code 4 or 5.

Selection and Ordering data	
	Order No.
<b>Mounting brackets</b> For differential pressure transmitters with flange thread M10 (7MF54...10 and 7MF54...50) <ul style="list-style-type: none"> <li>made of steel</li> <li>made of stainless steel</li> </ul>	7MF5987-1AA 7MF5987-1AD
<b>Mounting brackets</b> for differential pressure transmitter with flange thread 7/16-20 UNF (7MF54...00 and 7MF54...40) <ul style="list-style-type: none"> <li>made of steel</li> <li>made of stainless steel</li> </ul>	7MF5987-1AC 7MF5987-1AF
<b>Cover</b> Made of die-cast aluminum, including O-ring <ul style="list-style-type: none"> <li>without window</li> <li>with window</li> </ul>	7MF5987-1BE 7MF5987-1BF
<b>Digital indicator</b> Including mounting material	7MF5987-1BR
<b>TAG plate (incl. fastening material)</b> without inscription (5 pcs.) Printed (1 pc.) Data according to Y01 or Y02, Y15 and Y16 (see "SITRANS P transmitters")	7MF5987-1CA 7MF5987-1CB-Z Y.: .....
<b>Mounting screws</b> For TAG plate, grounding and connection terminals and securing and locking screws (30 units)	7MF5987-1CC
<b>Sealing plugs for process flange</b> (1 set = 2 units) <ul style="list-style-type: none"> <li>made of stainless steel</li> <li>made of Hastelloy</li> </ul>	7MF4997-1CG 7MF4997-1CH
<b>Vent valve</b> Complete (1 set = 2 units) <ul style="list-style-type: none"> <li>made of stainless steel</li> <li>made of Hastelloy</li> </ul>	7MF4997-1CP 7MF4997-1CQ
<b>Electronics module</b> HART, intrinsically safe Ex ia for installation in transmitter casing (observe warranty conditions)	7MF5987-1DC
<b>Connection board (incl. fastening material)</b> HART, intrinsically safe Ex ia for installation in transmitter casing (observe warranty conditions)	7MF5987-1DM
<b>O-rings for process flanges made of:</b> <ul style="list-style-type: none"> <li>Viton (FKM (FPM)) (10 pcs.)</li> <li>NBR (Buna N) (10 pcs.)</li> </ul>	7MF5987-2DA 7MF5987-2DE
<b>Push buttons assembly (incl. fastening material)</b> For replacement of operating keys for on-site operation of the transmitter	7MF5987-2AF
<b>Sealing ring for</b> <ul style="list-style-type: none"> <li>Process connection</li> <li>NBR sealing ring for screw cover (10 pcs.)</li> <li>NBR sealing ring for interface measuring cell/housing (10 pcs.)</li> </ul>	See catalog FI01, "Fittings" 7MF4997-2EA 7MF5987-2EB

Selection and Ordering data	
	Order No.
<b>Operating Instructions<sup>1)</sup></b> German English French Italian Spanish	A5E02344527 A5E02344528 A5E02344529 A5E02344530 A5E02344531
<b>Compact operating instructions<sup>1)</sup></b> English, German, Spanish, French, Italian, Dutch English, Estonian, Latvian, Lithuanian, Polish, Romanian English, Bulgarian, Czech, Finnish, Slovakian, Slovenian English, Danish, Greek, Portuguese, Swedish, Hungarian Russian	A5E02344532 A5E02307339 A5E02307340 A5E02307341 A5E02307338
<b>Brief instructions (Leporello)</b> German, English French, English Italian, English Spanish, English Chinese, English Russian, English	A5E02344536 A5E02344537 A5E02344538 A5E02344539 A5E02344540 A5E02556625
<b>CD with documentation</b> German, English, French, Spanish, Italian	A5E02344535
<b>Service Instructions<sup>1)</sup></b> for replacement of electronics, measuring cell and terminal board <ul style="list-style-type: none"> <li>german</li> <li>english</li> </ul>	A5E02822443 A5E02344534
<b>HART modem</b> <ul style="list-style-type: none"> <li>with RS232 interface</li> <li>with USB interface</li> </ul>	7MF4997-1DA 7MF4997-1DB
<b>Supplementary electronics for 4-wire connection</b>	A5E00322799
<b>Certificates (order only via SAP) additional to internet download</b> <ul style="list-style-type: none"> <li>hard copy (to order)</li> <li>on CD (to order)</li> </ul>	A5E03252406 A5E03252407

<sup>1)</sup> You can download these operating instructions free-of-charge from our Internet site at [www.siemens.de/sitransp](http://www.siemens.de/sitransp).

D) Subject to export regulations AL: 9I999, ECCN: N.

F) Subject to export regulations AL: N, ECCN: EAR99H.

▶ Available ex stock.

For power supply units, see catalog FI01 "Supplementary Components".

# A

## Appendix

### 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 Literature and catalogs

No.	Title	Publisher	Order no.
/1/	Catalog ST 70 <b>SIMATIC</b> Products for Totally Integrated Automation	Siemens AG	E86060-K4670-A111-B1
/2/	Catalog ST 70 N <b>SIMATIC</b> <b>News</b> Products for Totally Integrated Automation	Siemens AG	E86060-K4670-A151-A3
/3/	Catalog ST 80 <b>SIMATIC</b> <b>HMI</b> operation and observation products	Siemens AG	E86060-K4680-A101-B4
/4/	Catalog IK PI <b>Industrial Communication</b>	Siemens AG	Internet address: IK PI catalog ( <a href="http://www.automation.siemens.com/net/html_76/support/printkatalog.htm">http://www.automation.siemens.com/net/html_76/support/printkatalog.htm</a> ) E86060-K6710-A101-B5
/5/	Catalog FI 01 <b>Field devices for process automation</b>	Siemens AG	E86060-K6201-A101-B1
/6/	Catalog CA 01 <b>The interactive catalog of Industry Automation and Drive Technologies</b>	Siemens AG	E86060-D4001-A500-C7 (DVD)

## A.3 Technical support

### Technical Support

You can contact Technical Support for all IA and DT products:

- Via the Internet using the **Support Request:**  
Support request (<http://www.siemens.com/automation/support-request>)
- E-mail (<mailto:support.automation@siemens.com>)
- **Phone:** +49 (0) 911 895 7 222
- **Fax:** +49 (0) 911 895 7 223

Further information about our technical support is available in the Internet at  
Technical Support (<http://www.siemens.com/automation/csi/service>)

### Service & Support on the Internet

In addition to our documentation, we offer a comprehensive knowledge base online on the Internet at:

Services & Support (<http://www.siemens.com/automation/service&support>)

There you will find:

- The latest product information, FAQs, downloads, tips and tricks.
- Our newsletter, providing you with the latest information about your products.
- A Knowledge Manager to find the right documents for you.
- Our bulletin board, where users and specialists share their knowledge worldwide.
- You can find your local contact partner for Industry Automation and Drives Technologies in our partner database.
- Information about field service, repairs, spare parts and lots more under "Services."

### Additional Support

Please contact your local Siemens representative and offices if you have any questions about the products described in this manual and do not find the right answers.

Find your contact partner at:

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

A signpost to the documentation of the 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>)

Catalog process instrumentation (<http://www.siemens.com/processinstrumentation/catalogs>)



## A.4 Repair report for installation of spare parts

### For your local documentation

- Check mark the relevant items and fill out the fields

1.

<b>Customer information:</b>	
Company:	
Address:	
Department:	
Tel / Fax:	
E-mail:	
System part:	

2.

<b>Information on the original device: first replacement of a component <input type="checkbox"/></b>	
Electronic serial number:	
Sensor serial number:	
F-no.: (rating plate)	
HW: Approval plate)	
FW: (approval plate)	
Device order no.:	7MF5 _ _ _ - _ _ _ _ - _ _ _ _ - Z _ _ _
Additional components	- Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _

3a.

<b>Device information Spare Part(1): Measuring cell</b>	
Sensor serial number:	
Spare part order no.:	7MF599 _ _ - _ _ _ _ _ - Z _ _ _
Additional components	- Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _ - Z _ _ _

3b.

<b>Device information Spare Part(2): Application electronics</b>	
Electronic serial number:	
ES: (electronic cup)	

A.4 Repair report for installation of spare parts

<b>Device information Spare Part(2): Application electronics</b>	
FW: (electronic cup)	
Spare part order no.:	7MF5999 - _ _ _ _ _ - _ _ _ _ _

3c.

<b>Device information Spare Part(3): Connection board</b>	
HW: (connection board)	
Spare part order no.:	7MF5999 - _ _ _ _ _ - _ _ _ _ _

3d.

<b>Device information Spare Part(4): Pushbutton module</b>	
HW: (connection board)	
Spare part order no.:	7MF5999 - _ _ _ _ _ - _ _ _ _ _

3e.

<b>Device information Spare Part(5): Display</b>	
HW: (connection board)	
Spare part order no.:	7MF5999 - _ _ _ _ _ - _ _ _ _ _

3f.

<b>Device information Spare Part(6): Additional spare parts</b>	
HW: (connection board)	
Spare part order no.:	7MF5999 - _ _ _ _ _ - _ _ _ _ _

4.

<b>Additional information</b>	
Installation location (precise definition)	

Additional information	
Repair period:	From:
	To
Safety measures:	
Work completed:	

5.

Acceptance:			
Check mark the relevant items and fill out the fields			
Replacement documentation was read and observed: <input type="checkbox"/>			
ESD guidelines were observed: <input type="checkbox"/>			
Inspected by Ex expert: <input type="checkbox"/>			
Function test completed: <input type="checkbox"/>			
Name of Ex expert:		Date:	
Signature of Ex expert:			
Author name:		Date:	
Author signature:			



# Glossary

## ATEX

ATEX is an abbreviation of the French term "Atmosphère explosible" (potentially explosive atmosphere). ATEX stands for both EC directives in the area of explosion protection: ATEX product directive 94/9/EC and ATEX operating directive 1999/92/EC.

## Auxiliary power supply

Auxiliary power supply refers to an electrical supply or reference voltage which some electrical circuits require apart from the standard supply. The auxiliary power supply can, for example, be specially stabilized, have a particular level or polarity and/or other properties which are important for the correct functioning of switch components.

## Auxiliary voltage

→ *Auxiliary power supply*

## Dangerous failure

Failure with the potential to bring the safety-instrumented system into a dangerous or non-functional status.

## EEPROM

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

EEPROMs are often used where individual bytes of data (e.g. configuration data or runtime meters) change over time and must be stored safely in the event of a mains power failure.

## Fail-safe

The capability of a control to maintain the safe state of the controlled device, e.g. machine, process, or to bring the device to a safe state even when faults/failures occur.

## Failure/Fault

Failure:

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

Fault:

Undesired state of a resource indicated by the incapability of executing a required function.

## **Fault**

→ *Failure/Fault*

## **Fault tolerance**

Fault tolerance N means that a device can execute the intended task even when N faults exist. The device fails to execute the intended function in case of N+1 faults.

## **Final controlling element**

Converter that converts electrical signals into mechanical or other non-electrical variables.

## **Firmware**

Firmware (FW) is software that is embedded on a chip in electronic devices – in contrast to software which is saved on hard disks, CD-ROMs or other media. These days, firmware is mostly stored in a flash memory or EEPROM.

Firmware usually contains the elementary functions for controlling the device, as well as input and output routines.

## **Frequency shift keying**

Frequency shift keying is a simple form of modulation, where the digital values 0 and 1 modulate the actual current signal by means of two different frequencies.

## **Frequency Shift Keying (FSK)**

→ *Frequency shift keying*

## **HART**

HART (Highway Addressable Remote Transducer) is a standardized, widely used communications system used to structure industrial fieldbuses. The communications system provides digital communications for multiple participants (field devices) via a common databus. HART is based especially on the equally widely used 4/20 mA standard for the transfer of analog sensor signals. The cabling from existing older systems can be used directly and both systems operated in parallel.

HART specifies several protocol levels in the OSI model. It facilitates the transfer of process and diagnostics data and control signals between field devices and high-level control systems. Standardized parameter sets can be used for the manufacture-independent operation of all HART devices.

Typical applications include transmitters for measuring mechanical and electrical dimensions.

## **Non-volatile memory**

→ *EEPROM*

**Risk**

The combination of probability of a damage occurring and its magnitude.

**Safety function**

Defined function executed by a safety-instrumented system with the objective of achieving or maintaining a safe system status taking into account a defined dangerous occurrence.

Example:

Limit pressure monitoring

**Safety Instrumented Function**

→ *SIF*

**Safety Integrity Level**

→ *SIL*

**Safety-instrumented system**

A safety-instrumented system executes the safety functions that are required to achieve or maintain a safe status 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-electrical variables into electrical signals.

**SIF**

A part/function of a safety-instrumented system that reduces the risk of a dangerous failure occurring.

**SIL**

The international standard IEC 61508 defines four discrete Safety Integrity Levels (SIL) from SIL 1 to SIL 4. Each level corresponds to the probability range for the failure of a safety function. The higher the SIL of the safety-instrumented system, the higher probability that the required safety function will work.

The achievable SIL is determined by the following safety characteristics:

- Average probability of dangerous failure of a safety function in case of demand (PFD<sub>AVG</sub>)
- Hardware fault tolerance (HFT)
- Safe failure fractions (SFF)

**Total error**

Total Error is sum of Total Performance and the long-term stability.

**Total Error(s)**

→ *Total error*

**Total Performance**

Total Performance is the square root of the sum of the squares of the three deviations resulting from the influence of the static pressure, the temperature and the characteristic deviation.

**TP**

→ *Total Performance*



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