SIEMENS

SITRANS P
Absolute pressure transmitter, DS series (Smart)
7MF4232

Operating Instructions C79000-B5676-C92-01
SIEMENS

SITRANS P
Absolute pressure transmitter, DS series (Smart)
(from the pressure transmitter series)

7MF4232

Operating Instructions
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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 Range of Application

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

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

Transmitters with intrinsic safety and flame-proof enclosure protection type can be used in areas where there is an explosion hazard (zone 1). The certificates of conformity satisfy the European standard (CENELEC) the American standard (FM) or the Canadian standard (CSA).

The transmitters are available with various types of chemical seal for special applications, e.g. measuring high viscous substances.

1.2 How It works

The pressure is transferred via the isolating diaphragm (2, fig. 1.1) and the liquid filling (3) to the silicon absolute pressure sensor (4) and its measuring diaphragm distorted. Four doped piezo-resistors in bridge circuit in the measuring diaphragm change their resistance as a result. This change in resistance causes a bridge output voltage proportional to the input pressure which is transformed through a measuring amplifier (11) in an analog-digital converter (12) into a digital signal. The measuring signal is evaluated by a microcontroller (13), corrected with respect to linearity and temperature behavior and transformed by a digital-analog converter (14) into the output current 4 to 20 mA.

The measuring cell-specific data and the data for parameterization of the transmitter are stored in a non-volatile EEPROM.

The cable termination point and the electronics' side are arranged opposite.

The transmitter is parameterized with a PC/laptop or HART®-Communicator. The PC/laptop is connected to the two-wire circuit via the HART®-Modem. The signals necessary for communication according to the HART®-protocol, Revision 5.1, are superimposed on the output current according to the frequency shift keying method (FSK, Frequency Shift Keying).

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

- Measuring point number
- Measuring point description
- Text
- Upper limit of output signal
- Measuring limit
- Transmitter design (e.g. materials)
- Measuring range *
- Engineering unit *
- Measured value in mA, % or engineering units *
- Damping *
- "Loop check" function *
- Output current in the event of an error *
- Pushbutton and/or function disable *

In addition to the parameterization with a PC/laptop or HART®-Communicator (see Figure 1.2) the start of scale and full scale can be "fixed" on the transmitter with three external pushbuttons; the parameters marked with * can be set directly on the transmitter using the digital display 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>
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<tbody>
<tr>
<td>8.3 to 250 mbar</td>
<td>6 bar</td>
</tr>
<tr>
<td>43 to 1300 mbar</td>
<td>10 bar</td>
</tr>
<tr>
<td>160 to 5000 mbar</td>
<td>30 bar</td>
</tr>
<tr>
<td>1000 to 30000 mbar</td>
<td>100 bar</td>
</tr>
</tbody>
</table>

**Note for the 250 mbar measuring cell:**

This measuring cell is designed for operation within the measuring limits 0 mbar (abs) to 250 mbar (abs). When storing under normal ambient pressure of about 1000 mbar (abs) the measuring cell is in the overload state. An overrange error may occur in this state. The overrange error disappears when operating within the measuring limits. Then the transmitter operates within its specification again; it may be necessary to readjust the start of the measuring range.

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

**Lower measuring limit**

- Silicone oil filling: 0 mbar (abs)
- Inert filling liquid

**Upper measuring limit**

- 0 and 100 % of the max. measuring span

**Start of scale**

- anywhere between the measuring limits

**Auxiliary power**

- Terminal voltage on the transmitter
  - 11 to 45 V, DC
  - 11 to 30 V DC in intrinsically safe operation
  - $U_{\text{op}} \leq 0.2 \text{ V (47 to 125 Hz)}$
  - $U_{\text{rms}} \leq 1.2 \text{ mV (0.5 to 10 kHz)}$

**Ripple**

- 4 to 20 mA

**Noise**

- 3.84 mA

**Output signal**

- lower limit: 4 to 20 mA
- upper limit: 20.5 to 22.0 mA
- 3.6 mA or 22.8 mA

**In the event of an error ripple**

- $I_{\text{op}} \leq 0.5 \%$ of the maximum output current

---

1) adjustable with PC/Laptop or HART-Communicator; factory set 20.5 mA.
Load

\[ R \leq \frac{U_p - 11\,V}{0.023\,A} \]

\( U_p \): auxiliary power in V

230 to 500 \( \Omega \) for communication with PC/Laptop
230 to 1100 \( \Omega \) for communication with \( \geq 230 \, \Omega \)

HART®-Communicator

Electrical damping

variable time constant

0 to 100 s

Current sensor

adjustable 3.6 mA to 22.8 mA

Permissible ambient temperature

-40 °C to +85 °C silicone oil
-20 °C to +85 °C inert filling liquid

Observe temperature class in hazardous locations!

Permissible medium temperature

-40 °C to +100 °C silicone oil
-20 °C to +100 °C inert filling liquid

Permissible storage temperature

-50 °C to +85 °C

Condensation

permitted

Transmission behavior

Start of scale 0 bar, rising characteristic, silicone oil filling and isolating diaphragm made of stainless steel. All data refer to the output span.

Measuring span ratio

\[ r = \frac{MS_{\text{max}}}{MS} \]

\( MS_{\text{max}} \): maximum span

\( MS \): set span

Measurement error when calibrating fixed point (including hysteresis and reproducibility)

\( \leq 0.1 \% \) at \( r \leq 10 \)

\( \leq 0.2 \% \) at \( r > 10 \)

Time constant \( T_{95} \) at 20 °C

about 0.2 ms

(without electrical damping)

Long-term drift

\( \leq 0.2 \% \) every 12 months at max. span

Influence of the ambient temperature

-40 °C to +60 °C

\( \leq (0.1 \, r + 0.2) \% \)

-40 °C to +10 °C and +60 °C to +85 °C

\( \leq (0.1 \, r + 0.15) \% / 10 \, K \)

Influence of the auxiliary power

\( \leq 0.005 \% \) per 1 V change in voltage

Influence of the installation position

\( \leq 0.05 \, \text{mbar} \) to \( 10^4 \) of deviation

Electromagnetic compatibility

Resistance to interference

Sporous emission

EN 50082-2 and NAMUR NE 21, May 1993

EN 50081-1

1) Note:

At temperatures below -20 °C the digital indicator may no longer be legible under some circumstances due to its inertia.
Instrument design

Electrical connection
Screw terminals or connector Han 7 D ¹ ²
For screw terminals cable inlet via
compression gland Pg 13,5 ¹ ²
or
female thread M20 x 1.5 ²
or
female thread 1/2"-14 NPT
¹ Not in flame-proof enclosure type of protection
² Not in FM exp/CSA exp type of ignition protection

Type of protection according to EN 60529
IP65

Process connection
Connecting shank G 1/2 according to DIN 16288
or
female thread 1/2"-14 NPT or
oval flange and connection pin of stainless steel,
fastening thread:
- 7/16"-20 UNF
- M10

Materials of the components that come into contact with the medium
Connection pin
stainless steel, material no. 1.4401
Overload diaphragm
stainless steel, material no. 1.4404 or
Hastelloy C276, material no. 2.4819

Measuring cell filling
silicone oil or inert filling liquid

Electronics housing
low-copper die-cast aluminum GD-AISI 12,
polyester-based lacquer,
stainless steel rating plate

Mounting bracket (optional)
steel, galvanized and yellow-passivated or stainless steel

Digital indicator
Housing cover with or without viewing window according to order, see also chapter 4.3.1, page 23

Analog indicator (optional)
with linear scale 0 to 100 % or customer-specific scale

Weight
about 1.5 kg (without options)

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

Intrinsic safety "i"

Identification
EEx ia IIC T4 or T5 or T6
PTB No. Ex-94.C.2090

Certificate of conformity
+85 °C in temperature class T4
+75 °C in temperature class T5
+60 °C in temperature class T6

Max. ambient temperature
Connection
to certified intrinsically safe circuits with the maximum values:
U0 = 30 V, I0 = 100 mA, P = 750 mW

Effective internal inductance
L1 ≤ 0.6 mH

Effective internal capacitance
Cf ≤ 8 nF
Flame-proof enclosure "d"
Identification                        EEx d IIC T5 or T6
Certificate of conformity             PTB No. Ex-94.C.1021
Max. ambient temperature             +85 °C in temperature class T5
                                           +75 °C in temperature class T6

Communication (PC/laptop or HART®-Communicator with SITRANS P transmitter)

Load with connection of
HART®-Modem                          230 to 500 Ω
HART®-Communicator                   230 to 1100 Ω
Cable                                 Shielded two-core: ≤ 3.0 km
                                           Shielded multicore: ≤ 1.5 km
Protocol                              HART®, Revision 5.1
PC/laptop requirements                IBM-compatible
                                           RAM ≥ 32 Mbyte
                                           Hard disk at least 70 Mbyte
                                           RS-232-C interface
                                           VGA graphics
Software for PC/laptop               Windows 95 or Windows NT 4.0 and SIMATIC PDM
### 1.4 Ordering data

<table>
<thead>
<tr>
<th>Name</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SITRANS P transmitter</td>
<td>7MF4232-1</td>
</tr>
</tbody>
</table>

#### Measuring cell filling
- silicone oil
- inert filling liquid 1) normal grease-free

#### Measuring scale max. overload
- 8.3 mbar to 250 mbar / 8 bar
- 43 mbar to 1300 mbar / 10 bar
- 160 mbar to 5000 mbar / 50 bar
- 1000 mbar to 30000 mbar / 100 bar

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

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<thead>
<tr>
<th>Diagram</th>
<th>Process connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>stainless steel</td>
<td>stainless steel</td>
</tr>
<tr>
<td>Hastelloy</td>
<td>Hastelloy</td>
</tr>
</tbody>
</table>

#### Process connection
- Connecting shank G1/2 A
- Female thread 1/2-14 NPT
- oval flange and connection pin made of stainless steel (G1/2-14 UNF)
- oval flange and connection pin made of stainless steel ball-tightening thread M10

#### Material of the components that do not come into contact with the medium
- Electronics housing: die-cast aluminium (electronics housing)
- Precision-cast stainless steel (electronics housing)

#### Explosion protection
- without explosion protection
- with explosion protection (CE/IEEC), ignition protection type intrinsic safety (Ex ia)
- Pressure-proof housing Ex d 2)
- Intrinsische safety (Ex ia) and flame-proof enclosure (Ex d 2)
- Use in zone 2 (T6) (in planning)
- with explosion protection (FM and CSA), ignition protection type intrinsic safety (is) and explosion proof op (11) (in planning)

#### Electrical connection/cable glands
- Compression gland Pg 13.5 not in connection with flame-proof enclosure
- Compression gland M20 x 1.5
- Compression gland 1/2-14 NPT
- Han T.D connector not in connection with flame-proof enclosure

#### Indicators
- Standard version with housing cover without viewing window
- (built-in digital indicator covered)
- Housing cover with analog display
- Scale 0 to 100 %, linear division
- Scale as specified (abbreviation Y20 necessary)
- Housing cover with viewing window (built-in digital indicator visible)

---

1) Also for oxygen applications.
2) Without cable gland.

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C79000-B5676-C92-01
### Operating Instructions

#### Other Versions

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmitter with mounting bracket made of steel</td>
<td>A01</td>
</tr>
<tr>
<td>Stainless steel</td>
<td>A02</td>
</tr>
<tr>
<td>Han 7D connector (metal, grey)</td>
<td>A30</td>
</tr>
<tr>
<td>Han 8U connector (instead of Han 7D)</td>
<td>A31</td>
</tr>
<tr>
<td>Labeling of plates (instead of German)</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>
<tr>
<td>Manufacturer test certificate M according to DIN 50 360, Part 18, and according to ISO 8402</td>
<td>C11</td>
</tr>
<tr>
<td>Acceptance certificate B according to DIN 50 048/EN 10 204-3.1B</td>
<td>C12</td>
</tr>
<tr>
<td>Work certificate according to DIN 50 049-2.2/EN 10 204-2.2</td>
<td>C14</td>
</tr>
<tr>
<td>Setting the upper limit of the output signal to 22 mA</td>
<td>D05</td>
</tr>
<tr>
<td>Acetic gas version according to NACE (only in connection with diaphragm of Hastelloy)</td>
<td>D07</td>
</tr>
<tr>
<td>IP 68 (not in connection with plug)</td>
<td>D12</td>
</tr>
<tr>
<td>Used in zone 0 (standard instrument EEx ia)</td>
<td>E02</td>
</tr>
<tr>
<td>Four-wire connection</td>
<td>On request</td>
</tr>
</tbody>
</table>

### Additional Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range to be set, state in plain text: Y01: ... to ... mbar, bar, kPa, MPa, ...</td>
<td>Y01</td>
</tr>
<tr>
<td>Measuring point number/description (max. 16 characters), state in plain text: Y16: ...</td>
<td>Y15</td>
</tr>
<tr>
<td>Measuring point text (max. 27 characters), state in plain text: Y16: ...</td>
<td>Y16</td>
</tr>
<tr>
<td>Customer-specific scale for the analog indicator, state in plain text: Y20: ... to ... mbar, bar, kPa, MPa, ...</td>
<td>Y20</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software SIMATIC PDM</td>
<td></td>
</tr>
<tr>
<td>HART®-Modem</td>
<td>Catalog MP17, Part 5</td>
</tr>
<tr>
<td>HART®-Communicator</td>
<td>Catalog MP17, Part 5</td>
</tr>
<tr>
<td>Spare parts and accessories</td>
<td>Catalog MP17, Part 5</td>
</tr>
</tbody>
</table>
1.5 Dimensions

1 Process connection 1\(\frac{1}{2}\)\#14 NPT or connection shank G 1\(\frac{1}{2}\) A or oval flange with connection pin
2 Terminal side, analog indicator (optional)
3 Electronic side, cover with viewing window
4 Rotation reference mark (see chapter 2.1.2, page 15)
5 Permissible range of rotation, hatched in the diagram (see chapter 2.1.2)
6 Locking screw (see chapter 2.1.2)
7 Safety angle for housing cover
   (only for flame-proof enclosure, not illustrated in the drawing)
8 Blankling plug (only for Pg 13.5 and Han 70I)
9 Protective key cover
10 Electrical connection:
    compression gland Pg 13.5 1\(\frac{3}{4}\) or
    female thread M20 x 1.5\(\frac{3}{4}\) or
    female thread 1\(\frac{1}{2}\) - 14 NPT or
    Han 70 connector 1\(\frac{3}{4}\)

1) take approx. 20 mm thread length into account additionally
2) not for flame-proof and ensures ignition protection type
3) not for protection type FM/exp/G5A exp

Figure 1.3 SITRANS P pressure transmitter, dimensions
2 Installation

2.1 Installation

The transmitter can be installed above or below the pressure taping point.
When measuring gases we recommend installing the transmitter above the pressure taping point and laying the pressure pipe with a constant downward gradient to the pressure taping point so that condensation which forms can drain into the main pipe and the measured value is not falsified.
When measuring liquids the transmitter should be installed below the pressure taping point and the pressure pipe should have a constant upward gradient so that entrapped gas can escape into the main pipe.

The installation point should have good access, if possible in the vicinity of the measuring point and should not be exposed to strong vibration. The permissible ambient temperature limits should not be exceeded.

The transmitter should be protected against direct heat.
The operating data must be compared with the values specified on the rating plate before installation.
The housing must be kept closed during assembly!

2.1.1 Fixing with a mounting bracket

The mounting bracket is fixed either:
- to a wall or a mounting frame with two screws
- or with a U-bolt to a horizontal or vertical mounting pipe
  (Ø 50 to 60 mm)

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

---

Figure 2.1 Fixing the SITRANS P transmitter with mounting bracket
2.1.2 Turning the measuring cell in relation to the housing

If necessary, the electronics housing can be turned in relation to the measuring cell in the SITRANS P transmitter to move the electronics side (with digital indicator) into view.

Only a limited rotation is permitted!

The range of rotation (7) is marked on the base of the electronics housing; there is a reference mark (6) on the neck of the measuring cell which must stay within the marked area (7) when rotating.

- Loosen the locking screw (8)
- Turn the housing within the marked area
- Tighten the locking screw

Figure 2.2 Turning the electronics housing in relation to the measuring cell
2.2 Electrical connection

Warning

The pertinent regulations must be observed for electrical installation; particularly in hazardous areas.
- the directive governing electrical systems in hazardous areas (Exel V)
- the regulation for installing electrical systems in hazardous areas (VDE 0165) and
- the certificate of conformity

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

The transmitter should be powered from a power source with SELV (safety extra-low voltage). If other power sources are used, we recommend grounding the transmitter housing. The ground terminal on the terminal side is connected with the external ground terminal.

Note

- Sealing caps in the cable inlets should be replaced by suitable compression glands or blanking plugs which must be certified for transmitters with flame-proof enclosure protection type!
- For laying the connecting cable (max. 1.5 mm² cross section)/signal cable it generally applies that:
  - the signal cable should laid separately from cables with voltages >60 V
  - use cables with twisted pairs
  - avoid the vicinity of large electrical installations or use screened cables
  - full specification according to HART® Revision 5 only with screened cables

• connection to screw terminals
  - Unscrew the housing cover of the terminal side (marked "FIELD TERMINALS" on the housing)
  - Pull out the analog indicator if necessary
  - Insert the connecting cable through the compression gland
  - Connect wires at the terminals "+" and "-", pay attention to the polarity!
  - Insert analog indicator if necessary
  - Screw in housing cover

Note

In transmitters for the protection type "flame-proof enclosure", the housing cover must be fastened with the safety angle.
• Connection with plug (not for protection type “flame-proof enclosure”)

The contact parts for the connector are enclosed packed in a bag.

- Push sleeve and gland onto the cable
- Strip off cable ends about 8 mm
- Crimp or solder contact parts to the cable ends
- Assemble the connector

Figure 2.3 Connection with plug

For error-free communication at least one load of 230 Ω must be available in the signal circuit (see Figure 2.4). When using power supply isolators for Smart transmitters, e.g. Siemens 7KM4421, a load is already installed in the isolator (see Figure 2.5, page 18). The isolator with intrinsically safe input circuit (transmitter circuit) is at the same time a safe isolation between the intrinsically safe and the not intrinsically safe circuit. The HART®-Modem or the HART®-Communicator can be connected to the jacks marked with HK (see Figure 2.5).

Warning

The HART®-Modem may not be used in hazardous areas and must not be connected to intrinsically safe circuits.
2.3 Installing the analog indicator

- Unscrew the housing cover of the terminal side (marked "FIELD TERMINALS" on the housing)
- Plug analog indicator into the test sockets
  Depending on the operating position of the transmitter the analog indicator can be plugged in two different positions (rotation by ±180° possible).
- Screw in casing cover with glass pane

2.4 Turning the digital indicator

- Unscrew housing cover of the electronics side
- Unscrew digital indicator
- Plug in the digital indicator
  Depending on the operating position of the transmitter the digital indicator can be plugged in four different positions (rotation by ±90° or ±180° possible).
- Screw on digital indicator
- Screw in housing cover
3 Commissioning

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

Warning

- If the venting valve and/or the screw plug are missing or are not tight enough,
- If the valves are operated incorrectly or improperly, this can lead to serious injury or considerable material damage.

In the case of hot media the individual operating steps must be performed in rapid succession. Otherwise the valves and the transmitter may overheat leading to damage.

- Measuring gases

The isolating valves must be operated in the following order:

Initial position: all valves closed

- Open isolating valve (2B),
- Apply pressure corresponding to the start of the scale through the test connection of the isolating valve (2) to the transmitter,
- Check the start of scale and correct if necessary,
- Close the isolating valve (2B),
- Open the isolating valve (4) on the pressure tapping point,
- Open isolating valve (2A).

Figure 3.1 Measuring gases
• Measuring liquids

The isolating valves must be operated in the following order:
Initial position: all valves closed
- Open isolating valve (2B),
- Apply pressure corresponding to the start of the scale through the test connection of the isolating valve (2) to the transmitter,
- Check the start of scale and correct if necessary,
- Close the isolating valve (2B),
- Open the isolating valve (4) on the pressure tapping point,
- Open isolating valve (2A).

![Diagram](image)

Figure 3.2 Measuring liquids

• Measuring steam

The isolating valves must be operated in the following order:
Initial position: all valves closed
- Open isolating valve (2B),
- Apply pressure corresponding to the start of the scale through the test connection of the isolating valve (2) to the transmitter,
- Check the start of range and correct if necessary,
- Close the isolating valve (2B),
- Open the isolating valve (4) on the pressure tapping nipple,
- Open isolating valve (2A).

![Diagram](image)

Figure 3.3 Measuring steam
4 Operation

4.1 Operation with PC/Laptop

For parameterization of the SITRANS P transmitter with PC/laptop, the SIMATIC PDM software is required (see also Technical data, page 16).

See the software description for operating instructions.

4.2 Operating from a HART®-Communicator

The handheld terminal is connected to the transmitter (see Figure 2.4, pg. 17 and Figure 2.5, pg. 18).

Action keys

With the key the handheld terminal is switched on and off. After switching on, the handheld terminal automatically starts communication with the transmitter. The online menu appears in the display.

It is not possible to switch off the handheld terminal in some instrument states (e.g. if essential parameters have not yet been sent to the transmitter). In this case a message is output on the display.

With the key the cursor is moved up through the menu list. The selected menu line is marked.

With the key the cursor is moved down through the menu list. The selected menu line is marked.

With the key the cursor is moved to the right through the menu list or branched to a subroutine. The name of the selected subroutine is displayed at the top of the display.

With the key the cursor is moved to the left through the menu list or a subroutine is exited.

With the key (hot key) the subroutine "Set zero point or span" is called directly even if the handheld terminal is switched off.

Function keys

The function keys F1 to F4 are located below the LCD. The function of the keys which differs in the individual menus is displayed at the bottom of the display.

Alphanumeric and shift keys

Alphanumeric values can be entered with these keys. The function as a number or letter key depends on the respective menu. Letters are selected by pressing the appropriate Shift key first.

For all further information about operation and the technical data of the handheld terminal, please see the instruction manual of the HART®-Communicator.
Figure 4.1  Menu Module Review 4.6 (with connected transmitter)
4.3 Operation on the transmitter

4.3.1 General

The SITRANS P pressure transmitter can also be set locally. The start of the scale and full scale can be "set" or adjusted with three keys; other parameters can be set using the digital indicator. The keys are accessible after unscrewing both screws and lifting up the protective cover.

![Control elements of the SITRANS P transmitter](image)

Figure 4.2 Control elements of the SITRANS P transmitter

The transmitter is always delivered with a built-in digital indicator (full pushbutton operation possible). The version of the cover (with or without viewing window) is as ordered.

In transmitters with cover without viewing window the pushbuttons and functions are disabled ("LS" in the digital indicator means: all functions disabled except start of scale and full scale, see Figure 4.3).

![Principle diagram of the digital display with functions disabled](image)

Figure 4.3 Principle diagram of the digital display with functions disabled

If the disabling is released for comfortable operation with the cover open, the function disabling should be reset after completing the work (see chapter 4.3.3.7, page 31). This reinstates the as-delivered condition and potential operating errors are avoided.
In the version with cover with viewing window (option) or with open cover and released lock, all functions of the Table 4.1, page 28 are selected with the mode key M. If the M-key is pressed, (Mode) 2 appears at the bottom left of the digital indicator. Every further keypress increments the mode by 1. With the [4]-key and the [5]-key the parameters, the current value or the engineering unit are changed and displayed on the LCD; in the event of an error the word Error appears, (see chapter 4.3.3.6, page 30). The transmitter returns to the "Measured value" function when mode 14 is exceeded with the M-key or 2 minutes after the last keypress (except mode 8: "loop check").

**Note**
- If the capacity of the digital indicator is exceeded, the following appears in the indicator 9,9,9,9,9 (for smaller engineering units such as Pa).
- If a appears in the mode display, the transmitter parameters are protected against overwriting (see chapter 4.4, page 32) and the keys locked.
- If a . appears in the mode display, the transmitter is in current transmitter or multidrop operation when operating with a PC/laptop or HART®-Communicator. The output current is independent of the applied absolute pressure. The keys are locked.
- For all modes (except 7 and 8) the following applies:
  A set new value is only saved when the mode is changed or when the transmitter returns automatically to the "Measured value" function about 2 minutes after the last keypress.

### 4.3.2 Setting the start of scale and full scale with the cover closed without viewing window and functions disabled

**Note**
- The measuring span does not change when the start of scale is set! (span = full scale minus start of scale)
- The pushbuttons and/or functions may be disabled! see chapter 4.4, page 32

Undo both screws of the protective cover and swing the protective cover up.

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

The SITRANS P transmitter sets the output current for the start of scale to 4 mA and the full scale to 20 mA when the operating keys are pressed according to the following instructions. An ammeter is not required.

- **Start of scale**
  - Apply absolute pressure corresponding to the start of scale to the transmitter.
  - Press the [4]-key and [5]-key simultaneously for about 2 s.
- **Full scale**
  - Apply absolute pressure corresponding to full scale to the transmitter.
  - Press all three keys, whereby always press the M-key first, hold it and then press the other two keys.
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 Figure 2.4, page 17)

⚠️ 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 $+$ and $-$ keys

- Full scale
  - Apply an absolute pressure corresponding to the full scale to the transmitter
  - Set the output current for full scale using the $+$ key and the $+$ key or the $+$ key and the $+$ key.
  - Always press the $+$ key first, hold it, and press either the $+$ key or the $+$ 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 1)</th>
<th>Key function 1)</th>
<th>Indicator, explanations</th>
<th>Chapter</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td>Output current in mA or % or input pressure in engineering units</td>
<td>4.3.3.8</td>
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<tr>
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<td><em>Error</em> if transmitter is disturbed</td>
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<tr>
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</tr>
<tr>
<td>Electrical damping</td>
<td>4</td>
<td>increase, decrease</td>
<td>Time constant (T_m) in s Parameter range: 0 to 100.0</td>
<td>4.3.3.4</td>
</tr>
<tr>
<td>Start of scale &quot;blind calibration&quot;</td>
<td>5</td>
<td>increase, decrease</td>
<td>set to start of scale 0 4)</td>
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<tr>
<td>Set zero point at vacuum 4) &quot;position correction&quot;</td>
<td>7</td>
<td></td>
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</tr>
<tr>
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</tr>
<tr>
<td>Disable pushbuttons and/or functions</td>
<td>10</td>
<td>change between the four functions</td>
<td>(L) = none (L_B) = all locked (L_D) = all locked except start of range (L.S) = all locked except Start of scale and full scale</td>
<td>4.3.3.7</td>
</tr>
<tr>
<td>Engineering units</td>
<td>14</td>
<td>change</td>
<td>Engineering unit (input value) or output current in mA or %</td>
<td>4.3.3.8</td>
</tr>
</tbody>
</table>

1) If a \(L\) appears in the indicator, the transmitter parameters are protected against overwriting (see chapter 4.4, page 32) and the keys are locked.
If a \(L\) appears in the indicator the transmitter is in current transmitter mode or multidrop operation when operating with a PC/laptop or Hart65 Communicator.

The output current is independent of the applied pressure. The keys are locked.

2) \(\bigcirc\) and \(\bigotimes\) keys pressed simultaneously for about 2 s, displayed value disappears, current value appears after about 2 s.

3) If the character \(\bigotimes\) appears at the left hand side of the display the range limits are exceeded.

4) ATTENTION: The start of scale is at vacuum at absolute pressure transmitters. The zero adjustment in ventilated transmitters leads to misadjustment!

Table 4.1 Functions of the SITRANS P transmitter
4.3.3 Operation with visible digital display and deactivated function lock

Note
- The measuring span does not change when the start of scale is set (span = full scale minus start of scale)
- The keys and/or functions can be locked!
  See Table 4.1 (page 26), Mode 10, chapter 4.3.3.7 (page 31) and 4.4 (page 32).

Unscrew both screws of the protective cover and swing the protective cover up.

On completion of the adjustment:
- Close the protective cover and tighten both screws

4.3.3.1 Setting start of scale and full scale with a pressure source

Note
The setting only affects the output current. If there is no pressure source
in mode 5 the start of source and
in mode 6 the full scale
can be set in the selected engineering unit, see chapter 4.3.3.2, page 28.

- Setting start of scale
  - Apply absolute pressure corresponding to the start of scale to the transmitter
  - With the \[2\]-key, set mode 2
  - With the \[+\]-key or the \[-\]-key, set the output current of the start of the scale
    or
    - set the output current to 4 mA:
      Press the \[+\]-key and \[-\]-key simultaneously for about 2 s.
      If the character \[\downarrow\] appears at the left hand side of the indicator the measuring limits are exceeded; the previous setting is not changed.

- Setting the full scale
  - Apply absolute pressure corresponding to full scale to the transmitter
  - With the \[3\]-key, set mode 3
  - With the \[+\]-key or the \[-\]-key, set the output current of the full scale
    or
    - set the output current to 20 mA:
      Press the \[+\]-key and \[-\]-key simultaneously for about 2 s.
If the character appears at the left hand side of the display the measuring limits are exceeded; the previous setting is not changed.

If \( \cdots \cdots \) appears in the display the set span is greater than the double max. span. If the \( \Delta \) and \( \Delta \) keys are pressed 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 pressure transmitter

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

- To set start of scale
  - Select mode 5 using the \( \Delta \) key
  - Use the \( \Delta \) or \( \Delta \) key to set the start of scale in the selected engineering unit
  - When pressing both \( \Delta \) and \( \Delta \) 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 \( \Delta \) key
  - Use the \( \Delta \) or \( \Delta \) key to set the full scale in the selected engineering unit
  - When pressing both \( \Delta \) and \( \Delta \) 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 5 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 456.7 to 123.4 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 \( \Delta \) key; the full scale "300.00 mbar" is displayed
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 pipeline to the transmitter) may cause an offset in the transmitter’s zero point. This offset (max. 20% 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 (<0.01 % of measuring span)
- Select mode 7 using the \[ \text{X} \] key.
- Press the \[ \text{F} \] and \[ \text{H} \] 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.

---

**Note**

At absolute pressure sensors the start of scale is at vacuum. The zero adjustment in ventilated transmitters leads to misadjustments! The factory calibration function (accessible only by HART® command) will undo misadjustments if necessary.

---

**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 (<0.01 % of measuring span)
- Press the \[ \text{F} \] and \[ \text{H} \] 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 $T_{d3}$ (see Chapter 1.3, Page 7), and the electrical damping value.

The SITRANS P transmitter is supplied with a damping value of 0.1 s. Values of 0 to 100.0 s in increments of 0.1 s are permitted.
- Select mode 4 using the [4] key
- Use the [3] and [5] 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:

| 3.6 mA | 4.0 mA | 12.0 mA | 20.0 mA | 22.8 mA |

- Select mode 8 using the [8] key
- Press the [3] and [5] keys simultaneously for about 2 s. This activates the "loop check" function. An output current of 4.0 mA is displayed.
- Use the [3] and [5] 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, "Err" 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 [9] key.
- Use the [3] or [5] 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 \[\text{key}\].
- Use the $\text{[ or ]}$ key to select one out of four functions

\[D\] → no pushbuttons or functions disabled (operation see chapter 4.3.3, page 27)

\[LR\] → all pushbuttons and functions disabled

\[LS\] → all functions disabled except start of scale (to set or adjust start of scale see chapter 4.3.2, page 24)

\[L5\] → all functions disabled except start of scale and full scale (to set or adjust start of scale or full scale see chapter 4.3.2, page 24)

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

Note

- When selecting lock \[L0\] or \[L5\] the measured value display current in mA or % should be chosen beforehand in mode 13 (see chapter 4.3.3.8, page 31). Otherwise a change of the output value is not noticeable when the $\text{[ or ]}$ keys are pressed.
- If an \[L\] is displayed on the LCD, then the transmitter parameters are protected against overwriting (see chapter 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 \[\text{key}\].
- Use the $\text{[ or ]}$ key to select the required variable

4.3.3.9 Select engineering units

The following engineering units can be chosen:

| bar | mbar | in H₂O | in Hg | ft H₂O | mm H₂O | mm Hg | psi | kPa | MPa |

- Select mode 14 using the \[\text{key}\].
- Use the $\text{[ or ]}$ key to select the engineering units

Note

If there is an LCD overflow then \[9,9,9,9\] appears (with small engineering units like e.g. Pa)

---

1) Reference temperature 20°C
2) The engineering unit set in the local LCD is independent from the selected engineering unit.
4.4 Write protection

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
- On the LCD (optional) is the displayed letter L (locked)
- Secure jumper against losing: push jumper horizontally * on the right jumper pin

![Diagram of LCD, Jumper, Jumper pin, Fixing for safety angle]

- Screw on housing cover
- Fix safety angle (if applicable) and switch on the voltage

* Proceeding from the normal position (see Figure 1.5, page 13 and note chapter 4.3.3, page 27)
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 chapter 4.3.3.6, page 30),
- using SIMATIC PDM an appropriate message is displayed in the "Measured values" field,
- Error is displayed on LCD.
Conformance Certificates

Original: German

Physikalisch-Technische Bundesanstalt

CERTIFICATE OF CONFORMITY

PTB No. Ex-R4.C.1001

TRANSLATION

(1) This certificate is issued for the electrical apparatus

Transmitter SITEMASTER type: 7640

(2) manufactured by: Siemens AG

(3) The apparatus marked with the EC-marking conforms to the essential requirements of the EC Directives and is in conformity with the harmonized European Standards.

(4) The apparatus has been tested and passed the test requirements which are mentioned in the EC Council Directive 89/392/EWG.

(5) The manufacturer has the responsibility to ensure that the apparatus bearing the labeling conforms to the essential safety requirements of the Directives and has satisfied the required conformity verification and testing.

(6) The apparatus may be marketed with the EC-label shown above in accordance with the EC Council Directive 89/392/EWG.

(7) By order: Erhard Strehlow, 25.04.1994

(Signature)

The conditions under which apparatus and equipment are put on the market and brought into service shall be in accordance with the provisions of the following standards:

EN 50014:1993

(8) EN 50082-1:1993

(9) EN 50082-2:1993

(10) EN 50082-3:1993

(11) EN 50082-4:1993

(12) EN 50082-5:1993

(13) EN 50082-6:1993