BA00213C/07/EN/15.23-00
71616573
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Operating Instructions
Smartec CLD132/134

Measuring systems with inductive sensor for conductivity and concentration measurement in the food industry
PROFIBUS PA/DP

Endress+Hauser
People for Process Automation

Table of contents

1 Document information

1.1 Warnings

Structure of information	Meaning
DANGER **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **will** result in a fatal or serious injury.
WARNING **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **can** result in a fatal or serious injury.
CAUTION **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE **Cause/situation** If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.2 Symbols

- Additional information, tips
- Permitted
- Recommended
- Forbidden or not recommended
- Reference to device documentation
- Reference to page
- Reference to graphic
- Result of a step

1.3 Symbols on the device

- Reference to device documentation

1.4 Documentation

Operating Instructions for Smartec CLD132, BA00207C

Operating Instructions for Smartec CLD134, BA00401C

Guidelines for planning and commissioning PROFIBUS DP/PA, BA00034S

2 Basic safety instructions

2.1 Requirements for the personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Intended use

Smartec CLD132 and CLD134 are measuring systems for measuring conductivity. The PROFIBUS interface allows the device to be operated using a plant asset management tool, e.g. FieldCare, or a commissioning tool,e.g. DeviceCare, on the PC.

PROFIBUS is an open fieldbus standard in accordance with IEC 61158/IEC 61508. It is specially designed to meet the requirements of process engineering and allows multiple measuring devices to be connected to a bus line. The transmission method according to IEC 1158-2 guarantees safe signal transmission.

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:
- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

Electromagnetic compatibility
- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

During operation:

- If faults cannot be rectified:
  products must be taken out of service and protected against unintentional operation.

2.5 Product safety

The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

3 Incoming acceptance and product identification

3.1 Incoming acceptance

1. Verify that the packaging is undamaged.
   ↳ Notify the supplier of any damage to the packaging.
   Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
   ↳ Notify the supplier of any damage to the delivery contents.
   Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
   ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
   ↳ The original packaging offers the best protection.
   Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

3.2 Product identification

3.2.1 Nameplate

The nameplate provides you with the following information on your device:
- Manufacturer identification
- Order code
- Serial number
- Ambient and process conditions
- Input and output values
- Safety information and warnings
- Protection class

▶ Compare the information on the nameplate with the order.

3.2.2 Identifying the product

Product page

www.endress.com/CLD132

www.endress.com/CLD134

Interpreting the order code

The order code and serial number of your product can be found in the following locations:
- On the nameplate
- In the delivery papers

Obtaining information on the product

1. Go to www.endress.com.
2. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
   ↳ The product structure is displayed in a popup window.

4. Click the product overview.
   ↳ A new window opens. Here you fill information pertaining to your device, including the product documentation.

3.3 Scope of delivery

CLD132

The scope of delivery of the "compact version" with PROFIBUS comprises:
- Compact measuring system Smartec with integrated sensor
- Terminal strip set
- Bellows (for device version -*GE1*****)
- Operating Instructions BA00207C
- Operating Instructions for field communication with PROFIBUS BA00213C
- M12 connector (for device version -******PF*)

The scope of delivery of the "Remote version" with PROFIBUS includes:
- Smartec transmitter
- CLS52 inductive conductivity sensor with fixed cable
- Terminal strip set
- Bellows (for device version -*GE1*****)
- Operating Instructions BA00207C
- Operating Instructions for field communication with PROFIBUS BA00213C
- M12 connector (for device version -******PF*)

CLD134

The scope of delivery of the "compact version" with PROFIBUS comprises:
- Smartec compact measuring system with embedded sensor
- Terminal strip set
- Operating Instructions BA00401C
- Operating Instructions for field communication with PROFIBUS BA00213C
- M12 connector (for device version -******PF*)

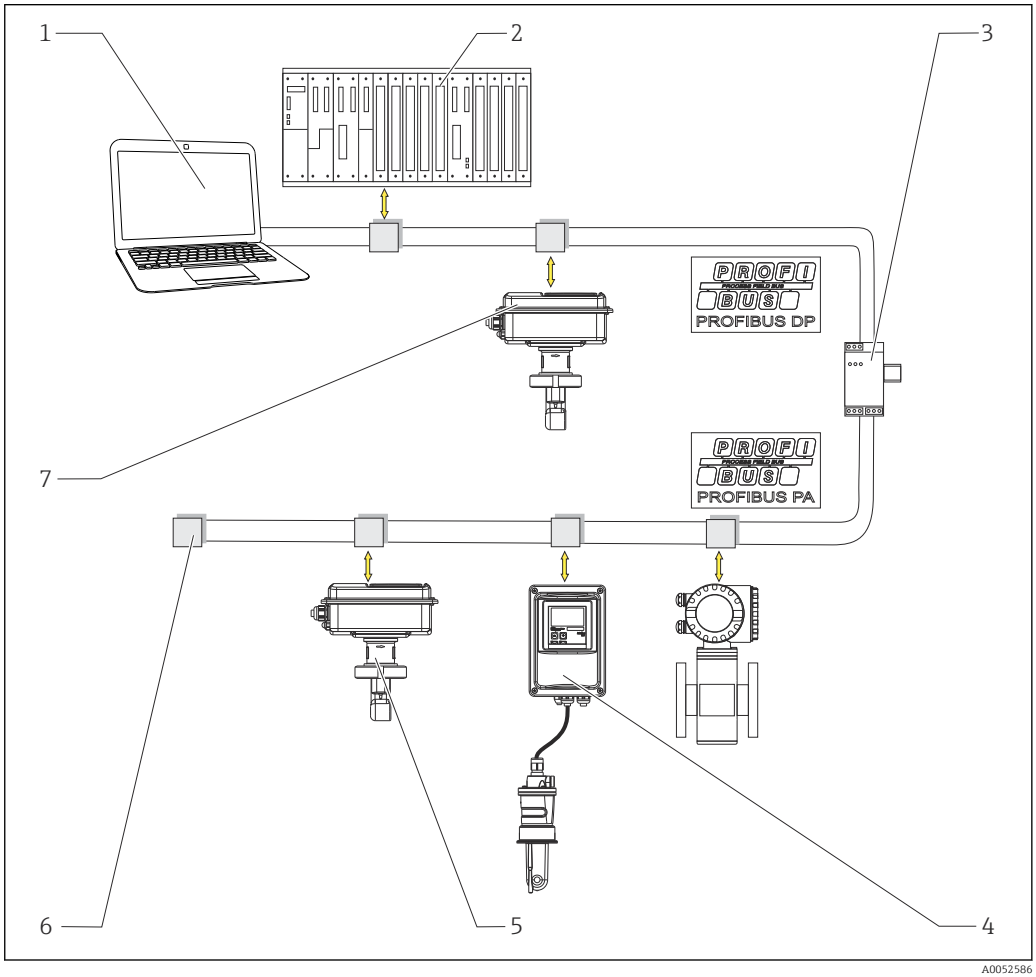
The scope of delivery of the "remote version" comprises:
- Smartec transmitter
- CLS54 inductive conductivity sensor with fixed cable
- Terminal strip set
- Operating Instructions BA00401C
- Operating Instructions for field communication with PROFIBUS BA00213C
- M12 connector (for device version -******PF*)

The scope of delivery of the "transmitter excluding sensor" version comprises:
- Smartec CLD134 transmitter
- Terminal strip set
- Operating Instructions BA00401C/07/EN
- Operating Instructions for field communication with PROFIBUS BA00213C
- M12 connector (for device version -******PF*)

4 Installation

4.1 System architecture

A complete measuring system consists of
- CLD132 or CLD134 transmitter with PROFIBUS PA or DP
- Segment coupler (PA only)
- PROFIBUS bus terminator
- Cabling incl. bus distributor
- Programmable Logic Controller (PLC) or PC with FieldCare or DeviceCare



1 *Measuring systems with PROFIBUS interface*

1 PC with PROFIBUS interface and operating program
2 PLC
3 Segment coupler
4 CLD132 or CLD134 PROFIBUS PA remote version with CLS52 or CLS54
5 CLD132 or CLD134 PROFIBUS PA compact version
6 Terminating resistor
7 CLD132 or CLD134 PROFIBUS PA compact version

The maximum number of transmitters in a bus segment is determined by their current consumption, the bus coupler power and the required bus length.

Guidelines for planning and commissioning PROFIBUS DP/PA, BA00034S

4.2 Mounting the measuring device

▶ Carry out installation in accordance with the operating instructions.

Operating Instructions for Smartec CLD132, BA00207C

Operating Instructions for Smartec CLD134, BA00401C

4.3 Post-installation check

1. After installation, check the measuring system for damage.
2. Check that the sensor is aligned with the flow direction of the medium.
3. Check that the coil former of the sensor is completely wetted by the medium.

5 Electrical connection

⚠ WARNING

Device is live!

Incorrect connection may result in injury or death!

- The electrical connection may be performed only by an electrical technician.
- The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- **Prior** to commencing connection work, ensure that no voltage is present on any cable.

5.1 Connecting the measuring device

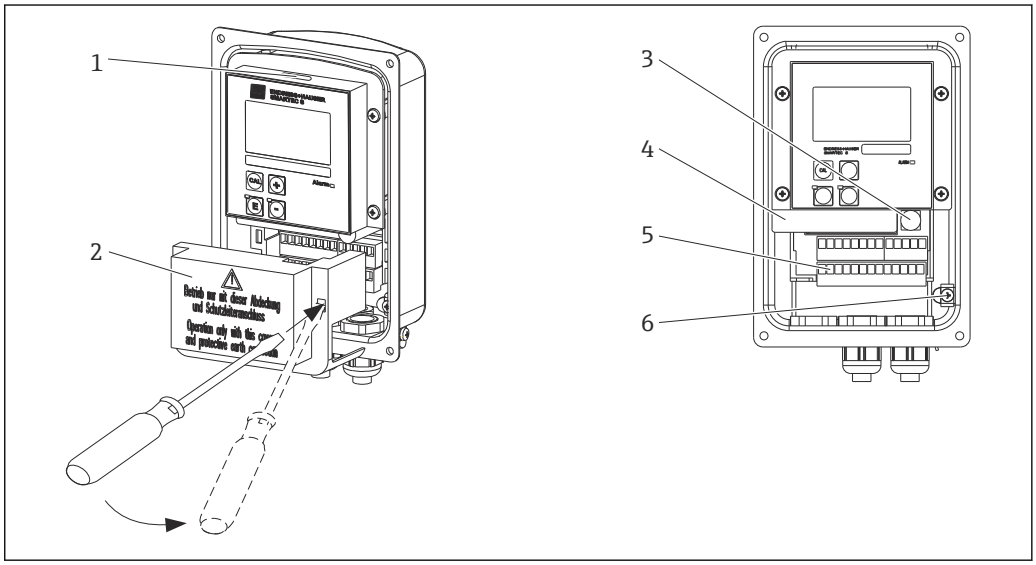
- Set up the electrical connection according to the operating instructions.

Operating Instructions for Smartec CLD132, BA00207C

Operating Instructions for Smartec CLD134, BA00401C

5.2 Connecting the bus cable

Feeding the cable into the housing



2 *Bus cable connection (right = remove the cover frame, left = view without cover frame)*

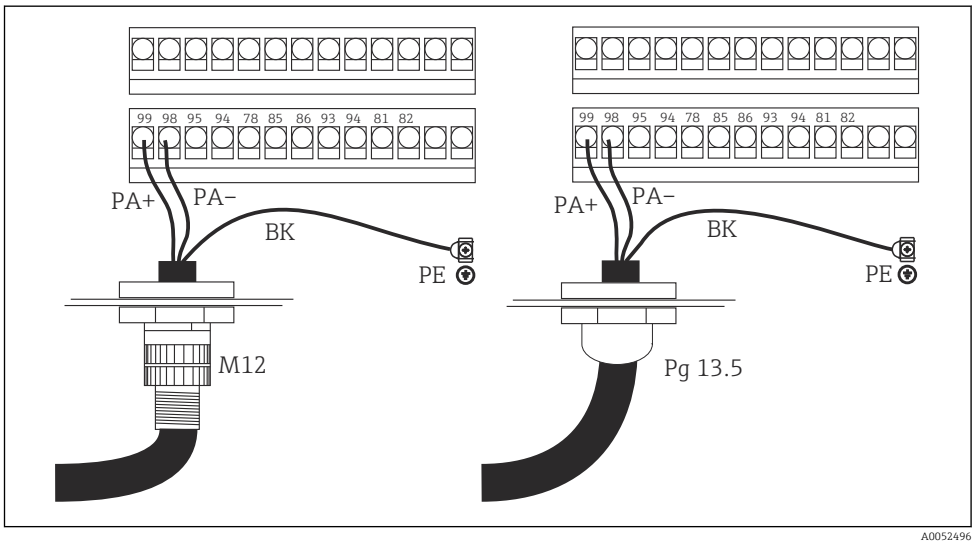
1 Port for DIL switch
2 Cover frame
3 Fuse
4 Removable electronics box
5 Terminals
6 Housing ground

1. Loosen the four Phillips screws and remove the housing cover.
2. Remove the cover frame above the terminal blocks. To do so, insert the screwdriver into the recess and push down the tab ().
3. Guide the cable through the opened cable entry into the connection compartment.

Cable connection for PA device

1. Mount the bus cable using the high-strength cable gland or an M12 connector.

2.



Connect the cable cores of the bus cable to the terminal block. Mixing up the polarity of the PA + and PA- connections has no effect on operation.

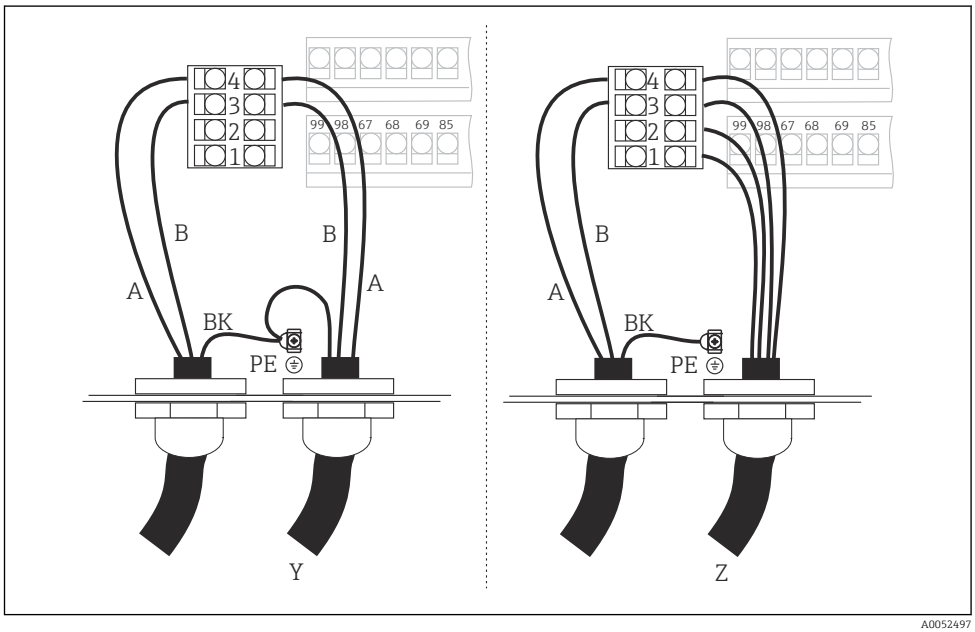
3. Tighten the cable gland.

4. Close the housing cover.

Cable connection for DP device

1. Mount the bus cable using the high-strength cable gland.

2.



1 GND
2 Power supply +5 V for bus termination
3 B (RxD / TxD-P)
4 A (RxD / TxD-N)
Y Next PROFIBUS device (looped-through)
Z Bus termination

Connect the cable cores of the bus cable to the terminal block.

3. Tighten the cable gland.

4. Close the housing cover.

Bus termination
The bus terminations for PROFIBUS PA and DP are different.
- Each PROFIBUS PA bus segment must be terminated with a**passive** bus terminator on each end.
- Each PROFIBUS DP bus segment must be terminated with an**active** bus terminator on each end.

5.3 Post-connection check

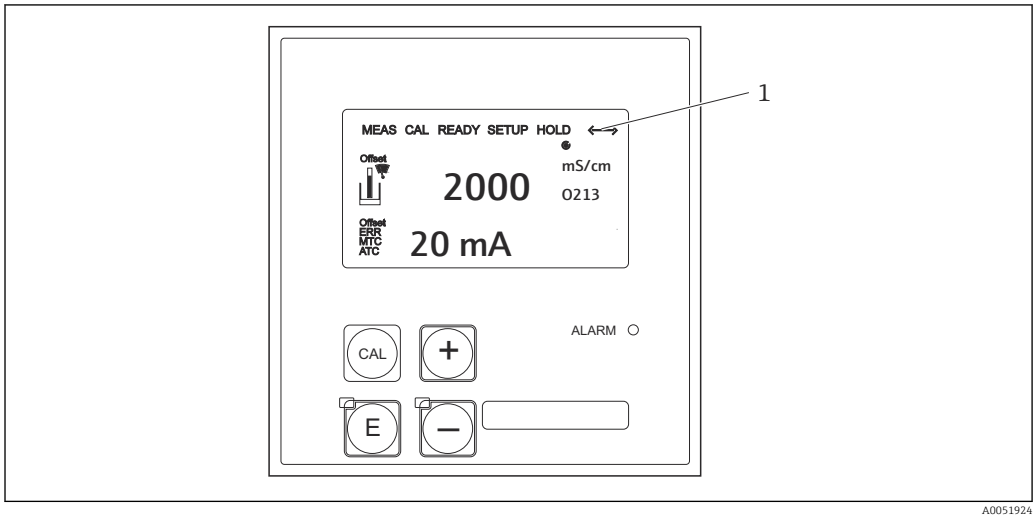
▶ Once the electrical connection is set up, carry out the following checks:

Device condition and specifications	Notes
Are the devices and cables free from damage on the outside?	Visual inspection

Electrical connection	Notes
Does the supply voltage correspond to that specified on the nameplate?	230 V AC 115 V AC 100 V AC 24 V AC/DC
Do the cables used meet the necessary specifications?	Use an original E+H cable for electrode/ sensor connection; see Accessories section
Are the connected cables provided with strain relief?	
Is the cable type route completely isolated?	Run the power supply and signal cables separately along the entire cable route so that no interference can occur. Separate cable ducts are optimal.
Is the cable run correct, without loops and cross-overs?	
Are the power cable and signal cables connected correctly and in accordance with the wiring diagram?	
Are all the screw terminals tightened?	
Are all the cable entries fitted, tightened and leak-proof?	
Are all housing covers installed and firmly tightened?	Check seals for damage.

6 Operation

6.1 Display and operating elements



3 User interface

1 Display symbol for active communication via PROFIBUS interface

Explanation of key assignment and symbols:

► Use the operating instructions.

Operating Instructions for Smartec CLD132, BA00207C

Operating Instructions for Smartec CLD134, BA00401C

6.2 Operation via FieldCare or DeviceCare

Fieldcare is the FDT-based plant asset management tool from Endress+Hauser. It can configure all intelligent field devices in your plant and help you manage them. By using status information, it also provides a simple but effective means of monitoring the devices.

- Supports PROFIBUS
- Supports multiple Endress+Hauser devices
- Supports all third-party devices that comply with the FDT standard,e.g. drive, I/O systems, sensors
- Ensures full functionality for all devices with DTMs
- Offers generic profile operation for third-party fieldbus devices that do not have a supplier DTM

DeviceCare is the tool developed by Endress+Hauser for the configuration of Endress +Hauser devices. All intelligent devices in a plant can be configured via a point-to-point or point-to-bus connection.

See the operating instructions for an installation description.

FieldCare/DeviceCare, BA00027S

7 System integration

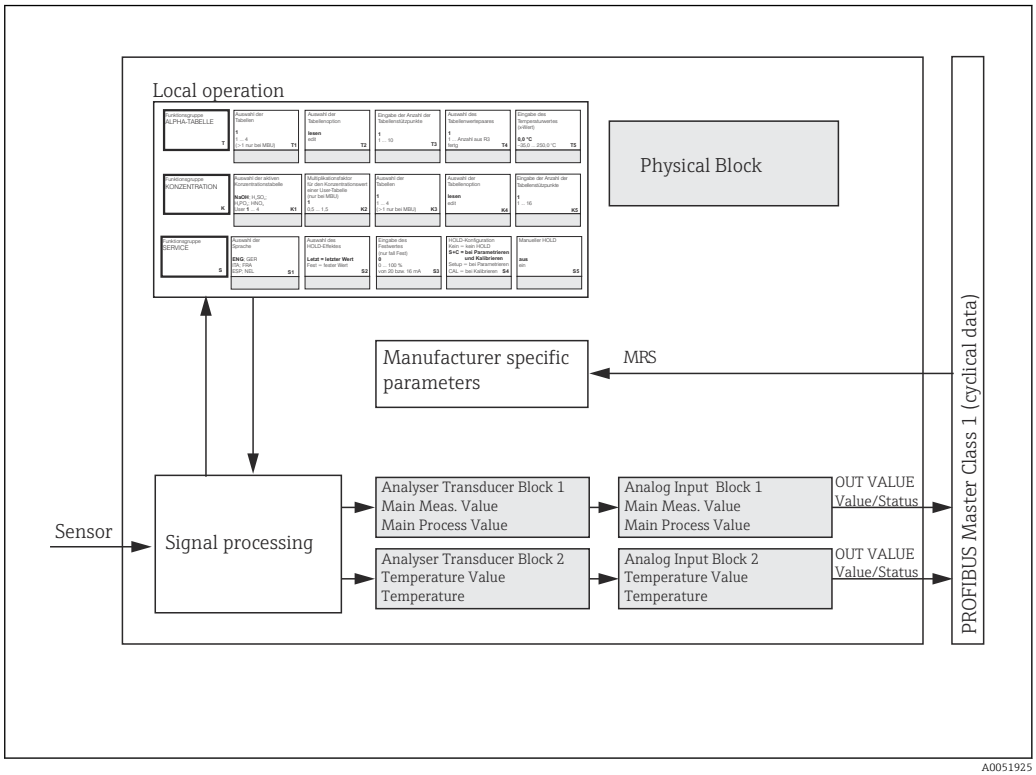
7.1 PROFIBUS PA/DP block model

In the PROFIBUS configuration, all the device parameters are categorized according to their functional properties and tasks and are generally assigned to three different blocks. A block may be regarded as a container in which parameters and the associated functions are contained (see).

A PROFIBUS device has the following block types:

- **A physical block (device block)**
  The physical block contains all the device-specific features of the device.
- **One or more transducer blocks**
  The transducer block contains all the measuring and device-specific parameters of the device. The measuring principles (e.g. conductivity, temperature) are depicted in the transducer blocks in accordance with the PROFIBUS Profile 3.0 Specification.
- **One or more function blocks (function block)**
  A function block contains the device's automation functions. The transmitter contains Analog Input Blocks which can be used to scale the measured values and to check for limit value overshoot.

A number of automation tasks can be implemented with these blocks. In addition to these blocks, a transmitter can also contain any number of other blocks. These can include, for example, several analog input function blocks if more than one process variable is provided by the transmitter.



4 *Block model (gray = profile blocks)*

7.1.1 Physical block (device block)

A physical block contains all the data that uniquely identify and characterize the transmitter. It is an electronic version of a nameplate on the transmitter. Physical blocks parameters are e.g. device type, device name, manufacturer identification, serial number.

Another task of the physical block is to manage general parameters and functions that influence the execution of the remaining blocks in the transmitter. The physical block is therefore the central unit that also checks the device status and influences or controls the operability of the other blocks and thus operability of the device.

7.1.2 Write protection

- **On-site hardware write protection**
  You can lock the device on-site for configuration operations by pressing the **Plus** and **ENTER** keys simultaneously.
  Unlock the device by pressing the **CAL** and **MINUS** keys.
- **Hardware write protection via PROFIBUS**
  The **HW_WRITE_PROTECTION** parameter indicates the status of the hardware write protection. The following statuses are possible:
  1: Hardware write protection enabled, device data cannot be overwritten
  0: Hardware write protection disabled, device data can be overwritten
- **Software write protection**
  You can also set software write protection to prevent all parameters from being acyclically overwritten. Do this by making an entry in the **WRITE_LOCKING** parameter. The following entries are permitted:
  2457: Device data can be overwritten (factory setting)
  0: Device data cannot be overwritten

Operating Instructions for Smartec CLD132, BA00207C

7.1.3 Parameter LOCAL_OP_ENABLE

Use this parameter to either allow or lock local operation on the device.

The following values are possible:
- **0**: Disabled
  Local operation is locked. You can only change this status via the bus. The code 9998 is displayed in local operation. The transmitter behaves in the same way as with hardware write protection via the keyboard.
- **1**: Enabled.
  Local operation is active. However, commands from the master have a higher priority than on-site commands.

If communication fails for more than 30 seconds, local operation is automatically enabled.

If communication fails while local operation is locked, the device will immediately revert to the locked state once communication is working again.

7.1.4 Parameter PB_TAG_DESC

You can configure the customer-specific number (TAG number) via:
- Local operation in the menu field I2 (function groupINTERFACE) or via
- PROFIBUS parameter **TAG_DESC** of the physical block.

If you change the tag number via one of the two options, the change can also be seen immediately at the other location.

7.1.5 Parameter FACTORY_RESET

Using the **FACTORY_RESET**parameter, you can reset the following data:
- 1 - All data to PNO default values
- 2506 - Transmitter warm start
- 2712 - Bus address
- 32768 - Calibration data
- 32769 - Setting data

Using local operation, you can either reset all data to the factory settings or delete the sensor data in menu field **S10** (SERVICE function group).

7.1.6 Parameter IDENT_NUMBER_SELECTOR

Using this parameter, you can switch the transmitter between three different mode of operation, each of which has a different functionality in relation to the cyclical data:

IDENT_NUMBER_SELECTOR	Functionality
0	Cyclic communication only possible with Profile GSD. Only standard diagnosis in cyclic data
1 (default)	Full functionality with Profile 3.0 and advanced diagnostics in cyclic data The manufacturer-specific GSD is required.
2	Backwards-compatible Profile 2.0 functionality without diagnosis in cyclic data The manufacturer-specific Profile 2.0 GSD is required.

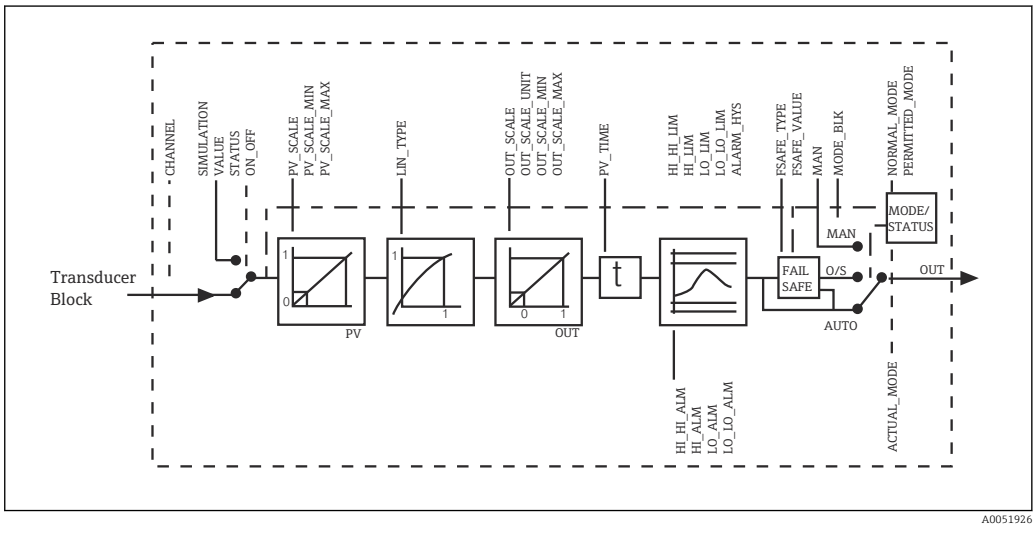
(See also the table on device master files).

7.1.7 Analog Input Block (function block)

In the Analog Input function block, the process variables (conductivity and temperature) are prepared in terms of instrumentation and control by the transducer block for the subsequent automation functions (e.g. scaling, limit value processing). Two Analog Input function blocks are provided for the transmitter with PROFIBUS.

7.1.8 Signal processing

The following is a schematic diagram of the internal structure of an Analog input function block:



5 Schematic internal structure of an analog input function block

The Analog Input function block receives its input value from the Analyzer Transducer Block. The input values are permanently assigned to the Analog Input function block:
- Main process value – Analog Input function block 1 (AI 1)
- Temperature – Analog Input function block 2 (AI 2)

7.1.9 SIMULATE

In the **SIMULATE** parameter group, you can replace the input value with a simulation value and activate simulation. By specifying the status and the simulation value, you can test the response of the automation system.

7.1.10 PV_FTIME

In the **PV_FTIME** parameter, you can dampen the converted input value (primary value = PV) by specifying a filter. If a time of 0 seconds is specified, the input value is not dampened.

7.1.11 MODE_BLK

The **MODE_BLK** parameter group is used to select mode of operation of the Analog Input function block. By selecting the **MAN** mode of operation (manual), you can directly specify the **OUT** output value and the OUT status.

The most important functions and parameters of the Analog Input Block are listed below.

Tabular summary of the functions of the Analog Input Block: .

7.1.12 Selecting the mode of operation

The mode of operation is set using the **MODE_BLK**parameter group. The Analog Input function block supports the following modes of operation:
- AUTO(Automatic mode)
- MAN(Manual mode)
- O/S(Out of service)

7.1.13 Selecting the units

You can change the system unit for one of the measured values via Fieldcare in the Analog Input Block.

Changing the unit in the Analog Input Block initially has no effect on the measured value transmitted to the PLC. This ensures that a sudden change cannot affect the subsequent control. If you want the unit change to affect the measured value, you need to use Fieldcare to activate the function **SET_UNIT_TO_BUS**.

Another way of changing the unit is by using the parameters **PV_SCALE** and **OUT_SCALE** .

7.1.14 OUT

The output value **OUT** is compared with warning limits and alarm limits (e.g. **HI_LIM**, **LO_LIM**) that can be entered using various parameters. If one of these limit values is violated, a limit value process alarm (e.g. **HI_ALM**, **LO_ALM**) is triggered.

7.1.15 OUT Status

The status of the **OUT** parameter group is used to report the status of the Analog Input function block and the validity of the OUT output value to the downstream function blocks.

The following status values can be displayed:
- **GOOD_NON_CASCADE**
  The output value **OUT** is valid and be used for further processing.
- **UNCERTAIN**
  The output value **OUT** can only be used for further processing to a limited extent.
- **BAD**
  The output value **OUT** is invalid. This occurs when the Analog Input function block is switched to the mode of operation **O/S** or in the event of major faults (and system or process error messages in the Operating Instructions).

Besides the device-internal error messages, other device functions have an influence on the status of the OUT value:
- **Automatic hold**
  If **Hold** switched on, the OUT status is set to **BAD** not specific (0x00).
- **Calibration**
  During calibration, the OUT status is set to the **UNCERTAIN** sensor calibration value (0x64) (even when hold is switched on).

7.1.16 Simulation of input/output

You can use various parameters of the Analog Input function block to simulate the function block's input and output:

Simulating the input of the Analog Input function block

- Using the **SIMULATION**parameter group, you can specify the input value (measured value and status).
  - Since the simulation value runs through the entire function block, you can check all of the block's parameter settings.

Simulating the output of the Analog Input function block

- Set the mode of operation in the **MODE_BLK** parameter group to **MAN** and directly specify the required output value in the **OUT**parameter.

7.1.17 Measured value simulation in local operation

For measured value simulation in local operation, the status **UNCERTAIN** – simulated value is transferred to the function blocks. This triggers the failsafe mechanism in the AI blocks.

7.1.18 Failsafe mode (FSAFE_TYPE)

If an input value or simulation value has the status (**BAD**), the Analog Input function block continues to operate in the failsafe mode defined in the parameter **FSAFE_TYPE**.

The parameter **FSAFE_TYPE** offers the following failsafe mode:
- **FSAFE_VALUE**
  The value specified in the parameter **FSAFE_VALUE** is used for further processing.
- **LAST_GOOD_VALUE**
  The last valid value is used for further processing.
- **WRONG_VALUE**
  The current value is used for further processing irrespective of the status **BAD**. The factory setting is the default value (**FSAFE_VALUE**) with the value **0**.

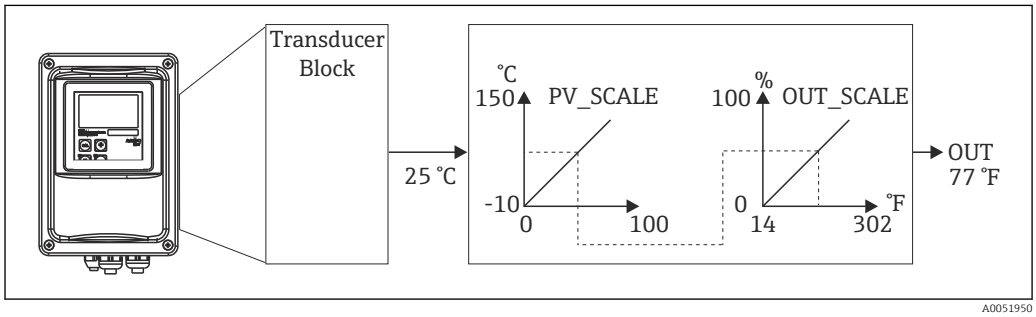
Failsafe mode is also activated if the Analog Input function block is set to the **O/S** mode of operation.

7.1.19 Rescaling the input value

In the Analog Input function block, the input value or input range can be scaled in accordance with the automation requirements.

Example:
- The system unit in the transducer block is °C.
- The measuring range of the device is −10 to 150 °C.
- The output range in relation to the automation system should be 14 °F ... 302 °F.
- The measured value from the transducer block (input value) is linearly rescaled via the input scaling **PV_SCALE** to the desired output range OUT_SCALE.
- Parameter group **PV_SCALE**
  PV_SCALE_MIN (V1H0) −10
  PV_SCALE_MAX (V1H1) 150
- Parameter group **OUT_SCALE**
  OUT_SCALE_MIN (V1H3) 14
  OUT_SCALE_MAX (V1H4) 302
  OUT_UNIT (V1H5) [°F]

This means that, for example, for an input value of 25 °C using the **OUT** parameter, a value of 77 °F is output.



6 Scaling the input value on the Analog Input function block

7.1.20 Limit values

You can set two warning limits and two alarm limits for monitoring your process. The status of the measured value and the parameters of the limit value alarms are indicative of the measured value's relative position. You can also define an alarm hysteresis in order to avoid frequent changes in the limit-value flags and frequent activation/deactivation of alarms. The limit values are based on the output value **OUT**. If the output value **OUT** exceeds or drops below the defined limit values, the automation system signals an alarm via the limit value process alarms (see below).

The following limit values can be defined:
- HI_LIM, HI_HI_LIM
- LO_LIM, LO_LO_LIM

7.1.21 Alarm detection and processing

Limit value process alarms are generated by the Analog Input function block. The status of the limit value process alarms is reported to the automation system by the following parameters:

- HI_ALM, HI_HI_ALM
- LO_ALM, LO_LO_ALM

7.2 Cyclic data exchange

Cyclic data exchange is used to transmit the measured values during operation.

7.2.1 Modules for the cyclic data telegram

For the cyclic data telegram, the transmitter provides the following modules as input data (data from the transmitter to PLC) (see also block model):

- **Main Process Value**
  This byte transfers the primary value.
- **Temperature**
  This byte transfers the temperature.
- **MRS Measuring Range Switch**
  This byte is used to transmit the external hold and parameter set changeover from the PLC to the transmitter.

Structure of the input data (transmitter → PLC)

The input data are transmitted by the transmitter with the following structure:

Index Input data	Data	Access	Data format/comments	Configuration data
0 to 4	Analog Input Block 1 **Main Process Value**	Read	Measured value (32-bit floating point number; IEEE-754) Status byte (0x80) = OK	0x42, 0x84, 0x08, 0x05 or 0x42, 0x84, 0x81, 0x81 or 0x94
5 to 9	Analog Input Block 2 **Temperature**	Read	Measured value (32-bit floating point number; IEEE-754) Status byte (0x80) = OK	0x42, 0x84, 0x08, 0x05 or 0x42, 0x84, 0x81, 0x81 or 0x94

Structure of the output data (PLC → transmitter)

The output data of the PLC for device control have the following structure:

Index Input data	Data	Access	Data format/comments	Configuration data
0	MRS	Write	Byte Status byte (0x80) = OK	0x42, 0x84, 0x08, 0x05 or 0x42, 0x84, 0x81, 0x81 or 0x94

IEEE-754 floating point number

PROFIBUS processes data in hexadecimal code and converts this into 4 bytes (8 bits each, 4x8=32 bits).

A number has three components, in accordance with IEEE 754:
- Sign (S)
  The sign requires exactly 1 bit and has the values 0 (+) or 1 (-). It is determined by bit 7 of the first byte of a 32-bit floating-point number.
- Exponent
  The exponent comprises bits 6 to 0 of the first byte, plus bit 7 of the second byte (= 8 bits).
- Mantissa
  The remaining 23 bits are used for the mantissa.

Byte 1								Byte 2								Byte 3								Byte 4							
Bit								Bit								Bit								Bit							
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Byte 1								Byte 2							Byte 3								Byte 4							
+/-	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}
S	Exponent							Mantissa																						

Formula (IEEE 754): Value $= (-1)^{sign} * 2^{(exponent - 127)} * (1 + mantissa)$

Example: 40 F0 00 00 (hexadecimal) = 0 1000000 1110000 00000000 00000000
Byte 1 Byte 2 Byte 3 Byte 4

Value
$= -1^0 \times 2^{129-127} \times (1 + 2^{-1} + 2^{-2} + 2^{-3})$
$= 1 \times 2^2 \times (1 + 0.5 + 0.25 + 0.125)$
$= 1 \times 4 \times 1.875$
$= 7.5$

Explanation of measuring range switching (MRS)

MRS									Function
reserved	reserved	reserved	reserved		reserved	E2	E1	Decimal	Hexadecimal	
Number of binary inputs = 2; E1 and E2 active										
-	-	-	-		-	0	0	0	0x00	MRS 1
-	-	-	-		-	0	1	1	0x01	MRS 2
-	-	-	-		-	1	0	2	0x02	MRS 3
-	-	-	-		-	1	1	3	0x03	MRS 4
Number of binary inputs = 1; E1 and E2 active										
-	-	-	-		-	0	0	0	0x00	MRS 1
-	-	-	-		-	-	1	1	0x01	Hold On
-	-	-	-		-	1	0	2	0x02	MRS 2
Number of binary inputs = 0; E1 active										
-	-	-	-		-	-	0	0	0x00	Hold Off
-	-	-	-			-	1	1	0x01	Hold On

Customizing the cyclic data telegram

You can customize the cyclic telegram to better meet the requirements of a process. The above tables show the maximum contents of the cyclic data telegram.

If you do not want to use all output variables of the transmitter, you can use the device configuration (CHK_CFG) to eliminate individual data blocks from the cyclic telegram via the PLC software. Shortening the telegram improves the data throughput rate of a PROFIBUS system. You should only leave those blocks active that you process further in the system. You can do this by means of a **negative** selection in the configuration tool.

To achieve the correct structure of the cyclic data telegram, the PROFIBUS master must send the identification FREE_PLACE (00h) for the non-active blocks.

Status codes for the OUT parameter of the Analog Input Block

Status code	Device status	Meaning	Limits
0x00 0x01 0x02 0x03	BAD	Not specific	OK LOW_LIM HIGH_LIM CONST
0x04 0x05 0x06 0x07	BAD	Configuration error	OK LOW_LIM HIGH_LIM CONST
0x0C 0x0D 0x0E 0x0F	BAD	Device error	OK LOW_LIM HIGH_LIM CONST
0x10 0x11 0x12 0x13	BAD	Sensor error	OK LOW_LIM HIGH_LIM CONST
0x1F	BAD	Out of service	CONST
0x40 0x41 0x42 0x43	UNCERTAIN	Not specific	OK LOW_LIM HIGH_LIM CONST
0x47	UNCERTAIN	Last usable value	CONST
0x4B	UNCERTAIN	Replacement value of failsafe status	CONST
0x4F	UNCERTAIN	Initial value of failsafe status	CONST
0x50 0x51 0x52 0x53	UNCERTAIN	Measured value of sensor too inaccurate	OK LOW_LIM HIGH_LIM CONST
0x5C 0x5D 0x5E 0x5F	UNCERTAIN	Configuration error	OK LOW_LIM HIGH_LIM CONST
0x60 0x61 0x62 0x63	UNCERTAIN	Simulation value	OK LOW_LIM HIGH_LIM CONST
0x64 0x65 0x66 0x67	UNCERTAIN	Sensor calibration	OK LOW_LIM HIGH_LIM CONST
0x80 0x83	UNCERTAIN	Measuring system OK.	OK CONST
0x84 0x85 0x86 0x87	GOOD	Change of parameters	OK LOW_LIM HIGH_LIM CONST
0x89 0x8A	GOOD	Warning: Early warning limit exceeded	LOW_LIM HIGH_LIM
0x8D 0x8E	GOOD	Critical alarm: Alarm limit exceeded	LOW_LIM HIGH_LIM

7.3 Acyclic data exchange

Acyclic data exchange is used to transfer parameters during commissioning and maintenance or to display other measured variables that are not contained in cyclic data traffic.

Generally, a distinction is made between Class 1 and Class 2 master connections. Depending on the implementation of the transmitter, several Class 2 connections can be set up simultaneously.

- With Smartec, two Class 2 masters are permitted. This means that two Class 2 masters can access the transmitter at the same time. However, you must ensure that they do not both attempt to **write** to the same data. Otherwise data consistency is no longer guaranteed.
- When a Class 2 master reads parameters, it sends a request telegram to the transmitter specifying the device address, the slot/index and the expected record length. The transmitter responds with the requested record if it exists and has the correct length (bytes).
- When a Class 2 master writes parameters, it transmits the address of the transmitter, the slot and index, length information (byte) and the record. The transmitter acknowledges this write job after completion. A Class 2 master can access the blocks that are shown in the figure.

7.3.1 Slot/index tables

The device parameters are listed in the following tables. You can access these parameters via the slot and index numbers. The individual blocks each contain standard parameters, block parameters and partly manufacturer-specific parameters. In addition, the matrix positions for operation via Fieldcare are specified.

7.3.2 Device management

Parameter	Matrix FC [1)]	Slot	Index	Size (bytes)	Type	Acc.	Store
DIR_OBJECT HEADER		1	0	12	Array of unsigned16	r	Cst.
COMP_LIST_DIR_ENTRIES		1	1	32	Array of unsigned16	r	Cst.
COMP_DIR_ENTRIES_CONTINUES		1	2	12	Array of unsigned16	r	Cst.

1) FC=Fieldcare

7.3.3 Physical Block

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
Standard parameter							
BLOCK_OBJECT		1	160	20	DS-32*	r	C
ST_REV		1	161	2	Unsigned16	r	N
TAG_DESC	VAHO	1	162	32	Octetstring	r, w	S
STRATEGY		1	163	2	Unsigned16	r, w	S
ALERT_KEY		1	164	1	Unsigned8	r, w	S
TARGET_MODE		1	165	1	Unsigned8	r, w	S

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
MODE_BLK Actual Permitted Normal		1	166	3	DS-37* Unsigned8 Unsigned8 Unsigned8	r	S
ALARM_SUM		1	167	8	DS-42*	r	D
Block parameter							
SOFTWARE_REVISION		1	168	16	Visible string	r	Cst
HARDWARE_REVISION		1	169	16	Visible string	r	Cst
DEVICE_MAN_ID		1	170	2	Unsigned16	r	Cst
DEVICE_ID		1	171	16	Visible string	r	Cst
DEVICE_SER_NUM		1	172	16	Visible string	r	Cst
DIAGNOSIS		1	173	4	Octetstring	r	D
DIAGNOSIS_EXTENSION		1	174	6	Octetstring	r	D
DIAGNOSIS_MASK		1	175	4	Octetstring	r	Cst
DIAGNOSIS_MASK_EXTENSION		1	176	6	Octetstring	r	Cst
DEVICE_CERTIFICATION		1	177	32	Visible string	r	N
WRITE_LOCKING		1	178	2	Unsigned16 0: acyclic refused 2457: writeable	r, w	N
FACTORY_RESET		1	179	2	Unsigned16 0x8000: Reset calibration data 0x8001: Reset setting data 0x0001: PNO defaults all data 2506: Warm start 2712: Reset bus addr.	r, w	S
DESCRIPTOR		1	180	32	Octetstring	r, w	S
DEVICE_MESSAGE		1	181	32	Octetstring	r, w	S
DEVICE_INSTALL_DATE		1	182	16	Octetstring	r, w	S
LOCAL_OP_ENABLE		1	183	1	Unsigned8 0: disabled 1: enabled	r, w	N
IDENT_NUMBER_SELECTOR		1	184	1	Unsigned8 0: profile specific 1: manufacturer specific P 3.0 2: manufacturer specific P2.0	r, w	S
HW_WRITE_PROTECTION		1	185	1	Unsigned8 0: unprotected 1: protected	r	D
DEVICE_CONFIGURATION		1	196	32	Visible string	r	N
INIT_STATE		1	197	1	Unsigned8 1: status before reset 2: run 5: maintenance	r, w	S
DEVICE_STATE		1	198	1	Unsigned8 2: run 5: maintenance	r, w	D

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
GLOBAL_STATUS		1	199	2	Unsigned16	r	D
Gap		1	200 - 207				
E +H parameter							
ACTUAL_ERROR	VAH2	1	208	2	Unsigned16	r	D
LAST_ERROR	VAH3	1	209	2	Unsigned16	r	D
UPDOWN_FEATURES_SUPP		1	210	1	Octetstring	r	C
DEVICE_BUS_ADRESS	VAH1	1	213	1	Signed8	r	N
SET_UNIT_TO_BUS	VAH9	1	214	1	Unsigned8 0: off 1: confirm	r, w	D
CLEAR_LAST_ERROR	VAH4	1	215	1	Unsigned8 0: off 1: confirm	r, w	D

7.3.4 Analyzer Transducer Block

Two Analyser Transducer Blocks are provided. These are distributed to slots 1 and 2 in the following order:

1. Main process value
2. Temperature

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
Standard parameter							
BLOCK_OBJECT		1 - 2	100	20	DS-32*	r	C
ST_REV		1 - 2	101	2	Unsigned16	r	N
TAG_DESC		1 - 2	102	32	Octetstring	r, w	S
STRATEGY		1 - 2	103	2	Unsigned16	r, w	S
ALERT_KEY		1 - 2	104	1	Unsigned8	r, w	S
TARGET_MODE		1 - 2	105	1	Unsigned8	r, w	S
MODE_BLK Actual Permitted Normal		1 - 2	106	3	DS-37* Unsigned8 Unsigned8 Unsigned8	r	N Cst Cst
ALARM_SUM		1 - 2	107	8	DS-42*	r	D
Block parameter							
COMPONENT_NAME		1 - 2	108	32	Octetstring	r, w	S
PV		1 - 2	109	12	DS-60*	r	D
PV_UNIT		1 - 2	110	2	Unsigned16	r, w	S
PV_UNIT_TEXT		1 - 2	111	8	Visible string	r, w	S
ACTIVE_RANGE		1 - 2	112	1	Unsigned8 1: Range 1	r, w	S
AUTORANGE_ON		1 - 2	113	1	Boolean	r, w	S
SAMPLING_RATE		1 - 2	114	4	Time_difference	r, w	S
Gap reserved PNO		1 - 2	115 - 124				

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
NUMBER_OF_RANGES		1 - 2	125	1	Unsigned8	r	N
RANGE_1		1 - 2	126	8	DS-61*	r, w	N

7.3.5 Analog Input Block

Two Analog Input Blocks are provided. These are distributed to slots 1 and 2 in the following order:

1. Main process value

2. Temperature

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
Standard parameter							
BLOCK_OBJECT		1 - 2	16	20	DS-32*	r	C
ST_REV		1 - 2	17	2	Unsigned16	r	N
TAG_DESC		1 - 2	18	32	Octetstring	r, w	S
STRATEGY		1 - 2	19	2	Unsigned16	r, w	S
ALERT_KEY		1 - 2	20	1	Unsigned8	r, w	S
TARGET_MODE		1 - 2	21	1	Unsigned8	r, w	S
MODE_BLK Actual Permitted Normal		1 - 2	22	3	DS-37* Unsigned8 Unsigned8 Unsigned8	r	N Cst Cst
ALARM_SUM		1 - 2	23	8	DS-42*	r	D
BATCH		1 - 2	24	10	DS-67*	r, w	S
Gap		1 - 2	25				
Block parameter							
OUT		1 - 2	26	5	DS-33*	r	D
PV_SCALE		1 - 2	27	8	Float	r, w	S
OUT_SCALE		1 - 2	28	11	DS-36*	r, w	S
LIN_TYPE		1 - 2	29	1	Unsigned8	r, w	S
CHANNEL		1 - 2	30	2	Unsigned16	r, w	S
PV_FTIME		1 - 2	32	4	Float	r, w	S
FSAFE_TYPE		1 - 2	33	1	Unsigned8	r, w	S
FSAFE_VALUE		1 - 2	34	4	Float	r, w	S
ALARM_HYS		1 - 2	35	4	Float	r, w	S
HI_HI_LIM		1 - 2	37	4	Float	r, w	S
HI_LIM		1 - 2	39	4	Float	r, w	S
LO_LIM		1 - 2	41	4	Float	r, w	S
LO_LO_LIM		1 - 2	43	4	Float	r, w	S
HI_HI_ALM		1 - 2	46	16	DS-39*	r	D
HI_ALM		1 - 2	47	16	DS-39*	r	D
LO_ALM		1 - 2	48	16	DS-39*	r	D
LO_LO_ALM		1 - 2	49	16	DS-39*	r	D

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
SIMULATE		1 - 2	50	6	DS-50*	r, w	S
VIEW_1		1 - 2	61	18	Unsigned8	r	D

7.3.6 Manufacturer-specific parameters

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
Measured value	V0H0	3	100	4	Float	r	D
Temperature	V0H1	3	101	4	Float	r	D
Mode of operation	V0H2	3	102	1	Unsigned8 0: Conductivity 1: Concentration	r	D
Unit of measure (concentration)	V0H3	3	103	1	Unsigned8 57: % 139: ppm 245: mg/l 106: tds 251: none	r, w	N
Number of decimal places	V0H4	3	104	1	Unsigned8 0: X.xxx 1: XX.xx 2: XXX.x 3: XXXX	r, w	N
Unit of measure (conductivity)	V0H5	3	105	1	Unsigned8 66: mS/cm 67: µm/cm 240: S/m	r, w	N
Signal damping	V0H6	3	106	1	Unsigned8	r, w	N
Raw value	V0H7	3	107	4	Float	r	D
Current measuring range	V0H9	3	108	1	Unsigned8	r, w	N
Temperature measurement	V1H0	3	109	1	Unsigned8 0: Fixed 1: Pt 100 2: Pt 1000 3: NTC	r, w	N
Process temperature	V1H3	3	110	4	Float	r, w	N
Cell constant	V1H4	3	111	4	Float	r, w	N
Installation factor	V1H6	3	112	4	Float	r, w	N
Calibration temperature	V1H8	3	113	4	Float	r, w	N
Temperature correction	V1H9	3	114	4	Float	r, w	N
Contact function	V3H0	3	115	1	Unsigned8 0: Alarm function 1: Limit function 2: Limit + alarm fct.	r, w	N
Switch-on delay	V3H3	3	116	2	Unsigned16	r, w	N
Switch-off delay	V3H4	3	117	2	Unsigned16	r, w	N
Number of binary inputs	V4H0	3	118	1	Unsigned8	r, w	N
Source of binary inputs	V4H1	3	119	1	Unsigned8 0: Binary contacts 1: Cyclic data	r, w	N
Processed measuring range	V4H2	3	120	1	Unsigned8	r, w	N

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
Mode of operation for processed measuring range	V4h3	3	121	1	Unsigned8 0: Conductivity 1: Concentration	r, w	N
Substance selection for processed measuring range	V4H4	3	122	4	Unsigned8 0: NaOH 1: H2SO4 2: H3PO4 3: HNO3 4: User 1...	r, w	N
Temperature compensation for processed measuring range	V4H5	3	123	4	Unsigned8 0: none 1: linear 2: NaCl 3: User 1...	r, w	N
Alpha value for operating measuring range	V4H6	3	124	4	Float	r, w	N
Switch-on point for processed measuring range	V4H8	3	125	4	Float	r, w	N
Switch-off point for processed measuring range	V4H9	3	126	4	Float	r, w	N
Correction factor	V5H0	3	127	4	Float	r, w	N
Selection of substances	V5H1	3	128	1	Unsigned8 0: NaOH 1: H2SO4 2: H3PO4 3: HNO3 4: User 1...	r	D
Current concentration table	V5H2	3	129	1	Unsigned8	r, w	D
Read/edit concentration table	V5H3	3	130	1	Unsigned8 0: Read 1: Edit	r, w	D
Number of concentration table elements	V5H4	3	131	1	Unsigned8	r, w	N
Selection of concentration table elements	V5H5	3	132	1	Unsigned8	r, w	D
Concentration table conductivity	V5H6	3	133	4	Float	r, w	N
Concentration table concentration	V5H7	3	134	4	Float	r, w	N
Concentration table temperature	V5H8	3	135	4	Float	r, w	N
Concentration table status	V5H9	3	136	1	Unsigned8 0: OK 1: Service 2: Processing 3: Invalid	r	D
Current alpha table	V6H0	3	137	1	Unsigned8 1: User	r, w	D
Read/edit alpha table	V6H1	3	138	1	Unsigned8 0: Read 1: Edit	r, w	D
Number of alpha table elements	V6H2	3	139	1	Unsigned8	r, w	N
Selection of alpha table elements	V6H3	3	140	4	Unsigned8	r, w	D
Alpha table temperature	V6H4	3	141	4	Float	r, w	N
Alpha table alpha value	V6H5	3	142	1	Float	r, w	N

Parameter	Matrix FC	Slot	Index	Size (bytes)	Type	Acc.	Store
Alpha table status	V6H6	3	143	1	Unsigned8 0: OK 1: Service 2: Processing 3: Invalid	r	D
PCS alarm	V7H0	3	144	1	Unsigned8 0: No PCS 1: 1 hour 2: 2 hours 3: 4 hours	r, w	N
Relay contact type	V8H1	3	145	1	Unsigned8 0: Latching contact 1: Wiping contact	r, w	N
Relay time unit	V8H2	3	146	1	Unsigned8 0: Seconds 1: Minutes	r, w	N
Alarm delay	V8H3	3	147	1	Unsigned16	r, w	N
Diagnostic code selection	V8H4	3	148	1	Unsigned8	r, w	D
Alarm status	V8H53	3	149	1	Unsigned8 0: No 1: Yes	r	D
Alarm relay	V8H6	3	150	1	Unsigned8 0: No 1: Yes	r, w	N
Locking	V8H9	3	151	2	Unsigned16 22: not protected 9998: loc. op. disabl. 9999: hardware prot.	r, w	N
Hold function	V9H0	3	152	1	Unsigned8	r, w	N
Hold dwell period	V9H1	3	153	2	Unsigned16	r, w	N
MRS version	V9H2	3	154	1	Unsigned8	r	Cst
Factory values	V9H4	3	155	1	Unsigned8 1: Device data 2: Sensor data 3: User data 4: Adress data	r, w	D
SW version	VAH5	3	156	2	Unsigned16	r	Cst
HW version	VAH6	3	157	2	Unsigned16	r	Cst

7.3.7 Data strings

Some data types in the slot index table (e.g. DS-33) are marked with an asterisk (*). These are data strings that are structured in accordance with the PROFIBUS Specification Part 1, Version 3.0. They consist of several elements that are also addressed via a subindex, as shown in the following example.

Parameter type	Subindex	Type	Size (byte)
DS-33	1	Float	4
	5	Unsigned8	1

8 Commissioning

8.1 Function check

Before commissioning the measuring point, make sure that all final checks have been carried out:
- "Post-installation" checklist
- "Post-connection" checklist

8.2 Configuring the device address

The address must always be set for each PROFIBUS device. The control system does not recognize the transmitter if the address is not set correctly.

All devices leave the factory with the address 126. You can use this address to check the function of the device and to connect to a PROFIBUS-PA network. Then you need to change this address to be able to integrate additional devices.

You can set the device address via:
- local operation,
- the PROFIBUS service Set_Slave_Add or
- the DIL switch in the device.

Valid device addresses are in the range 0 ... 125.

No cyclic data exchange takes place via address 126.

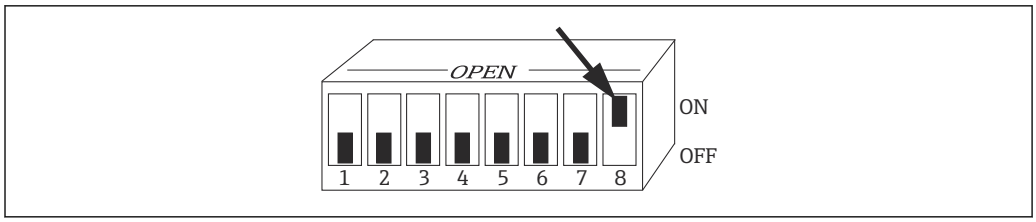
Each address can only be assigned once in a PROFIBUS network.

The double arrow on the display indicates active communication with PROFIBUS.

7 *Position of the DIL switch in the transmitter (accessible only when housing cover is open)*

8.2.1 Setting the device address using the operating menu

You can only set the address via the software if the DIL switch 8 is at the software setting. Switch 8 is already factory-set to software.



8 DIL switch 8 must be set to ON to allow operation via software.

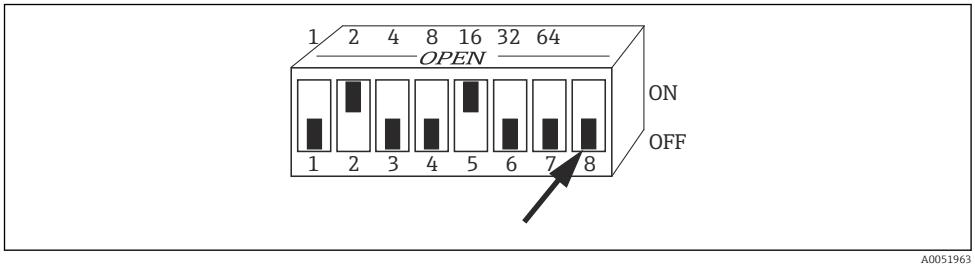
Set the device address using the INTERFACE function group in the I1 menu field.

CODE	USER INTERFACE	SELECTION (factory setting = bold)	INFO
I	SETUP HOLD I INTERFACE A0051423		
I1	SETUP HOLD 126 I1 Address A0051424	**126** 0 to 126	**Enter the bus address** Each address may only be assigned once in a network.
I2	SETUP HOLD Tag I2 @@@@@@@@ A0051425		**Device tag** Display only, cannot be edited.

8.2.2 Setting the device address using PROFIBUS communication

The address is set via the Set_Slave_Add service.

8.2.3 Setting the device address using the DIL switch hardware setting)

1. Loosen the four Phillips screws and remove the housing cover. The DIL switch is located on the electronics module above the display.
2. Set the device address (from 0 to 126) on switches 1 to 7 (example: 18 = 2 + 16).
3. 

9 Example of device address using DIL switch

Set switch 8 to OFF.

4. Then close the housing cover again.

8.3 Device master files

The device master file (GSD) is needed to configure a PROFIBUS-DP network. The GSD (a simple text file) describes e.g. which data transfer rate is supported by the device or which digital information is received by the PLC from the device and in which format.

Each device is assigned an ID number by the PROFIBUS user organization (PNO). The name of the GSD is derived from this number. For Endress+Hauser, this ID number starts with the manufacturer ID 15xx. For easier classification and greater transparency of each GSD, the GSD names at Endress+Hauser are as follows:

EH3x15xx

EH = Endress+Hauser

3 = Profile

x = Extended ID

15xx = ID no.

8.3.1 Types of device master files

- Before configuration, decide which GSD you want to use to operate the system.
  - You can change the setting by means of a Class 2 master (under Physical Block - Parameter Ident_Number_Selector).

In general, the following Device Master Files with different functionalities are available to you:

- **Manufacturer-specific GSD with Profile 3.0 functionality:**
  This GSD guarantees unlimited functionality of the field device. Device-specific process parameters and functions are therefore available.
- **Manufacturer-specific GSD with Profile 2.0 functionality:**
  This GSD ensures that the cyclic data are backwards compatible with the Smartec transmitter with Profile 2.0 functionality. This means that in plants where the Smartec transmitter with Profile 2.0 functionality is used, the Smartec transmitter with Profile 3.0 functionality can also be used.
- **Profile GSD:**
  If a system is configured with profile GSDs, it is possible to exchange devices supplied by various manufacturers. However, it is essential that the cyclic process values follow the same sequence.

Example:

The Smartec transmitter supports the profile GSD **PA139750.gsd** (IEC 61158- 2). This GSD contains AI blocks. The AI blocks are always assigned to the following measured variables:

AI 1 = Main Process Value

AI 2 = Temperature

This ensures that the first measured variable matches the third-party field devices.

8.3.2 Device master files (GSD) for Smartec

Device name	Ident_ number_ Selector	ID number	GSD	Bitmaps
Only Profile 3.0 functionality:				
Smartec PA	0	9750 Hex	PA139750.gsd	PA_9750n.bmp
	0	9750 Hex	PA039750.gsd	PA_9750n.bmp
Manufacturer-specific functions with Profile 3.0 functionality:				

Device name	Ident_ number_ Selector	ID number	GSD	Bitmaps
Smartec PA Additional cycl. data for digital I/O (parameter set changeover)	1	153E Hex	EH3x153E.gsd	EH153E_d.bmp EH153E_n.bmp EH153E_s.bmp
Smartec DP Additional cycl. data for digital I/O (parameter set changeover)	1	153D Hex	EH3x153D.gsd	EH153D_d.bmp EH153D_n.bmp EH153D_s.bmp
Manufacturer-specific functions with Profile 2.0 functionality:				
Smartec PA	2	151B Hex	EH__151B.gsd	EH151B_d.bmp EH151B_n.bmp EH151B_s.bmp
Smartec DP	2	151A Hex	EH__151A.gsd	EH151A_d.bmp EH151A_n.bmp EH151A_s.bmp

You can request the GSD of all Endress+Hauser devices from:
- www.endress.com
- www.profibus.com

8.3.3 Content structure of the GSD files from Endress+Hauser

For the Endress+Hauser transmitter with PROFIBUS interface, you receive an exe file containing all of the files required for configuration. This file creates the following structure when automatically unpacked:

The available measuring parameters of the transmitter are at the top level. Below this level, you have:
- **Revision x.xx** folder:
  This designation stands for a special device version. The corresponding subdirectories **BMP** and **DIB** each contain device-specific bitmaps.
- **GSD** folder
- **Info** folder:
  Information about the transmitter and any dependencies in the device software.

▶ Read the information in the **Info** folder carefully before configuration.

8.3.4 Working with the device master files (GSD)

The GSD must be integrated into the automation system. Depending on the software used, the GSD files can either be copied to the program-specific directory or read into the database via an import function within the configuration software.

Example:

PLC Siemens S7-300/400 with Siemens STEP 7 configuration software

1. Copy the files to the subdirectory: **...\ siemens \ step7 \ s7data \ gsd**.
2. Upload the bitmap files to the directory: **...\ siemens \ step7 \ s7data \ nsbmp**.
   ↳ The bitmap files also belong to the GSD files. These bitmap files are used to represent the measuring points graphically.

For other configuration software, ask the manufacturer of your PLC for the correct directory.

9 Diagnosis and troubleshooting

9.1 System error messages

The DIAGNOSIS and DIAGNOSIS_EXTENSION parameters are generated from the device-specific errors.

NAMUR class	Error no.	Description	DIAGNOSIS	DIAGNOSIS_ EXTENSIO	Measured value status		
					Quality	Sub-status	Hex [1]
Failure	E001	Memory error	01 00 00 80 - DIA_HW_ELECTR	01 00 00 00 00 00	BAD	device failure	0C
Failure	E002	Data error in EEPROM	10 00 00 80 - DIA_MEM_CHKSUM	02 00 00 00 00 00	BAD	device failure	0C
Failure	E003	Invalid configuration	00 04 00 80 - DIA_CONF_INVAL	04 00 00 00 00 00	BAD	device failure	0C
Failure	E007	Faulty transmitter	20 00 00 80 - DIA_MEASUREMENT	08 00 00 00 00 00	BAD	device failure	0C
Failure	E008	Sensor or sensor connection faulty	20 00 00 80 - DIA_MEASUREMENT	10 00 00 00 00 00	BAD	sensor failure	10
Failure	E010	Temperature sensor defective	20 00 00 80 - DIA_MEASUREMENT	20 00 00 00 00 00	BAD	sensor failure	10
Failure	E025	Limit value for airset offset exceeded	20 00 00 80 - DIA_MEASUREMENT	40 00 00 00 00 00	BAD	configuration error	04
Failure	E036	Calibration range of sensor exceeded	20 00 00 80 - DIA_MEASUREMENT	80 00 00 00 00 00	BAD	configuration error	04
Failure	E037	Below calibration range of sensor	20 00 00 80 - DIA_MEASUREMENT	00 01 00 00 00 00	BAD	configuration error	04
Failure	E045	Calibration aborted	20 00 00 80 - DIA_MEASUREMENT	00 02 00 00 00 00	BAD	configuration error	04
Failure	E049	Installation factor exceeded	20 00 00 80 - DIA_MEASUREMENT	00 04 00 00 00 00	BAD	configuration error	04
Failure	E050	Installation factor undershot	00 20 00 80 - DIA_MAINTENANCE	00 08 00 00 00 00	BAD	configuration error	5C
Failure	E055	Measuring range of the main parameter undershot	20 00 00 80 - DIA_MEASUREMENT	00 10 00 00 00 00	UNCERT AIN	sensor conversion not accurate	50
Failure	E057	Measuring range of the main parameter exceeded	20 00 00 80 - DIA_MEASUREMENT	00 20 00 00 00 00	UNCERT AIN	sensor conversion not accurate	50
Failure	E059	Temperature range undershot	20 00 00 80 - DIA_MEASUREMENT	00 40 00 00 00 00	UNCERT AIN	sensor conversion not accurate	50
Failure	E061	Temperature range exceeded	20 00 00 80 - DIA_MEASUREMENT	00 80 00 00 00 00	UNCERT AIN	sensor conversion not accurate	50
Failure	E067	Limit switch set point exceeded	00 20 00 80 - DIA_MAINTENANCE	00 00 00 04 00 00	UNCERT AIN	non-specific	40
Failure	E077	Temperature not within the α-value table	00 04 00 80 - DIA_CONF_INVAL	00 00 01 00 00 00	BAD	configuration error	04
Failure	E078	Temperature not within the concentration table	00 04 00 80 - DIA_CONF_INVAL	00 00 02 00 00 00	BAD	configuration error	04
Failure	E079	Conductivity not within the concentration table	0 04 00 80 - DIA_CONF_INVAL	00 00 04 00 00 00	BAD	configuration error	04
Funct. check	E101	Service function active			-	-	

NAMUR class	Error no.	Description	DIAGNOSIS	DIAGNOSIS_ EXTENSIO	Measured value status		
					Quality	Sub-status	Hex [1]
Funct. check	E102	Manual operation active			-	-	
Funct. check	E106	Download active	00 00 00 80 - EXTENSION_AVAILABLE	00 00 00 00 00 80	-	-	
Failure	E116	Download error	00 04 00 80 - DIA_CONF_INVAL	00 00 08 00 00 00	BAD	configuration error	04
Mainten ance	E150	Distance of temperature values or α-value table too small	00 20 00 80 - DIA_MAINTENANCE	00 00 00 01 00 00	UNCERT AIN	configuration error	50
Failure	E152	Live check alarm (PCS)	20 00 00 80 - DIA_MEASUREMENT	00 00 00 02 00 00	BAD	sensor failure	50

1) Depending on the status of the limit bits, 00 to 03 is added.

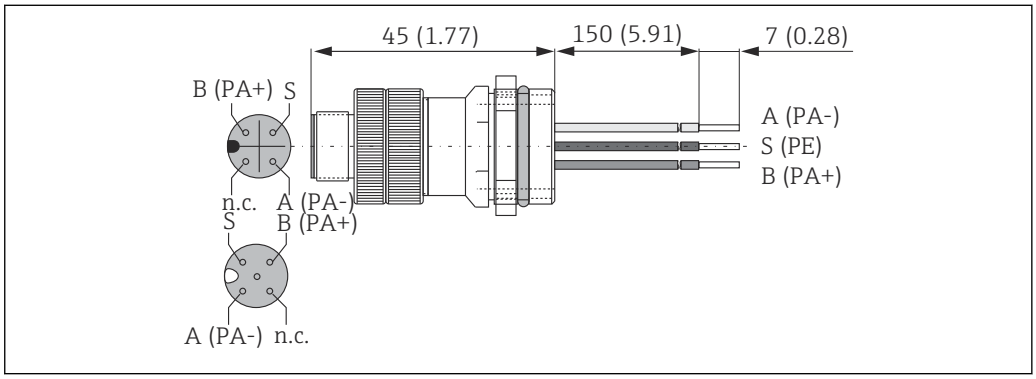
9.2 Process and device-specific errors

Operating Instructions for Smartec CLD132, BA00207C

Operating Instructions for Smartec CLD134, BA00401C

10 Communication-specific accessories

M12 fieldbus connector set
- Four-pin metal connector for mounting on the transmitter
- For connecting to the junction box or cable socket
- Cable length 150 mm (5.91 in)
- Order No. 51502184



A0052585

FieldCare SFE500
- Universal tool for field device configuration and management
- Supplied with a complete library of certified DTMs (Device Type Manager) for operation of Endress+Hauser field devices
- Order according to product order structure
- www.endress.com/sfe500

11 Protocol-specific data

11.1 PROFIBUS-PA

Output signal	PROFIBUS-PA: EN 50170 vol. 2, Profile version 3.0
PA function	Slave
Transmission rate	31.25 kbps
Signal coding	Manchester II
Slave response time	Approx. 20 ms
Signal on alarm	Status and alarm messages in accordance with PROFIBUS-PA, profile version 3.0 Display: error code
Physical layer	IEC 61158-2, MBP (Manchester Coded Bus Powered)
Bus voltage	9 to 32 V
Bus current consumption	10 mA ± 1 mA
Failure current consumption I_{FDE}	0 mA

11.2 PROFIBUS-DP

Output signal	PROFIBUS DP in accordance with EN 50170 vol. 2, profile version 3.0
PA function	Slave
Transmission rate	9.6 kbps, 19.2 kbps, 45.45 kbps, 93.75 kbps, 187.5 kbps, 500 kbps, 1.5 Mbps
Signal coding	NRZ code
Slave response time	Approx. 20 ms
Signal on alarm	Status and alarm messages in accordance with PROFIBUS-DP, profile version 3.0 Display: Error code
Physical layer	RS 485

11.3 Human interface

Local operation	Via keyboard
Bus address	Set via ▪ DIL switch or ▪ via operating menu or ▪ via Set_Slave_Adr service
Communication interface	PROFIBUS-PA/-DP

11.4 Standards and guidelines

PROFIBUS	EN 50170, vol. 2
PROFIBUS-DP	EN 50170, vol. 2 RS 485 PNO guidelines for PROFIBUS-DP
PROFIBUS-PA	EN 50170, vol. 2 IEC 61158-2 PNO guidelines for PROFIBUS-PA

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