SITRANS® P
Absolute pressure transmitter, DS series (Smart)

7MF4332

Operating Instructions
Order No.: C73000—B5676—C84—1
SIEMENS

SITRANS P
Absolute pressure transmitter, DS series (Smart)

7MF4332

Operating Instructions
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</table>
Note

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency that may arise during installation, operation or maintenance.

Should further information be desired or should particular problems arise that are not covered sufficiently for the Purchaser's purposes, the matter should be referred to the local Siemens Sales Office.

The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The Sales Contract contains the entire obligations of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

![WARNING]

This equipment should only be installed and operated after qualified personnel have ensured that suitable power supplies are available. These personnel must ensure that the equipment is not subjected to any hazardous voltages during normal operation or when a defect occurs in the system.

This equipment may be used under high pressure and with aggressive media. Improper use of this equipment may therefore result in severe personal injury or extensive damage to property.

The successful and safe operation of this equipment is dependent upon its proper handling, installation, operation and maintenance.

Qualified person

For the purposes of this manual, a qualified person is one who is familiar with the installation, commissioning and operation of this equipment. In addition, the person must be:

✔ Trained and authorised to operate and service equipment/systems in accordance with established safety practices relating to electrical circuits, high pressures and aggressive media.

✔ Trained in the proper care and use of protective equipment in accordance with established safety practices.

✔ Trained in rendering first aid.
1 Technical description

1.1 Application

The Smart version of the STTRANS P transmitter measures the absolute pressure of non–aggressive and aggressive gases, steam and liquids.

Measuring spans of between 8.3 mbar and 30 bar are possible. The output signal is a load–independent direct current 4 to 20 mA, linearly proportional to the absolute pressure.

Transmitters conforming to protection type "Intrinsic safety" and "Flame–proof enclosure" may be installed within potentially explosive areas (zone 1). The conformance certificates correspond to the European standard (CENELEC).

Transmitters fitted with various types of chemical seal are available for special applications, e.g. measuring highly viscous media.

1.2 How it works

Absolute pressure is transmitted to a silicone pressure sensor (4, see Figure 1.1) through a diaphragm (6) and a liquid filling (7). If the pressure is too high, the overload diaphragm (5) is distorted until the diaphragm touches the body of the measuring cell (3), thus protecting the sensor (4) from overloads.

The pressure difference between the input pressure (p₁) and the reference vacuum (p₀) on the low pressure side of the measuring cell flexes the measuring diaphragm. The resistance of four doped piezo–resistors in a bridge circuit in the measuring diaphragm changes. This change in resistance generates an output voltage in the bridge circuit that is proportional to the measured pressure. This voltage is converted into a periodic signal by an amplifier (11) in a voltage/frequency converter (12). A microcontroller (13) evaluates the signal, corrects it with respect to linearity and temperature before passing it on to a digital/analogue converter, which converts it into a 4 – 20 mA output current.

Data specific to the measuring cell and transmitter parameters are stored in non–volatile memory (EEPROM).

The cable termination point and the electronics are arranged opposite one another.

Calibration of the transmitter is performed using a PC/laptop or HART® Communicator. The PC/Laptop is connected to the two–wire circuit of the transmitter through a HART® modem. The communication signals required by revision 5.1 of the HART® protocol are superimposed on the output current by the FSK (Frequency Shift Keying) method.

The following parameters can be set or their current settings interrogated:

- measuring point number
- measuring point description
- text
- upper limits of output signal
- limits of measuring range
- transmitter design (e.g. type of material)
- measuring range*
- engineering unit*
- measured value in mA, % or engineering units*
- damping*
- "loop check" function*
- output current when errors occur*
- disabling of pushbuttons and/or functions*

As well as calibrating the transmitter from a PC/laptop or HART® Communicator, the start of scale and full scale values can also be set directly on the transmitter by three pushbuttons. By means of a digital indicator (optional) the parameters marked by * can be adjusted directly on the transmitter without opening the housing.
**Figure 1.1** SITRANS P absolute pressure transmitter, function diagram

**Figure 1.2** Communication between PC/laptop or HART® Communicator and SITRANS P transmitter
1.3 Technical data

Functional data
Measuring spans and overrange limits

<table>
<thead>
<tr>
<th>Variable measuring spans</th>
<th>Overrange limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3 to 250 mbar / 0.83</td>
<td>32 bar</td>
</tr>
<tr>
<td>43  to 1300 mbar / 4.3</td>
<td>32 bar</td>
</tr>
<tr>
<td>160 to 5000 mbar / 16</td>
<td>32 bar</td>
</tr>
<tr>
<td>1000 to 30000 mbar / 100</td>
<td>160 bar</td>
</tr>
</tbody>
</table>

Measuring limits
0 and 100 % of max. measuring span
Start of scale
anywhere between the measuring limits

Auxiliary power
terminal voltage on transmitter
11 to 45 V DC,
11 to 30 V DC certified intrinsic safety

ripple
$U_{pp} \leq 0.2 \text{ V (47 to 125 Hz)}$

noise
$U_{eff} \leq 1.2 \text{ mV (0.5 to 10 kHz)}$

Output signal
4 to 20 mA
3.84 mA

lower limit

upper limit
20.0 to 22.0 mA ¹)

in error situation
3.6 mA or 22.8 mA

ripple
$I_{pp} \leq 0.5\%$ of maximum output current

Load
$R \leq \frac{V_H - 11 \text{ V}}{0.023 \text{ A}} \text{ in } \Omega$, $V_H$: auxiliary power in V
230 to 500 Ω for communication with PC/Laptop
230 to 1100 Ω for communication with HART® Communicator

Electrical damping
variable time constant
0.1 to 100.0 s

Current source
adjustable, 3.6 mA to 22.8 mA

Ambient temperature
-40 °C to +85 °C

Digital indicator (optional)
-20 °C to +85 °C
observe temperature classes in hazardous areas!

Temperature of medium
-40 °C to +100 °C
-40 °C to +85 °C with 30 bar measuring cell

Storage temperature
-50 °C to +85 °C

Condensation
permitted

¹) Adjustable with PC/laptop or HART® Communicator. The factory setting is 20.5 mA.
Output characteristic

Start of scale 0 bar
All figures relate to the output span.

Measurement error when calibrating fixed point (incl. hysteresis and repeatability)

\[ \leq 0.1\% \text{ }^2 \]

Time constant \( T_{63} \) at 20 °C (no electrical damping)

approx. 0.2 s

\[ \leq 0.2\% \text{ every } 6 \text{ months at max. measuring span} \]

Long-term drift

\[ \leq 0.05\% /10 \text{ K at max. measuring span} \]

\[ \leq 0.1\% /10 \text{ K at max. measuring span} \]

\[ \leq 0.1\% /10 \text{ K} \]

\[ \leq 0.15\% /10 \text{ K} \]

\[ \leq 0.005 \% \text{ for each } 1 \text{ V change in voltage} \]

Effect of auxiliary power

conforms to IEC 801/NAMUR recommendations

\[ \leq 0.05 \text{ mbar/10° of deviation} \]

Effect of installation from vertical

Instrument design

Electrical connection

screw-type terminals or Han 7D connector \(^3\) \(^4\)

Cable inlet in the case of screw-type terminals via

Pg 13.5 compression gland\(^3\) \(^4\) or

M20 x 1.5 female thread\(^6\) or

\( \frac{\sqrt{2}}{2} \) - 14 NPT female thread

Degree of protection
to EN 60529

IP65

Process connection

\( \frac{1}{4} \) - 18 NPT female thread and
flange connection to DIN 19213 with

M10 thread or \( \frac{1}{16} \) - 20 UNF

Material of components that come into contact with the medium

diaphragm

stainless steel, 316 L or

Hastelloy C276

process covers

stainless steel, 316

vent valve

stainless steel, 316

parts of measuring cell

stainless steel, 316

O-ring

FPM (Viton) or PTFE (Teflon)

Measuring cell filling

silicone oil

Housing for electronics

die-cast aluminium with low copper content GD- AlSi 12,
polyester based lacquer,
stainless steel rating plate

Screws for process covers

galvanised, yellow-passivated steel, or

stainless steel

---

\(^2\) Double this value if selected measuring span <10 % of max. measuring span

\(^3\) Not available for protection type "Flame-proof enclosure"

\(^4\) Not available for protection type FM exp/CSA exp
<table>
<thead>
<tr>
<th>Mounting bracket (optional)</th>
<th>galvanised, yellow-passivated steel, or stainless steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicator (optional)</td>
<td>analogue indicator with linear scale 0 to 100% or to customer's specification or digital indicator</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 4 kg (without options)</td>
</tr>
</tbody>
</table>

**Explosion protection**
to DIN EN 50 014, DIN EN 50 018 and DIN EN 50 020 (CENELEC)

**Intrinsic safety "i"**

<table>
<thead>
<tr>
<th>Identification</th>
<th>EEx ia IIC T4 or T5 or T6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conformance certificate</td>
<td>PTB Nr. Ex—94.C.2090</td>
</tr>
<tr>
<td>Max. ambient temperature</td>
<td>+85 °C (temperature class T4)</td>
</tr>
<tr>
<td></td>
<td>+75 °C (temperature class T5)</td>
</tr>
<tr>
<td></td>
<td>+60 °C (temperature class T6)</td>
</tr>
</tbody>
</table>

**Connection**
to certified intrinsically safe circuits with the following maximum values:

<table>
<thead>
<tr>
<th>Effective internal inductance</th>
<th>V_o = 30 V, I_k = 100 mA, P = 750 mW</th>
</tr>
</thead>
<tbody>
<tr>
<td>L_f</td>
<td>≤ 0.6 mH</td>
</tr>
<tr>
<td>Effective internal capacitance</td>
<td>C_f ≤ 8 nF</td>
</tr>
<tr>
<td>Flame-proof enclosure &quot;d&quot;</td>
<td>EEx d IIC T5 or T6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identification</th>
<th>PTB Nr. Ex—94.C.1021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conformance certificate</td>
<td>+85 °C (temperature class T5)</td>
</tr>
<tr>
<td>Max. ambient temperature</td>
<td>+75 °C (temperature class T6)</td>
</tr>
</tbody>
</table>

**Communication (PC/laptop or HART® Communicator to SITRANS P transmitter)**

<table>
<thead>
<tr>
<th>Load, with connection of HART® modem or HART® Communicator</th>
<th>230 to 500 Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable</td>
<td>230 to 1100 Ω</td>
</tr>
</tbody>
</table>

| screened 2-core: ≤ 3.0 km |
| screened multicore: ≤ 1.5 km |

<table>
<thead>
<tr>
<th>Protocol</th>
<th>HART®, revision 5.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC/laptop requirements</td>
<td>IBM or compatible</td>
</tr>
<tr>
<td>Hard disk</td>
<td>≥4 MByte memory</td>
</tr>
<tr>
<td>RS-232-C interface</td>
<td>RS-232-C interface</td>
</tr>
<tr>
<td>Graphics</td>
<td>VGA graphics</td>
</tr>
</tbody>
</table>

| Software | Windows 3.1 and SIPROM P |
**1.4 Ordering data**

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITRANS P absolute pressure 2-wire system, Smart version</td>
<td>7MF4332 - 1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring span</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>83 mbar to 250 mbar</td>
<td>D</td>
</tr>
<tr>
<td>43 mbar to 1300 mbar</td>
<td>F</td>
</tr>
<tr>
<td>160 mbar to 5000 mbar</td>
<td>G</td>
</tr>
<tr>
<td>1000 mbar to 30000 mbar</td>
<td>H</td>
</tr>
</tbody>
</table>

**Material of components that come into contact with the medium**

<table>
<thead>
<tr>
<th>Diaphragm</th>
<th>Parts of measuring cell</th>
<th>Process covers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Hastelloy</td>
<td>Stainless steel</td>
<td>Stainless steel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Version with chemical seal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female thread 1/4&quot;-18 NPT and flange connection to DIN 19 213 with</td>
</tr>
<tr>
<td>Venting valve</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>opposite the process connection</td>
</tr>
<tr>
<td>at the side of the process cover</td>
</tr>
<tr>
<td>1/4&quot;-20 UNF</td>
</tr>
<tr>
<td>1/4&quot;-20 UNF</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

**Material of components that do not come into contact with the medium**

<table>
<thead>
<tr>
<th>Screws of process covers</th>
<th>Electronics housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>De-cast aluminium</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>De-cast aluminium</td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

**Explosion protection**

None

<table>
<thead>
<tr>
<th>CENELEC Intrinsic safety</th>
<th>CENELEC Flame-proof enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM is (intrinsic safety) (applied for)</td>
<td>FM exp (explosion-proof) (applied for)</td>
</tr>
<tr>
<td>CSA is (intrinsic safety) (applied for)</td>
<td>CSA exp (explosion-proof) (applied for)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical connection/cable inlets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg 13.5 compression gland 1/2&quot;</td>
</tr>
<tr>
<td>Female thread M20 x 1.5 R</td>
</tr>
<tr>
<td>Han 7 D connector 1/2&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
</tr>
<tr>
<td>With analogue indicator</td>
</tr>
<tr>
<td>scale 0 to 100 %, linear scale as specified (Y20 code required)</td>
</tr>
<tr>
<td>With digital indicator</td>
</tr>
</tbody>
</table>

1) Not available for protection type "Flame-proof enclosure"
2) Not available for protection type FM exp/CSA exp

C73000-B5676-C84
### Other versions
Add "—Z" suffix and code to order no.

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitter with mounting bracket of stainless steel</td>
<td>A01</td>
</tr>
<tr>
<td>(FFM by default)</td>
<td>A02</td>
</tr>
<tr>
<td>Operating instructions and description of the plate</td>
<td>A20</td>
</tr>
<tr>
<td>(German by default)</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>B11</td>
</tr>
<tr>
<td>French</td>
<td>B12</td>
</tr>
<tr>
<td>Spanish</td>
<td>B13</td>
</tr>
<tr>
<td>Italian</td>
<td>B14</td>
</tr>
</tbody>
</table>

Manufacturer’s test certificate M as specified in DIN 55350, Part 1B and ISO 8402

Acceptance certificate B as specified in DIN 50049, section 3.1, and EN 10204

### Additional information
Add "—Z" suffix and code to order no. and specify in writing

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required measuring range (max. 26 characters), specify in plain text:</td>
<td>Y01</td>
</tr>
<tr>
<td>Y01: ... to ... mbar, bar, kPa, MPa, ...</td>
<td></td>
</tr>
<tr>
<td>Measuring point identification: Number of measuring point (max. 16 characters), specify in plain text:</td>
<td>Y15</td>
</tr>
<tr>
<td>Y15: ...............................................</td>
<td></td>
</tr>
<tr>
<td>Description of measuring point (max. 27 characters), specify in plain text:</td>
<td>Y16</td>
</tr>
<tr>
<td>Y16: ...............................................</td>
<td></td>
</tr>
<tr>
<td>Customer specified scale for analogue indicator (max. 26 characters), specify in plain text:</td>
<td>Y20</td>
</tr>
<tr>
<td>Y20: ... to ... mbar, bar, kPa, MPa, ...</td>
<td></td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Order No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HART® modem and SIROM P software</td>
<td>7MF4998—8DD</td>
</tr>
<tr>
<td>German</td>
<td>7MF4998—8DF</td>
</tr>
<tr>
<td>English</td>
<td></td>
</tr>
<tr>
<td>HART® Communicator with a accumulator, battery charger for 230 V AC and case</td>
<td></td>
</tr>
<tr>
<td>Type of protection intrinsically safe EEX ia II C T4</td>
<td>7MF4998—8KF</td>
</tr>
<tr>
<td>German</td>
<td>7MF4998—8KT</td>
</tr>
<tr>
<td>English</td>
<td></td>
</tr>
</tbody>
</table>
1.5 Dimensions

1. Process connection female thread $\frac{1}{4} - 18$ NPT
2. Female threads M10 or $\frac{7}{16}$-UNF
3. Terminal side, analogue indicator (optional)
4. Electronics side, digital indicator (optional)
5. Outlet valve
6. Rotation reference mark (see section 2.1.2)
7. Permitted range of rotation, hatched in drawing (see section 2.1.2)
8. Locking screw (siehe section 2.1.2)
9. Safety angle for housing cover, not displayed in drawing (only with protection type "Fire-proof enclosure")
10. Blanking plug (only with Pg 13,5 and Han 7D)
11. Protective cover for keys
12. Electrical connection:
   - Pg 13,5 compression gland $^{(2)(3)}$
   - Female thread M20 x 1,5 $^{(3)}$
   - Female thread $\frac{1}{2} - 14$ NPT
   - Han 7 D Connector $^{(2)(3)}$

$^{1)}$ Take into consideration the addition of about 20 mm for thread length
$^{2)}$ Not available for protection type "Fire-proof enclosure"
$^{3)}$ Not available for protection type FM exp/CSA exp

Figure 1.3  SITRANS P absolute pressure transmitter, Dimensions
2 Installation

2.1 Where to install

The transmitter can be installed above or below the pressure tapping point. When measuring gases, we recommend the transmitter be installed above the pressure tapping point and the pressure pipe be laid so it runs down to the pressure tap. This will permit any condensation in the pipe to drain off and not affect the measurement. When measuring liquids, the transmitter should be installed below the pressure tapping point and the pipe laid so it rises up to the pressure tap, thus enabling any gas in the pipe to be dispersed.

The point of installation should be easily accessible, preferably close to the measuring point and free from vibration. The permitted ambient temperature limits must not be violated. Protect the transmitter from direct heat sources. Before installing the transmitter, compare the process data against the data on the rating plate. Keep the transmitter closed during the installation process.

The transmitter can be fitted directly to the valve manifold or secured with a mounting bracket.

2.1.1 Fixing with a mounting bracket

The mounting bracket is fixed to either

- a wall or mounting frame using 2 screws,
- or

- to a vertical or horizontal mounting pipe (50 to 60 mm in diameter) using a U-bolt.

The transmitter is fastened to the mounting bracket using the four screws supplied.

![Image of SITRANS P transmitter with mounting bracket](image-url)

*Figure 2.1 Fixing the SITRANS P transmitter using a mounting bracket (horizontal pressure pipes)*
2.1.2 Rotating the measuring unit in relation to the housing

If required, the measuring unit of the transmitter SITRANS P can be rotated in relation to the electronics housing (with digital indicator) to a visible position.

Only a limited rotation is permitted!

The range of rotation (7) is marked at the bottom of the electronics housing. At the neck of the electronics housing there is a reverence mark which must always be within the marked range when rotated.

- undo the locking screw (8)
- rotate the housing within the marked range (7)
- tighten locking screw (torque 3.4±0.2 Nm)
2.2 Electrical connection

![WARNING]

Observe the relevant regulations during the electrical installation; in hazardous areas, pay particular attention to:

- the regulations governing electrical systems in hazardous areas (Exe V)
- the specifications regarding the installation of electrical systems in hazardous areas (VDE 0165) and
- the conformance certificate

Check that the auxiliary power supply matches that specified on the rating plate.

The transmitter should be powered from a SELV (safety extra-low voltage) source. If other power sources are to be used, we recommend that the transmitter housing be earthed. The earth terminal in the transmitter housing is connected to the external earth terminal.

**Note**
- The sealing caps in the cable entries have to be replaced by relevant cable glands or blanking plugs which must be certified when using transmitters conforming to protection type "Flame-proof enclosure".
- The terminal strip (Fig. 2.4) can be screwed on to four different positions (±90° or ±180° rotation possible). Please notice that the rotation is limited to ±180° (proceeding from the fixed position as on delivery).
- The following general guidelines apply when laying terminal (max. cross section 1.5 mm²/signal cables:
  - lay the signal cable separately from cables carrying voltages > 60 V
  - use twisted-pair cables
  - do not lay the cables close to large electrical systems, or use screened cable
  - full specifications in accordance with HART® 5.1 only with screened cable

**Connection to screw-type terminals**
- remove housing cover of the electronics side (marked "FIELD TERMINALS" on housing)
- remove analogue indicator (if fitted)
- feed cable in through cable gland
- connect to "+" and "-" terminals, observing polarity!
- replace analogue indicator (if applicable)
- replace housing cover

**Note**
- With transmitters conforming to protection type "Flame-proof enclosure" the housing cover has to be secured with the safety angle.

**Connection using a plug connector (not available for protection type "Flame-proof enclosure")**

The contacts for the connector are supplied in a bag with the instrument.
- slide sleeve and gland on to the cable
- remove about 8 mm of insulation from the end of the cable
- crimp or solder the contacts to the cable ends
- assemble connector

![Connection using plug connector](image)

**Figure 2.3 Connection using plug connector**
A faultless communication requires at least a load of 230 Ω within the signal circuit (see Fig. 2.4), when using power supply isolators for Smart transmitters, e.g. Siemens 7NG4021, a load has already been assembled (see Fig. 2.5). The power supply isolator with intrinsic safe input circuit (transmitter circuit) also separates safely between intrinsically safe and not—intrinsically safe circuit. The HART® modem or the HART® Communicator can be connected to the jacks marked HK (see Fig. 2.5).

**WARNING**

The HART® modem must not be installed in hazardous locations and not connected to intrinsically safe current circuits.
Figure 2.5  Electrical connection with power supply isolator for Smart transmitters

2.3  Installing the analogue indicator
- Remove the housing cover of the terminal side (marked "FIELD TERMINALS" on housing)
- Plug analogue indicator into the test sockets
  Depending on the transmitter position the analogue indicator can be plugged— in to four different positions
  (±90° or ±180° rotation possible).
- Replace cover with viewing window

2.4  Installing the digital indicator
- Remove the housing cover of the electronics side
- Plug— in the digital indicator
  Depending on the transmitter position the LCD can be plugged— in to four different positions
  (±90° or ±180° rotation possible).
- Replace cover with viewing window
3 Commissioning

The process data must correspond to that on the rating plate. The transmitter functions as soon as the power is turned on.

**WARNING**

Severe personal injury or damage to property may result if

- the venting valve and/or the screw plug are missing or not fitted properly and/or
- the valves are improperly or incorrectly operated.

When working with a hot medium, the individual steps described below must be performed in quick succession, otherwise the valves and transmitter may overheat and be damaged.

- **Measuring gases**

  The isolating valves should be operated in the following sequence:

  Initial setting: all valves closed
  - Open the isolating valve (4) at the pressure tapping point.
  - Open the isolating valve (2A).
  - Check the start of scale
    - Close the isolating valve (2A),
    - Open the isolating valve (2B),
    - Apply a pressure corresponding to the start of scale to the transmitter (1) using the test connection of isolating valve (2),
    - Check the start of scale (4 mA) and correct if necessary,
    - Close the isolating valve (2B),
    - Open the isolating valve (2A).

![Diagram of measuring gases](image)

*Figure 3.1 Measuring gases*
Measuring liquids

The isolating valves should be operated in the following sequence:

Initial setting: all valves closed
- Open isolating valve (4) at pressure tapping point,
- Open isolating valve (2A),
- Check the start of scale
  - Close the isolating valve (2A),
  - Open the isolating valve (2B),
  - Open the discharge—/venting valve at the transmitter (1) and discharge the liquid,
  - Close the discharge—/venting valve at the transmitter (1),
  - Apply a pressure corresponding to the start of scale to the transmitter (1) using the test connection of isolating valve (2),
  - Check the start of scale (4 mA) and correct if necessary,
  - Close the isolating valve (2B),
  - Open the isolating valve (2A).

Figure 3.2 Measuring liquids
Measuring steam

The isolating valves should be operated in the following sequence:

Initial setting: all valves closed
- Open isolating valve (4) at pressure tapping point,
- Wait until the steam in the impulse line (4) has condensed.
- Open isolating valve (2A).
- Check the start of scale
  - Close the isolating valve (2A),
  - Open the isolating valve (2B),
  - Open the discharge—/venting valve at the transmitter (1) and discharge the liquid,
  - Close the discharge—/venting valve at the transmitter (1),
  - Apply a pressure corresponding to the start of scale to the transmitter (1) using the test connection of isolating valve (2),
  - Check the start of scale (4 mA) and correct if necessary,
  - Close the isolating valve (2B),
  - Open the isolating valve (2A).

![Diagram](image)

**Figure 3.3** Measuring steam

1. Transmitter
2. Isolating valve
   A. Isolating valve to process
   B. Isolating valve to test connection
3. Pressure pipe
4. Isolating valve
5. Outlet valve
6. Condensate reservoir
4 Operation

4.1 Operating from a PC/Laptop

For the parametrization of the SITRANS P transmitter with the PC/laptop the software SiPROM P is necessary (see also technical data, section 1.3).

Please take service notes from the software description.

4.2 Operating from a HART® Communicator

The HART®—Communicator must be connected to the transmitter (see Fig. 2.4 and 2.5).

Action keys

Use the key to turn the HART® Communicator on and off. When the communicator is turned on the communication with the transmitter starts automatically. The online menu appears on the display.

Turning off the HART® Communicator is not possible in certain operations (e.g. when essential parameters have not been sent to the transmitter). In this case a message will be put out on the display.

Use the key to move the cursor up through a menu. The selected menu line will be marked.

Use the key to move the cursor down through a menu. The selected menu line will be marked.

Use the key to move the cursor to the right or to select menu options. The name of the selected menu will be displayed at the top.

Use the key to move the cursor to the left or to back out of a menu.

Use the key (hot key) to call—in directly the menu zero or span, also with turned off HART® Communicator.

Function keys

Below the LCD there are the function keys F1 to F4. The different function of the keys depend on the menus and will be displayed at the bottom of the LCD.

Alphanumeric and shift keys

These keys are used for data entry. The function as a number—or letter key depends on the respective menu. Letters are selected when the relevant shift key is used before.

Please take all other information for operating and technical data from the operating instructions of the HART® Communicator.
4.3 Operation on the transmitter

4.3.1 General

The SITRANS P absolute pressure transmitter can also be adjusted in the field by three pushbuttons, located on the outside of the instrument, with which the start of scale and full scale values are "set" or adjusted. By means of the digital indicator (optional) additional parameters can be adjusted. The pushbuttons can be accessed by undoing the two screws holding the protective cover in place, which can then be moved out of the way.

![Figure 4.2 SITRANS P transmitter controls and displays](image)

With the fitted digital indicator as an option all functions of table 4.1 are selected using the ▼ key. When pressing the M key (Modus) 2 appears bottom left on the LCD. Every additional key press increases the mode by one. The parameters, the current value or the engineering unit can be modified using the ▲ and ▼ keys. In the case of error situations Error is displayed on the LCD, (see section 4.3.3.6). The transmitter changes to function "Measured value", if mode 14 is passed by pressing the M key or if 2 minutes elapse without a key being pressed (except in mode 8: loop check”).

Note:  
- If there is an LCD overflow then 9.9.9.9 appears (with small engineering units like e.g. Pa)
  - If an L is displayed on the LCD, then the transmitter parameters are protected against overwriting (see section 4.4) and the keys are locked.
  - If a £ is displayed on the LCD, the transmitter, operating with a PC/laptop or HART® Communicator, works in the "loop check" function mode or multidrop operation. The output current is independent of the applied absolute pressure. The keys are locked.
- It applies to all modes (except 7 and 8): A set new value is only stored, when the mode has been changed or when the transmitter reverts automatically to the "Measured value" function approximately 2 minutes after last pressing the keys.
4.3.2 Setting start of scale and full scale without LCD

Note
- The start of scale and measuring span are non-interactive.
  (Measuring span = full scale minus start of scale)
- Pushbuttons may be disabled! (see Section 4.4)
  - Undo the two screws holding the protective cover in place, which can then be moved out of the way

Set start of scale (4 mA) and full scale (20 mA)

Assuming the pushbuttons are pressed as described below, the transmitter sets the start of scale to 4 mA and the full scale to 20 mA. An ammeter is not required.

☐ Start of scale
  - Apply an absolute pressure corresponding to the start of scale to the transmitter.
  - Press [4] and [M] keys together for about 2 s

☐ Full scale
  - Apply an absolute pressure corresponding to the full scale to the transmitter
  - Press all three keys, making sure you press the [M] key first, hold it, and press both the other
Calibrate start of scale and full scale

If the output current is not to be set but freely adjusted:

- Connect a DC meter to the output circuit or the test sockets (see Fig. 2.4)

⚠️ WARNING

- For intrinsic safe current circuits only certified current meters are permitted.
- It is forbidden to screw off the transmitter cover when working in hazardous location and using transmitters conforming to protection type “Flame-proof enclosure” (Explosion-proof).

Measuring at test sockets:

- Clean the transmitter to prevent the ingress of dirt
- Open the housing cover of the terminal side
- Remove the analogue indicator (if fitted)
- Connect DC meter

☐ Start of scale

- Apply an absolute pressure corresponding to the start of scale to the transmitter
- Set the output current for start of scale using the $\text{▲}$ and $\text{▼}$ keys

☐ Full scale

- Apply an absolute pressure corresponding to the full scale to the transmitter
- Set the output current for full scale using the $\text{▲}$ key and the $\text{▼}$ key or the $\text{▲}$ key and the $\text{▼}$ key. Always press the $\text{▲}$ key first, hold it, and press either the $\text{▼}$ key or the $\text{▼}$ key.

• On completion of calibration

- Replace the analogue indicator (if applicable)
- Screw housing cover back on
- Replace protective cover and tighten both screws
<table>
<thead>
<tr>
<th>Function</th>
<th>Mode</th>
<th>Key</th>
<th>Display, Description</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured value</td>
<td></td>
<td></td>
<td>Output current in mA or % or input pressure in engineering units</td>
<td>4.3.3.8</td>
</tr>
<tr>
<td>Error display</td>
<td></td>
<td></td>
<td>Error, when transmitter is disturbed</td>
<td>4.3.3.6</td>
</tr>
<tr>
<td>Start of scale</td>
<td>2</td>
<td>increase, decrease</td>
<td>set to 4 mA 2)</td>
<td>4.3.3.1</td>
</tr>
<tr>
<td>Full scale</td>
<td>3</td>
<td>increase, decrease</td>
<td>set to 20 mA 2)</td>
<td>4.3.3.1</td>
</tr>
<tr>
<td>Electrical damping</td>
<td>4</td>
<td>increase, decrease</td>
<td>Time constant $T_{90}$ in s</td>
<td>4.3.3.4</td>
</tr>
<tr>
<td>Range: 0.1 to 100.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start of scale &quot;blind&quot; calibration</td>
<td>5</td>
<td>increase, decrease</td>
<td>set to start of scale 2)</td>
<td>4.3.3.2</td>
</tr>
<tr>
<td>Full scale &quot;blind&quot; calibration</td>
<td>6</td>
<td>increase, decrease</td>
<td>set to upper range limit 5)</td>
<td>4.3.3.2</td>
</tr>
<tr>
<td>Set zero point &quot;blind&quot; calibration</td>
<td>7</td>
<td>--</td>
<td>--</td>
<td>execute (Evacuate (  0.1 % of measuring span)</td>
</tr>
<tr>
<td>&quot;Loop check&quot; function</td>
<td>8</td>
<td>increase, decrease</td>
<td>initiate Constant output current in mA</td>
<td>4.3.3.5</td>
</tr>
<tr>
<td>Output current in error situation</td>
<td>9</td>
<td>toggles between the two values</td>
<td>Either 22.8 or 3.6 mA</td>
<td>4.3.3.6</td>
</tr>
<tr>
<td>Disable pushbuttons and/or functions</td>
<td>10</td>
<td>toggles between the four functions</td>
<td>$O = $ none</td>
<td>4.3.3.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$L_A = $ locked all</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$L_D = $ locked all accept start of scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$L_S = $ locked all accept start of scale and full scale</td>
<td></td>
</tr>
<tr>
<td>Measured value display</td>
<td>13</td>
<td>change</td>
<td>Engineering units (input variable) or output current in mA or %</td>
<td>4.3.3.8</td>
</tr>
<tr>
<td>Engineering units</td>
<td>14</td>
<td>change</td>
<td>Engineering units</td>
<td>4.3.3.9</td>
</tr>
</tbody>
</table>

1) If an $L$ is displayed on the LCD, then the transmitter parameters are protected against overwriting (see section 4.4) and the keys are locked.

If a $E$ is displayed on the LCD, the transmitter, operating with a PC/laptop or HART® Communicator, works in the "loop check" function mode or multidrop operation. The output current is independent of the applied absolute pressure. The keys are locked.

2) Press $\uparrow$ and $\downarrow$ keys simultaneously for about 2 s. The display goes blank and the current value is displayed after about 2 s.

3) If the sign $\uparrow$ is displayed at the left, the measuring range limits have been violated.

Table 4.1 SITRANS P transmitter functions
4.3.3 Operation with LCD

Note: • The start of scale and measuring span are non-interactive
(Measuring span = full scale minus start of scale)
• Pushbuttons and/or functions may be disabled!
  See table 4.1, mode 10, section 4.3.3.7 and 4.4
• Depending on the transmitter position the LCD can be plugged—in to four different positions
  – Undo the two screws holding the protective cover in place, which can then be moved out of the way
• On completion of calibration
  – Replace protective cover and tighten both screws

4.3.3.1 Setting start of scale and full scale

Note: If no pressure source is available,
  the start of scale can be set in mode 5 and
  the full scale in mode 6.
  Both are specified in the selected engineering unit, see section 4.3.3.2.

☐ Set start of scale
  – Apply an absolute pressure corresponding to the start of scale to the transmitter
  – Select mode 2 using the \[ \text{M} \] key
  – Set the output current corresponding to the start of scale using the \[ \text{t} \] and \[ \text{u} \] keys
    or
    Set output current to 4 mA:
    – Press the \[ \text{t} \] and \[ \text{u} \] keys simultaneously for about 2 s
    If the sign \[ \uparrow \] is displayed at the left, the measuring range limits have been violated.
    The original value remains unchanged.

☐ Set full scale
  – Apply an absolute pressure corresponding to the full scale to the transmitter
  – Select mode 3 using the \[ \text{M} \] key
  – Set the output current corresponding to full scale using the \[ \text{t} \] and \[ \text{u} \] keys
    or
    Set output current to 20 mA:
    – Press the \[ \text{t} \] and \[ \text{u} \] keys simultaneously for about 2 s
    If the sign \[ \uparrow \] is displayed at the left, the measuring range limits have been violated.
    The original value remains unchanged.
    If the sign \[ \downarrow \sim \sim \sim \sim \sim \] is displayed the selected measuring span is more than twice the maximum measuring
    span. When pressing \[ \text{t} \] and \[ \text{u} \] keys simultaneously for about 2 s the full scale is set to 0.0000.
4.3.3.2 Setting start of scale and full scale without a pressure source

It is possible to set the start of scale and full scale of the SITRANSP P transmitter even if there is no pressure line connected or pressure source available ("blind" calibration).

☐ To set start of scale
- Select mode 14 using the [M] key
- Use the [↑] or [↓] key to select engineering unit
- Select mode 5 using the [M] key
- Use the [↑] or [↓] key to set the start of scale in the selected engineering unit
- When pressing both [↑] and [↓] keys simultaneously for about 2 s, the start of scale is set to zero (in the selected engineering unit)

☐ To set the full scale
- Select mode 6 using the [M] key
- Use the [↑] or [↓] key to set the full scale in the selected engineering unit
- When pressing both [↑] and [↓] keys simultaneously for about 2 s, the full scale is set to the upper measuring limit (in the selected engineering unit)

Example 1

A transmitter with a maximum measuring span of 4 bar is to be calibrated to a measuring range of 0 to 3.52 bar to correspond to 4 to 20 mA.
- Select engineering unit "bar" in mode 14
- For the start of scale, set the value "0.0000" in mode 5
- For the full scale, set the value "3.5200" in mode 6

Example 2

A transmitter with a maximum measuring span of 1.3 bar is to be calibrated to a measuring range of 456.70 to 123.40 mm Hg to correspond to 4 to 20 mA.
- Select engineering unit "mm Hg" in mode 14
- For the start of scale, set the value "456.7" in mode 5
- For the full scale, set the value "123.4" in mode 6

Example 3

A transmitter with a maximum measuring span of 250 mbar is calibrated for a measuring range of 0 to 200 mbar to correspond to 4 to 20 mA. The measuring range is to be changed to a setting of 100 to 240 mbar.
- For the start of scale, set the value "100.00" in mode 5
- Select mode 6 using [M] key; the full scale "300.00 mbar" is displayed
- When trying to decrease the value using the [↓] key, the error note [↑] is displayed additionally to the (not changeable) value
  (Explanation: If the start of scale is changed the measuring span remains unchanged. The full scale 300 mbar violates the measuring range limits.)
- Press the [↑] and [↓] keys simultaneously for about 2 s. Then the full scale is set to 250.00 mbar.
- Use the [↑] key to set the full scale to 240.00 mbar.
4.3.3.3 Correction of zero point

If the transmitter is installed and operational, external influences such as angle of installation, ambient temperature, or installation dependent pressure effects (e.g. head of liquid in the impulse pipe line to the transmitter) may cause an offset in the transmitter's zero point. This offset (max. 5 % of the max. measuring span) can be corrected in the SITRANS P transmitter without modifying the start of scale and full scale settings in modes 5 and 6 (correction of zero point).

- Evacuate (<1 % of measuring span) (see section 4.3.3.1)
- Select mode 7 using the [A] key.
- Press the [B] and [C] keys simultaneously for about 2 s.

The value 0 or 0.0 etc. to 0.0000 is displayed on the LCD, depending on the maximum measuring span of the transmitter and the selected engineering unit.

Example

A transmitter with a maximum measuring span of 1.3 bar is calibrated for a measuring range of 200 to 800 mbar (4 to 20 mA), i.e. start of scale 200 (mbar) in mode 5, full scale 800 (mbar) in mode 6 and engineering unit "mbar" in mode 14. The transmitter is, however, being used in hotter conditions, which is causing an offset (200.3 mbar) in the original zero point.

This offset is to be corrected.

- Evacuate (<1 % of measuring span)
- Press the [B] and [C] keys simultaneously for about 2 s in mode 7, the value of "0.0 mbar" is displayed
- Apply the original absolute pressure; "200.0 mbar" is displayed

The start of scale and full scale of 200 (mbar) and 800 (mbar) set in modes 5 and 6 respectively remain unchanged.

4.3.3.4 Setting electrical damping

**Note:** The time response of the SITRANS P transmitter is determined by the dead time, the time constant $T_{63}$ (see section 1.3), and the electrical damping value.

The SITRANS P transmitter is supplied with a damping value of 0.1 s. Values of 0.1 to 100.0 s in increments of 0.1 s are permitted.

- Select mode 4 using the [A] key
- Use the [B] and [C] keys to change the damping value

4.3.3.5 "Loop check" function

The following output current constants can be set to check the output signal loop, e.g. during commissioning, irrespective of the pressure:

<table>
<thead>
<tr>
<th>3.6 mA</th>
<th>4.0 mA</th>
<th>12.0 mA</th>
<th>20.0 mA</th>
<th>22.8 mA</th>
</tr>
</thead>
</table>

- Select mode 8 using the [A] key
- Press the [B] and [C] keys simultaneously for about 2 s. This activates the "loop check" function. An output current of 4.0 mA is displayed.
- Use the [B] and [C] keys to select the required current

Changing the mode disables the "loop check" function.
4.3.3.6  Output current in error situations

The pressure sensor and electronics are monitored continuously. If a defect occurs Error is displayed. The output current is set to 3.6 or 22.8 mA, neither of which are possible under normal conditions. The value set is determined using mode 9. The factory setting is 22.8 mA.

- Select mode 9 using the M key
- Use the ↑ or ↓ key to select either 3.6 mA or 22.8 mA

Changing the mode causes the selected value to be stored

4.3.3.7  Disable pushbuttons and/or functions

The pushbuttons located under the protective cover can be protected together with their functions against accidental or unauthorised use.

- Select mode 10 using the M key
- Use the ↑ or ↓ key to select one out of four functions

0  →  no pushbuttons or functions disabled (operation see section 4.3.3)
1  →  all pushbuttons and functions disabled
2  →  all functions disabled except start of scale (to set or adjust start of scale see section 4.3.2)
3  →  all functions disabled except start of scale and full scale (to set or adjust start of scale or full scale see section 4.3.2)

Changing the mode causes the selected locking to be stored. The disabling of pushbuttons and/or functions is displayed. It is cancelled when the M key is pressed more than 5 s.

Note:
- When selecting lock 1 0 or 1 5 the measured value display current in mA or % should be chosen beforehand in mode 13 (see section 4.3.3.8). Otherwise a change of the output value is not noticeable when the ↑ and ↓ keys are pressed.
- If an L is displayed on the LCD, then the transmitter parameters are protected against overwriting (see section 4.4)

4.3.3.8  Select display (current, %, pressure)

It can be displayed either the input variable pressure in the selected unit in mode 14 or the output variable current in mA or %.

- Select mode 13 using the M key
- Use the ↑ or ↓ key to select the required variable

4.3.3.9  Select engineering units

The following engineering units can be chosen from:

bar  mbar  in H₂O ²  in Hg  ft H₂O ²  mm H₂O ²  mm Hg  psi  Pa  kPa  MPa

- Select mode 14 using the M key
- Use the ↑ or ↓ key to select the engineering units

Note:
- If there is an LCD overflow then 9.999 appears (with small engineering units like e.g. Pa)

*) Reference temperature 20 °C
4.4 Write protection for HART® Communication

The transmitter parameters can be protected against accidental or unauthorised overwriting. The write protection prevents changing the parameters using the keys or PC/laptop or HART® Communicator. But they can be read out by PC/Laptop or HART® Communicator.

- Clean the transmitter before opening it to prevent the ingress of dirt
- Switch off the voltage for transmitters conforming to protection type "Flame-proof enclosure" when using in hazardous location, undo the screw holding the safety angle on the electronics side (if fitted)
- Move angle out of the way
- Screw off housing cover of the electronics side
- Pull off jumper
- On the LCD (optional) is displayed the letter L
- Secure jumper against losing: push jumper horizontal* on the right jumper pin
- Screw on housing cover
- Fix safety angle (if applicable) and switch on the voltage

*) Proceeding from the normal position (see Fig. 1.3 and note 4.3.3)
5 Maintenance

The transmitter requires no maintenance.
Check the transmitter's start of scale value occasionally.

If an error occurs:
- the output current is set to 22.8 mA or 3.6 mA, depending on selection (see section 4.3.3.6)
- using SIPROM P an appropriate message is displayed in the "Measured values" field
- "Error" is displayed on LCD (optional)
Physikalisch-Technische Bundesanstalt

(1) KONFORMITÄTSBEScheinigung

PTB Nr. Ex-84.C.1021

(2) Diese Bescheinigung gilt für das elektrische Betriebsmittel

Heiztransformator 5TTM8 P Typ 3M6P"+4"+4"+4"

(3) der Firma Siemens AG

(4) Der Name Siemens AG

(5) Die Bauart dieses elektrischen Betriebsmittels sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Konformitätsbescheinigung angegeben.


(7) Die Übereinstimmung mit der konformen Europäischen Normen ist nachweisbar.

(8) Im Auftrag

Dipl.-Ing. K. Stegmann

Braunschweig, 25.04.1994

(9) Die Bauart ist mit dem nachfolgenden Kennzeichen zu versehen:

EEA 6 BC 76 bzw. EEA 4 HC 76

(10) Im Auftrag

Dipl.-Ing. K. Stegmann

Braunschweig, 25.04.1994

(11) Die Änderung des Kennzeichens ist nicht zulässig.


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