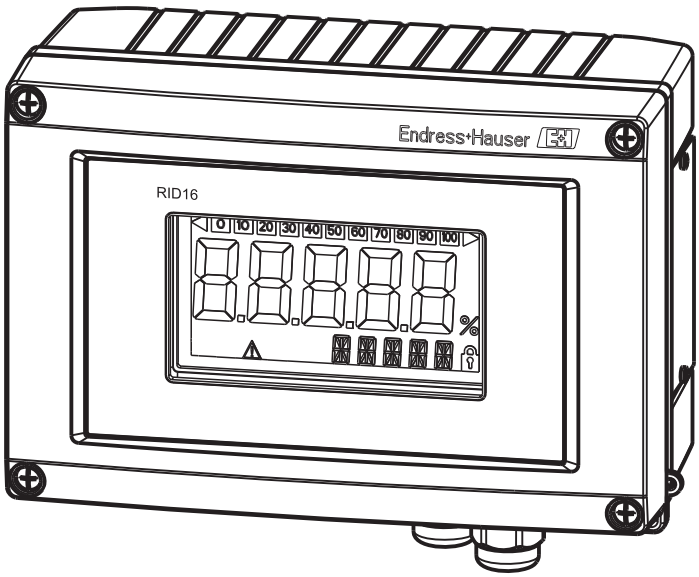
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

RID16

Field Indicator
with FOUNDATION Fieldbus™ – protocol



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Endress+Hauser
People for Process Automation

Brief overview

For quick and easy commissioning:

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1 Safety instructions

1.1 Designated use

- The device is a configurable field indicator with fieldbus connection.
- The device is designed for installation in the field.
- The manufacturer does not accept liability for damage caused by improper or non-designated use.
- Safe operation is only guaranteed if the Operating Instructions are observed and adhered to.
- Only operate the device in the permitted temperature range.

1.2 Installation, commissioning, operation

Note the following points:
- Mounting, electrical installation, commissioning and maintenance of the device must only be carried out by trained technical personnel authorised to perform such work by the owner-operator. They must have read and understood these Operating Instructions and must follow the instructions they contain.
- The device must be operated by persons authorised and trained by the facility's owner-operator. Strict compliance with the instructions in these Operating Instructions is mandatory.
- The installer must ensure that the measuring system is correctly wired in accordance with the wiring diagrams.
- Invariably, local regulations governing the opening and repair of electrical devices apply.

1.3 Operational safety

The measuring system complies with the general safety requirements in accordance with EN 61010 and the EMC requirements of EN 61326 and NAMUR Recommendations NE 21.

Hazardous area

Measuring systems for use in hazardous environments are accompanied by separate “Ex documentation”, which is an integral part of these Operating Instructions. Strict compliance with the installation instructions and connection values as stated in this supplementary documentation is mandatory.

1.4 Return

To reuse later or in case of repair, the device must be packed in protective packaging, preferably the original packaging. Repairs must only be carried out by your supplier's service organisation or specially trained personnel.
Enclose a note describing the fault and the application when sending the unit in for repair.

Please inform the haulier and the supplier if the goods are damaged in transport.

1.5 Notes on safety conventions and icons

The safety instructions in these Operating Instructions are labelled with the following safety icons and symbols:

Warning!
This symbol indicates an action or procedure which, if not performed correctly, can result in injury, a safety hazard or the destruction of the device.

Caution!
This symbol indicates an action or procedure which, if not performed correctly, can result in incorrect operation or the destruction of the device.

Note!
This symbol indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

Explosion protected, type-examined equipment
If this sign is on the nameplate of the device, the device can be used in a hazardous area.

Safe area (non-hazardous area)
In the drawings in these Operating Instructions, this symbol indicates the non-hazardous area. Devices in the non-hazardous area must also be certified if connecting cables lead into the hazardous area.

ESD - Electrostatic discharge
Protect the terminals against electrostatic discharge. Failure to comply with this instruction can result in the destruction of parts or malffunction of the electronics.

2 Identification

2.1 Device designation

2.1.1 Nameplate

The right device?
Compare the order code on the nameplate of the device to that on the delivery papers.

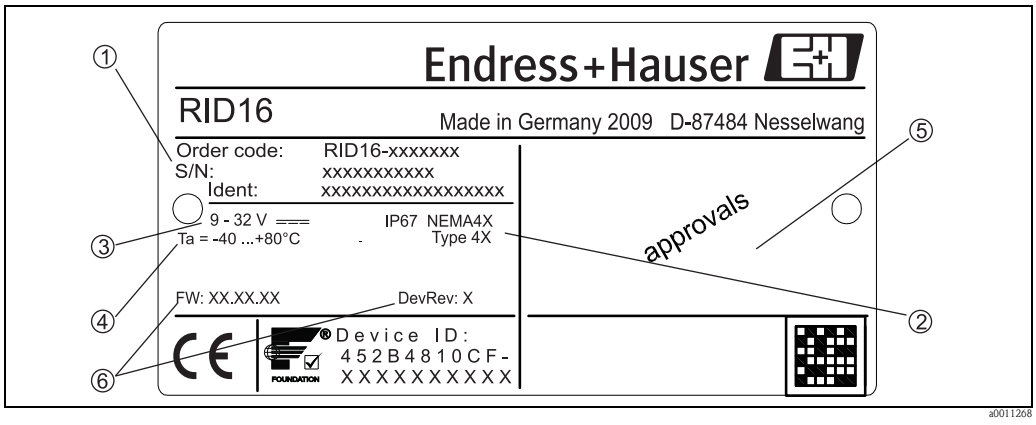

Fig. 1: Nameplate of the field indicator (example)

1 Designation, order code and serial number of the device
2 Degree of protection and approvals
3 Power supply
4 Ambient temperature
5 Approvals
6 Firmware version and device revision

2.2 Scope of delivery

The scope of delivery of the field indicator comprises:
- Field indicator
- Mounting plate for cable gland (only plastic housing)
- Cable gland
- Brief operating instructions as hardcopy
- Operating instructions on CD-ROM
- ATEX Safety Instructions for deploying a device permitted for use in hazardous areas, optional
- Accessories (eg. pipe mounting kit), see chapter 'Accessories'

2.3 Certificates and approvals

CE mark, declaration of conformity

The field indicator 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 device meets the relevant standards and directives as per EN 61 010 "Safety requirements for electrical equipment for measurement, control and laboratory use".
The device described in these Operating Instructions thus meets the legal requirements of the EU directives. The manufacturer confirms that the device has been tested successfully by affixing the CE mark.

Recognized component to UL 3111-1 (pending).
CSA General Purpose (pending).

2.3.1 Certification Foundation Fieldbus™

The field indicator has successfully passed all the tests and is certified and registered by the Fieldbus Foundation. The device meets all the requirements of the following specifications:

- Certified in accordance with FOUNDATION Fieldbus™ specification
- FOUNDATION Fieldbus™ H1
- Interoperability Test Kit (ITK), revision status 5.2.0 (device certification number available on request): the device may also be operated using certified devices from other manufacturers
- Physical Layer Conformance Test of the Fieldbus FOUNDATION™ (FF-830 FS 1.0)

2.4 Registered trademarks

FOUNDATION Fieldbus™
Registered trademark of the Fieldbus Foundation Austin, Texas, USA

3 Installation

3.1 Incoming acceptance, transport, storage

The permitted ambient and storage conditions must be observed. The precise specifications can be found in Section "Technical data".

3.1.1 Incoming acceptance

On receipt of the goods, check the following points:
- Are the packaging or contents damaged?
- Is anything missing from the delivery? Compare the scope of delivery with the information you specified in the order. See also section 2.2 "Scope of delivery".

3.1.2 Transportation and storage

Note the following points:
- Pack the device so that is protected against impact for storage and transportation. The original packaging provides optimum protection.
- The permitted storage temperature range is -40 to +80°C (-40 to +176 °F); it is possible to store the device in the limit temperature ranges for a limited period (maximum 48 hours).

3.2 Installation conditions

The process indicator is designed to be used in the field.
The orientation is determined by the readability of the display. Cable entries are located on the bottom of the device.
Operational temperature range:
-40 to +80 °C (-40 to +176 °F)

Caution!
If the device is operated in the upper temperature limit range, this reduces the operating life of the indicator.

Note!
The display may react slowly at temperatures below -20 °C (-4 °F).
Readability of the display cannot be guaranteed at temperatures below -30 °C (-22 °F).

3.2.1 Dimensions

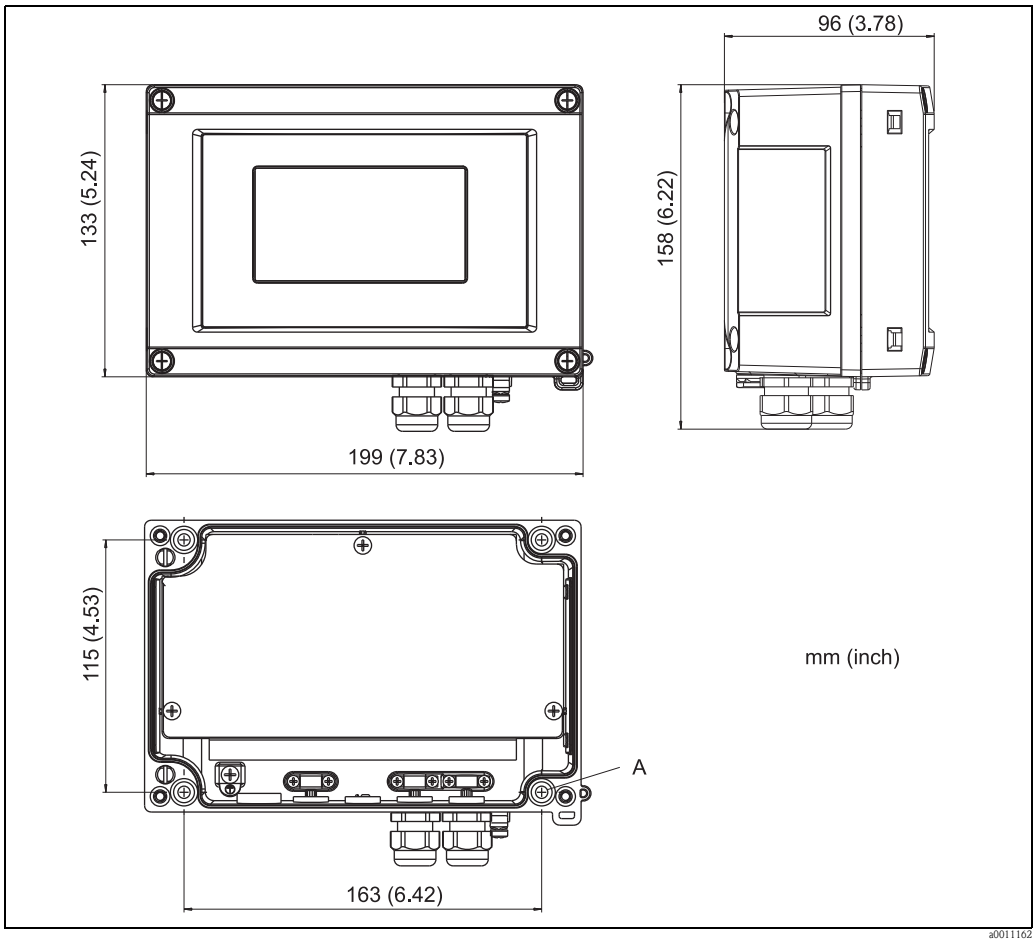

Fig. 2: Installation dimensions; dimensions in mm (dimensions in inches in brackets)

A: Bore hole for mounting to wall or optional mounting plate with 4 srews Ø5 mm (0.2")

3.2.2 Installation location

Information on conditions that must be present at the installation location to mount the device correctly can be found in Section 'Technical data'. These include the ambient temperature, degree of protection, climate class etc.

3.3 Mounting instructions

The device can be mounted directly on the wall or the optional mounting plate can be used for wall or pipe mounting (→ 3).

3.3.1 Direct wall mounting

Proceed as follows to mount the device directly on the wall:
- Drill 4 holes
- Attach the device to the wall with 4 screws (Ø5).

3.3.2 Pipe mounting

The mounting bracket is suited for pipes with a diameter between 1" - 5". The mounting kit consists of a mounting plate (item 1), 2 clamps (item 2) and 4 screws (item 3) (→ 3 and → 4). To install the field indicator on a pipe, proceed as follows:

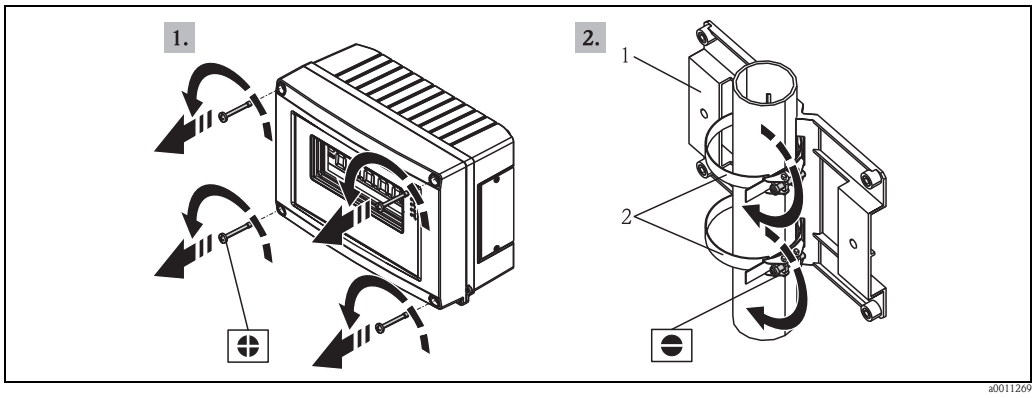

Fig. 3: Mounting the field indicator on a pipe with mounting bracket, steps 1.-2.

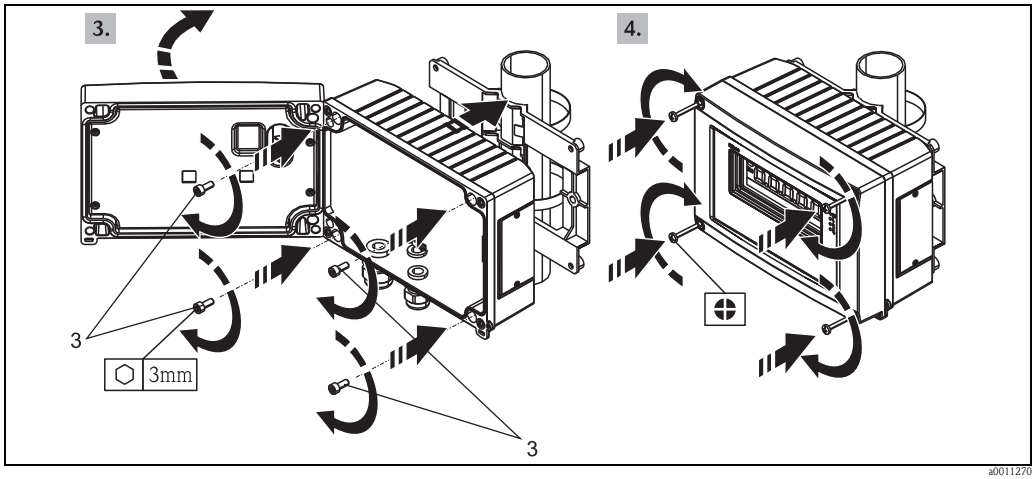

Fig. 4: Mounting the field indicator on a pipe with mounting bracket, steps 3.-4.

Mounting kit, consisting of:
Item 1:Mounting plate
Item 2:Clamps for pipe mounting
Item 3:4 screws

3.4 Post-installation check

After installing the device, always run the following final checks:

Device condition and specifications	Notes
Is the device damaged?	Visual check
Is the sealing ring undamaged?	Visual check
Is the device fixed securely to the wall or mounting plate?	-
Is the front cover fixed tightly?	-
Does the device comply with the measurement point specifications, e.g. ambient temperature etc.?	See Section 'Technical data'

4 Wiring

Caution!
- Switch off power supply before installing or connecting the device. Failure to observe this may result in destruction of parts of the electronics.
- When installing Ex-approved devices in a hazardous area please take special note of the instructions and connection schematics in the respective Ex documentation added to these Operating Instructions. The local E+H representative is available for assistance if required.
- The 4-pin post connector is only designed for connecting the associated display. Connecting other devices can destroy parts of the electronics.

Devices can be connected to the FOUNDATION Fieldbus™ in two ways:

- Connection via conventional cable gland → Chap. 4.2.1
- Connection via fieldbus connector (optional, can be purchased as an accessory) → Chap. 4.2.2

4.1 Connecting the cable to the field indicator

4.1.1 Mounting the cable gland or fieldbus connector in the plastic housing

Firstly, open one of the knock-outs provided on the bottom of the housing. Use a suitable tool, e.g. a screwdriver.

Caution!
Open the knock-out at room temperature. At very low temperature the housing might be damaged.

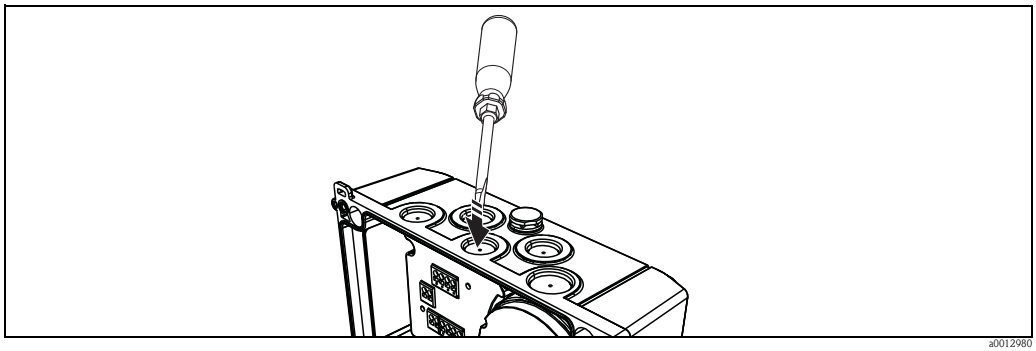

Fig. 5: Opening a knock-out on the bottom of the field indicator

Proceed as follows for mounting (→ 7):

1. Open the housing front of the field housing.

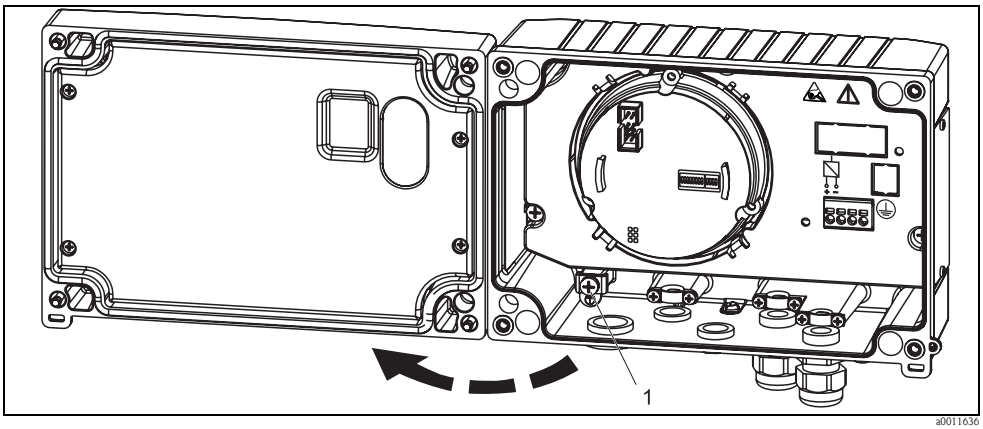

Fig. 6: Opening the housing of the field indicator

1 internal grounding terminal (only aluminum housing)

2. Insert the mounting plate (threaded anchor plate) for cable glands and fieldbus connector. The mounting plate is supplied with the field indicator, see Scope of delivery.
3. Install the cable gland or the fieldbus connector into the mounting plate. A cable gland is supplied with the field indicator, see Scope of delivery. The fieldbus connector is available as an accessory.

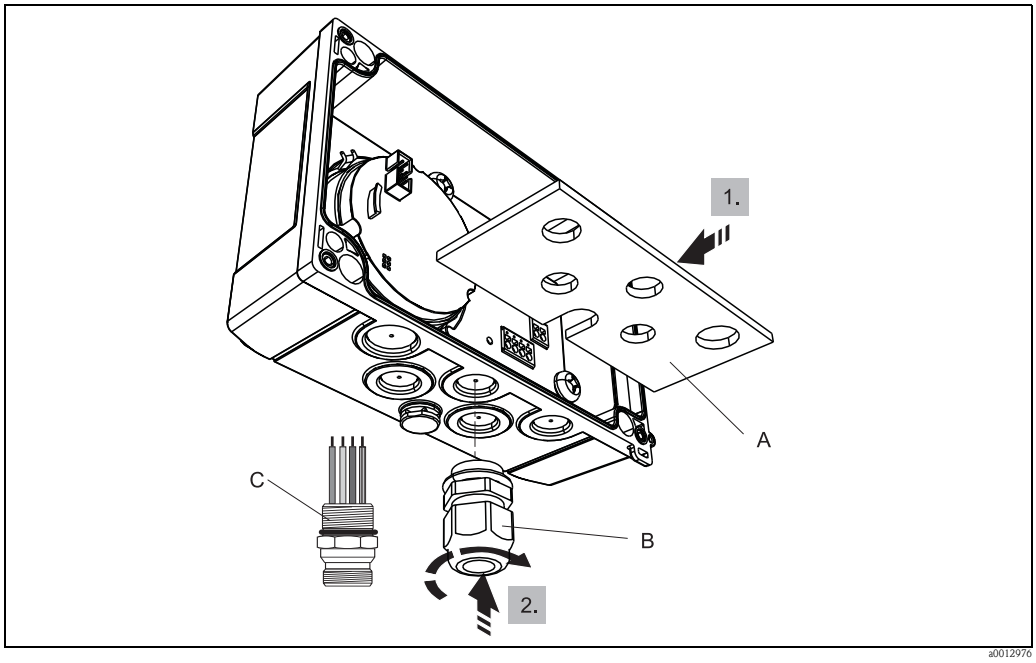

Fig. 7: Mounting the cable gland or the fieldbus connector

A Mounting plate
B Cable gland
C Fieldbus connector

4.1.2 Mounting the cable gland or fieldbus connector in the aluminum housing

With the aluminum housing, the cable gland or the fieldbus connector can be screwed directly into the housing. No mounting plate is required.

4.1.3 Quick wiring guide

Wiring the field indicator with cable gland:

1. Open the housing and the cable gland of the field indicator.
2. Feed the cables through the opening in the cable gland.
3. Connect the cables as shown in → 8.
4. Retighten the cable gland and close the housing cover.

Terminal assignment

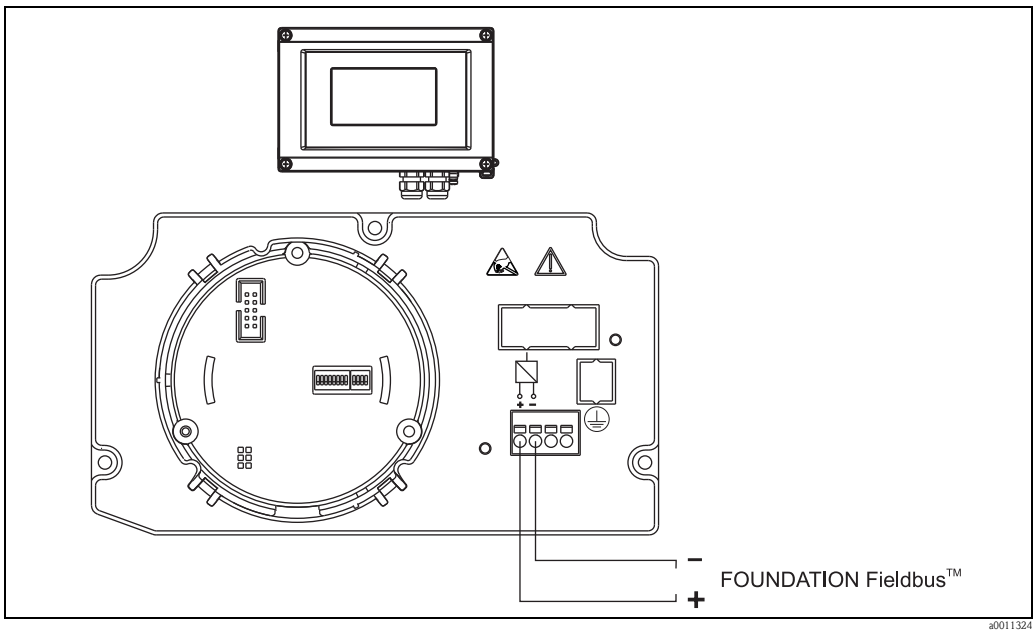

Fig. 8: Terminal assignment

ESD – electrostatic discharge
Protect the terminals from electrostatic discharge. Failure to observe this may result in destruction or malfunction of parts of the electronics.

Terminal	Terminal assignment
+	FOUNDATION Fieldbus™ connection (+)
-	FOUNDATION Fieldbus™ connection (-)

4.2 Connection to the FOUNDATION Fieldbus™

Devices can be connected to the FOUNDATION Fieldbus™ in two ways:

- Connection via conventional cable gland → Chap. 4.2.1
- Connection via fieldbus connector (optional, can be purchased as an accessory) → Chap. 4.2.2

Caution!
- Switch off power supply before installing or connecting the field indicator. Failure to observe this may result in destruction of parts of the electronics.
- Grounding via one of the grounding screws is recommended.
- Risk of damaging the fieldbus cable!
  - If the shielding of the fieldbus cable is grounded at more than one point in systems without additional potential matching, power supply frequency equalizing currents can occur that damage the cable or the shielding. In such cases the shielding of the fieldbus cable is to be grounded on only one side, i.e. it must not be connected to the ground terminal of the housing. The shield that is not connected should be insulated!
  - We recommend that the fieldbus not be looped using conventional cable glands. If you later replace even just one measuring device, the bus communication will have to be interrupted.

4.2.1 Cable glands or entries

Note!
Please also observe the general procedure on → 10.

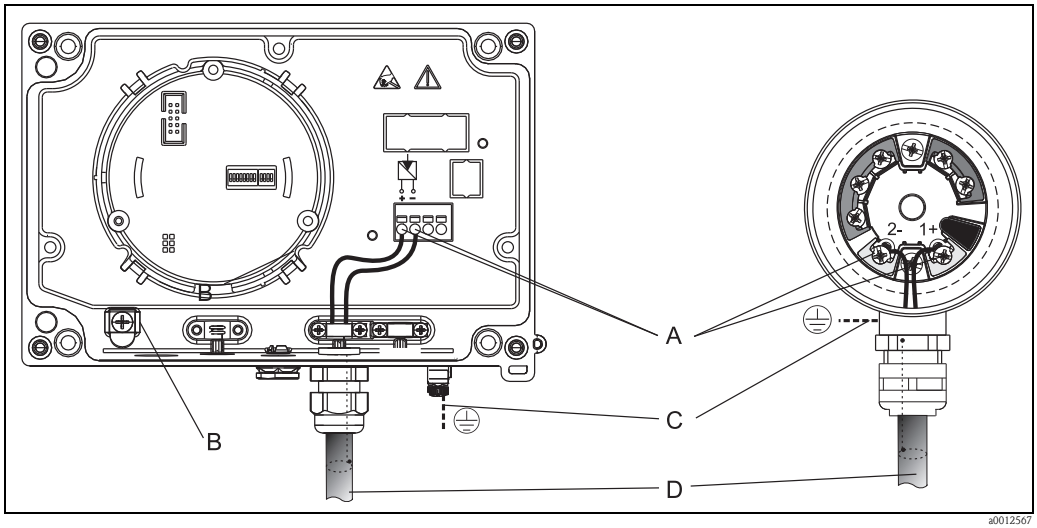

Fig. 9: Connection to the FOUNDATION Fieldbus™ fieldbus cable

A FF terminals - fieldbus communication and power supply
B Inner ground terminal (only aluminum housing)
C Outer ground terminal
D Shielded fieldbus cable (FOUNDATION Fieldbus™)

Note!
- The terminals for the fieldbus connection (1+ and 2-) are not polarity sensitive.
- Conductor cross-section:
  - Max. 2.5 mm^2 for screw terminals
- A shielded cable must be used for the connection.

4.2.2 Fieldbus connector

Optionally, a fieldbus connector can be installed in field housing instead of a cable gland. Fieldbus connectors can be ordered from Endress+Hauser as an accessory (see Section 8 'Accessories').

The connection technology of FOUNDATION Fieldbus™ allows measuring devices to be connected to the fieldbus via uniform mechanical connections such as T-boxes, junction boxes, etc.

This connection technology using prefabricated distribution modules and plug-in connectors offers substantial advantages over conventional wiring:
- Field devices can be removed, replaced or added at any time during normal operation. Communication is not interrupted.
- Installation and maintenance are significantly easier.
- Existing cable infrastructures can be used and expanded instantly, e.g. when constructing new star distributors using 4-channel or 8-channel distribution modules.

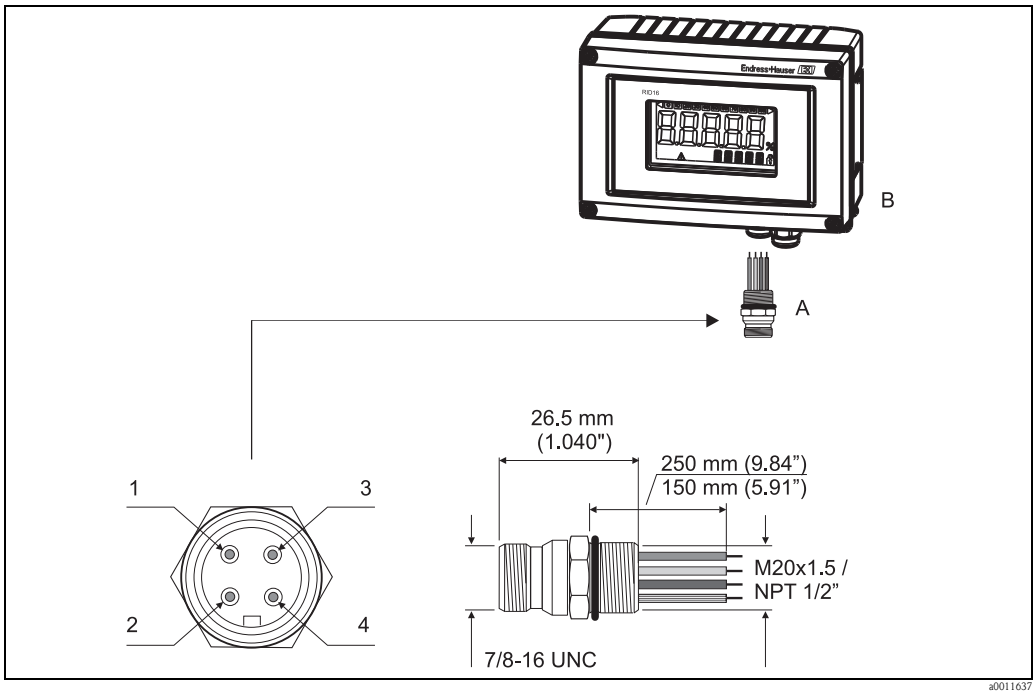

Fig. 10: Connectors for connecting to the FOUNDATION Fieldbus™

A Fieldbus connector
- *1 Blue wire: FF– (terminal 2)*
- *2 Brown wire: FF+ (terminal 1)*
- *3 Gray wire: shielding*
- *4 Green/yellow wire: ground*

B Field indicator

Connector technical data:
- Degree of protection IP 67 (NEMA 4x)
- Ambient temperature range: –40 to +105 °C (–40 to +221 °F)

4.3 FOUNDATION Fieldbus™ cable specification

4.3.1 Cable type

Twin-core cables are required for connecting the device to the FOUNDATION Fieldbus™ H1. Following IEC 61158-2 (MBP), four different cable types (A, B, C, D) can be used with the FOUNDATION Fieldbus™, only two of which (cable types A and B) are shielded.

- Cable types A or B are particularly preferable for new installations. Only these types have cable shielding that guarantees adequate protection from electromagnetic interference and thus the most reliable data transfer. In the case of cable type B, several field buses (same degree of protection) may be operated in one cable. No other circuits are permissible in the same cable.
- Practical experience has shown that cable types C and D should not be used due to the lack of shielding, since the freedom from interference generally does not meet the requirements described in the standard.

The electrical data of the fieldbus cable have not been specified but determine important characteristics of the design of the fieldbus, such as distances bridged, number of users, electromagnetic compatibility, etc.

	Type A	Type B
Cable structure	Twisted pair, shielded	One or more twisted pairs, fully shielded
Wire size	0.8 mm^2 (AWG 18)	0.32 mm^2 (AWG 22)
Loop-resistance (direct current)	44 Ω/km	112 Ω/km
Characteristic impedance at 31.25 kHz	100 Ω ± 20%	100 Ω ± 30%
Attenuation constant at 39 kHz	3 dB/km	5 dB/km
Capacitive asymmetry	2 nF/km	2 nF/km
Envelope delay distortion (7.9 to 39 kHz)	1.7 ms/km	*
Shield coverage	90%	*
Max. cable length (incl. spurs >1 m)	1900 m (6233 ft)	1200 m (3937 ft)
* Not specified		

Suitable fieldbus cables (type A) from various manufacturers for non-hazardous areas are listed below:
- Siemens: 6XV1 830-5BH10
- Belden: 3076F
- Kerpen: CeL-PE/OSCR/PVC/FRLA FB-02YS(ST)YFL

4.3.2 Maximum overall cable length

The maximum network expansion depends on the type of protection and the cable specifications. The overall cable length combines the length of the main cable and the length of all spurs (>1 m/ 3.28 ft). Note the following points:

- The maximum permissible overall cable length depends on the cable type used.
- If repeaters are used, the maximum permissible cable length is doubled. A maximum of three repeaters are permitted between user and master.

4.3.3 Maximum spur length

The line between the distribution box and field device is described as a spur.
In the case of non-Ex applications, the max. length of a spur depends on the number of spurs (>1 m/3.28 ft):

Number of spurs	1 to 12	13 to 14	15 to 18	19 to 24	25 to 32
Max. length per spur	120 m (393 ft)	90 m (295 ft)	60 m (196 ft)	30 m (98 ft)	1 m (3.28 ft)

4.3.4 Number of field devices

In accordance with IEC 61158-2 (MBP), a maximum of 32 field devices can be connected per fieldbus segment. However, this number is restricted under certain conditions (explosion protection, bus power option, field device current consumption). A maximum of four field devices can be connected to a spur.

4.3.5 Shielding and grounding

Optimum electromagnetic compatibility (EMC) of the fieldbus system can only be guaranteed if the system components and, in particular, the lines are shielded and the shield forms as complete a cover as possible.

- To ensure an EMC protective effect, connect the shield as often as possible to the reference ground.
- For reasons of explosion protection, you should refrain from grounding however.

To comply with both requirements, the FOUNDATION Fieldbus™ basically allows three different types of shielding:
- Shielding at both ends
- Shielding at one end on the feed side with capacitance connection to the field device
- Shielding at one end on the feed side

Experience shows that the best results with regard to EMC are achieved in most cases in installations with one-sided shielding. Appropriate measures with regard to input wiring must be taken to allow unrestricted operation when EMC interference is present. These measures have been taken into account for this device. Operation in the event of disturbance variables as per NAMUR NE21 is possible with one-sided shielding.
Where applicable, national installation regulations and guidelines must be observed during the installation!
Where there are large differences in potential between the individual grounding points, only one point of the shielding is connected directly with the reference ground. In systems without potential equalization, therefore, cable shielding of fieldbus systems should only be grounded on one side, for example at the fieldbus supply unit or at safety barriers, → 11

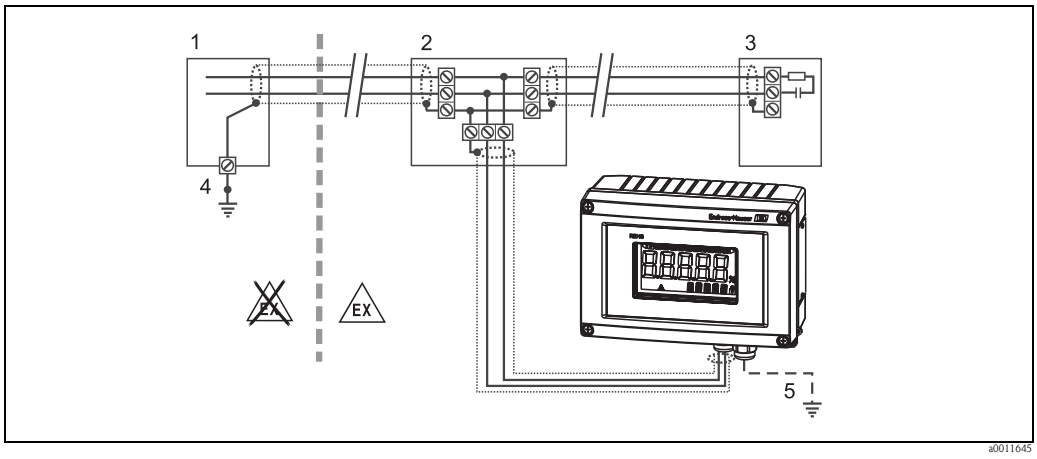

Fig. 11: Shielding and one-sided grounding of the fieldbus cable shielding

1 Supply unit
2 Distribution box (T-box)
3 Bus terminator
4 Grounding point for fieldbus cable shielding
5 Optional grounding of the field device, isolated from cable shielding.

Caution!
If the shielding of the cable is grounded at more than one point in systems without potential matching, power supply frequency equalizing currents can occur that damage the bus cable or shielding or have a serious effect on signal transmission. In such cases the shielding of the fieldbus cable is to be grounded on only one side, i.e. it must not be connected to the ground terminal of the housing (terminal head, field housing). The shield that is not connected should be insulated!

4.3.6 Bus termination

The start and end of each fieldbus segment are always to be terminated with a bus terminator. With various junction boxes (non-Ex), the bus termination can be activated via a switch. If this is not the case, a separate bus terminator must be installed. Note the following points in addition:
- In the case of a branched bus segment, the device furthest from the Fieldbus power supply represents the end of the bus.
- If the fieldbus is extended with a repeater, then the extension must also be terminated at both ends.

4.3.7 Further information

General information and further points on wiring can be found on www.fieldbus.org, the Web site of the Fieldbus Foundation or in the Operating Instructions "FOUNDATION Fieldbus™ Overview" which can also be found on the CD-ROM. (Additional sources: → www.endress.de → Download).

4.4 Degree of protection

The devices fulfill all the requirements for IP 67 degree of protection. Compliance with the following points is mandatory following installation or servicing in order to ensure that IP 67 protection is maintained:

- The housing seal must be clean and undamaged when inserted into the seal groove. The seal may have to be cleaned, dried or replaced.
- The cables used for connection must be of the correct specified outside diameter (e.g. M16 x 1.5, cable diameter from 5 to 10 mm).
- Replace any unused cable entries with dummy plugs.
- The grommet used should not be removed from the cable entry.
- The housing cover and the cable entry must be well tightened.
- Install the device upright in such a way that the cable entries point downwards.

4.5 Post-connection check

After the electrical installation of the device, always perform the following final checks:

Device condition and specifications	**Notes**
Are the indicator or the cables damaged (visual check)?	-
Electrical connection	**Notes**
Does the supply voltage match the specifications on the nameplate?	9 to 32 V DC
Do the cables used comply with the specifications?	Fieldbus cable, → 15
Do the cables have adequate strain relief?	-
Are the power supply cables correctly connected?	→ Chap. 4.1.3
Are all the screw terminals well tightened?	→ 15
Are all the cable entries installed, tightened and sealed? Cable run with "water trap"?	
Are all the housing covers installed and tightened?	
Electrical connection of FOUNDATION Fieldbus™	Notes
Are all the connecting components (T-boxes, junction boxes, connectors, etc.) connected with each other correctly?	-
Has each fieldbus segment been terminated at both ends with a bus terminator?	-
Has the max. length of the fieldbus cable been observed in accordance with the FOUNDATION Fieldbus™ specifications?	→ 15
Has the max. length of the spurs been observed in accordance with the FOUNDATION Fieldbus™ specifications?	
Is the fieldbus cable fully shielded (90%) and correctly grounded?	

5 Operating the field indicator

5.1 Quick operation guide

You have a number of options for configuring and commissioning the device:

1. Configuration programs
The configuration of FF functions and device-specific parameters is done via the fieldbus interface. You can obtain special configuration and operating programs from various manufacturers for these purposes.→ 📄 23

2. Miniature switches (DIP switches) for diverse hardware settings
You can make the following hardware settings for the FOUNDATION Fieldbus™ interface using miniature switches (DIP switches) inside the field indicator housing → 📄 25:

- Switching the hardware write protection on/off

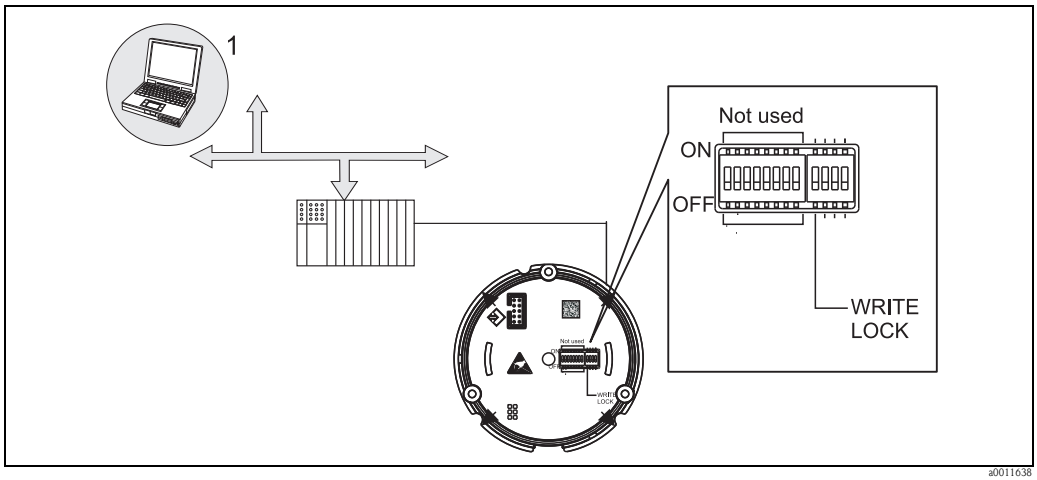

Fig. 12: Field indicator hardware configuration

5.1.1 Listener mode

The field indicator will analyze the active devices on the bus. Those will be listed and for up to 8 channels the according device can be chosen by its address. For this device the published values will be reported and the value to be shown on the display can be chosen.

5.1.2 Function block connection mode

In function block connection mode, a published value that is subscribed by a function block within the field indicator can be displayed. This can be IN and OUT parameters in the function blocks.

5.2 Display and operating elements

5.2.1 Display

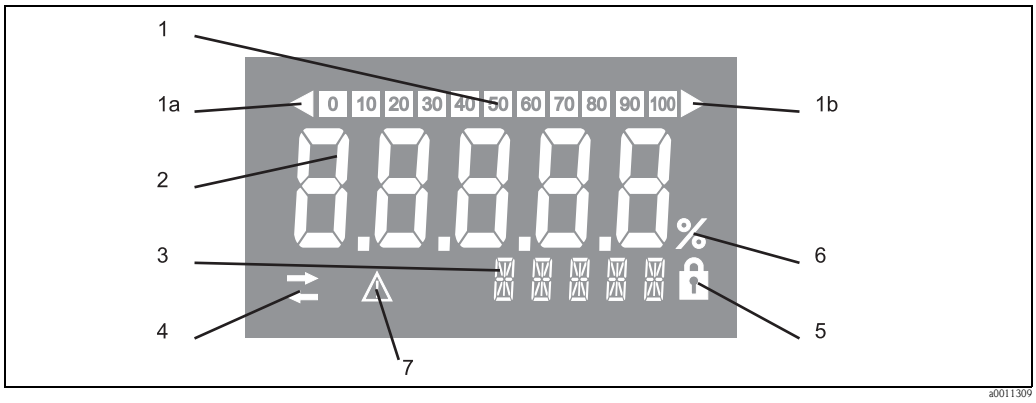

Fig. 13: LC display of the field indicator

Item 1: bar graph display in increments of 10% with indicators for underranging (item 1a) and overranging (item 1b)
Item 2: measured value display, digit height 26 mm (1.02"), status indication "Bad measured value status"
Item 3: 14-segment display for units and messages
Item 4: 'Communication' symbol
Item 5: 'Parameters cannot be modified' symbol
Item 6: '%' unit
Item 7: 'Uncertain measured value status' symbol

The backlit LCD display contains a bargraph (0–100) and arrows to indicate measurements above or below the measurement range. Analog process values, digital status and failure codes will be displayed in the 7-segment area. Here up to 8 values can be displayed with a alternating time between 2 to 20 seconds. Plain text can be displayed in the 14-segment area (text is limited to up to 16 characters and will be scrolled if needed).
The indicator also displays the quality of the measured value. In case the status of the displayed value is 'Good' (a value equal to or above 0x80), no symbol is lit and the indicator works in normal operation. If the status of the displayed value is 'Uncertain' (value between 0x40 and 0x7F), the 'Uncertain measured value status' symbol is lit. If the status of the displayed value is 'Bad' (value below 0x40), the display will show within the 7-segment area "bad-" and the channel number where the bad value is published. This channel number can also be found in the 14-segment area.

5.3 FOUNDATION Fieldbus™ technology

The FOUNDATION Fieldbus™ (FF) is a purely digital, serial communication system that connects fieldbus devices (sensors, actuators), automation and process control systems with each other. As a local communications network (LAN) for field devices the FF was primarily designed for the requirements of process technology. The FF thus forms the basic network throughout the hierarchy of a communication system.
Please refer to Operating Instructions BA 013S/04/en “FOUNDATION Fieldbus Overview: Installation and Commissioning Guidelines” for configuration information.

5.3.1 System architecture

The following figure shows an example of a FOUNDATION Fieldbus™ network with the associated components.

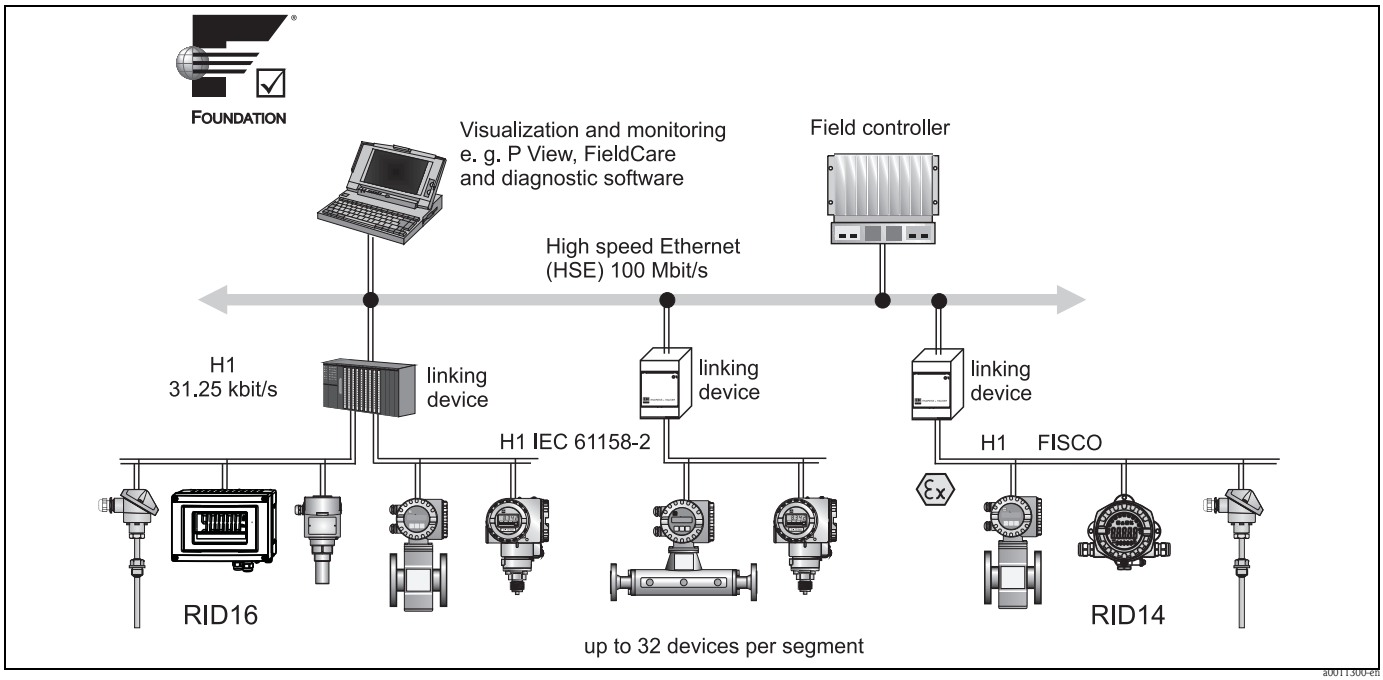

Fig. 14: System integration via FOUNDATION Fieldbus™

HSE = High Speed Ethernet, H1 = FOUNDATION Fieldbus-H1

The following system connection options are possible:
- *A linking device can be used to connect to higher ranking fieldbus protocols (e.g. to the High Speed Ethernet - HSE) (Control Net)*
- *A H1 card is required for direct connection to a process control system.*
- *System inputs are available directly for H1 (HSE).*

The system architecture of the FOUNDATION Fieldbus™ can be divided into two subnetworks:

H1 bus system:
In the field, fieldbus devices are connected only via the slower H1 bus system that is specified following IEC 61158-2. The H1 bus system allows simultaneous feed to the field devices and data transfer on the two-wire line.
The following points describe some important characteristics of the H1 bus system:

- All fieldbus devices are powered via the H1 bus. Like the fieldbus devices, the power supply is connected in parallel to the bus line. Devices requiring external power must use a separate power supply.
- One of the most common network structures is the line structure. Star, tree or mixed network structures are also possible using connecting components (junction boxes).
- The bus connection to the individual fieldbus devices is achieved by means of a T-connector or via a spur. This has the advantage that individual fieldbus devices can be connected or disconnected without interrupting the bus or the bus communication.
- The number of connected fieldbus devices depends on various factors, such as use in hazardous areas, length of spur, cable types, current consumption of field devices etc. (see → 15).
- If using fieldbus devices in a hazardous area, the H1 bus must be equipped with an intrinsically safe barrier before the transition to the hazardous area.
- A bus terminator is required at each end of the bus segment.

High Speed Ethernet (HSE):
The superior bus system is realized via the High Speed Ethernet (HSE) with a transmission rate of max. 100 MBit/s. This serves as the 'backbone' (basic network) between various local sub-networks and/or where there is a large number of network users.

5.3.2 Link Active Scheduler (LAS)

The FOUNDATION Fieldbus™ works according to the 'producer-consumer' relationship. This provides various advantages.
Data can be directly exchanged between field devices, e.g. a sensor and an actuating valve. Each bus user 'publishes' its data on the bus and all the bus users configured accordingly obtain this data. Publication of this data is carried out by a 'bus administrator' known as the 'Link Active Scheduler', which controls the sequence of bus communication centrally. The LAS organizes all the bus activities and sends appropriate commands to the individual field devices.

Other tasks of the LAS are:
- Recognition and reporting of newly connected devices.
- Reporting the removal of devices no longer communicating with the fieldbus.
- Keeping the 'Live List'. This list, in which all the fieldbus users are recorded, is checked by the LAS regularly. If devices are logged on or logged off, the "Live List" is updated and sent immediately to all the devices.
- Requesting process data from the field devices in accordance with a fixed schedule.
- Allocation of send rights (tokens) to devices between the untimed data transfer.

The LAS can be run redundantly, i.e. it exists both in the process control system and in the field device. If one LAS fails, the other LAS can accurately take over communication. Through precise timing of the bus communication via the LAS, the FF can run exact processes at regular intervals.

Note!
Fieldbus devices, such as this field indicator, which can take over the LAS function in the event of failure of the primary master, are called 'Link Masters'. In contrast, 'Basic Devices' can only receive signals and send them to the central process control system. The LAS function is deactivated in this field indicator when the unit is delivered.

5.3.3 Data transfer

We distinguish between two types of data transfer:
- **Scheduled data transfer (cyclic):** all time-critical process data (i.e. continuous measurement or actuating signals) are transferred and processed in accordance with a fixed schedule.
- **Unscheduled data transfer (acyclic):** device parameters that are not time-critical for the process and diagnosis information are only transferred to the fieldbus when needed. This data transfer is always carried out in the intervals between timed communication.

5.3.4 Device ID, addressing

Within the FF network, each fieldbus device is identified by a unique device ID (DEVICE_ID). The fieldbus host system (LAS) automatically gives the network address for this to the field device. The network address is the address that the fieldbus currently uses.

The FOUNDATION Fieldbus™ uses addresses between 0 and 255:
- **0 to 15** are reserved.
- **16 to 247** are available for permanent devices. Some host systems may further subdivide this range. This range is typically shortened for efficiency.
- **248 to 251** are available for devices with no permanent address such as new devices or decommissioned devices.
- ***252 to 255*** are available for temporary devices, such as handhelds.

The field device tag name (PD_TAG) is given to the device in question during commissioning (see → 27). It remains stored in the device even during a supply voltage failure.

5.3.5 Function blocks

The FOUNDATION Fieldbus™ uses predefined function blocks to describe the functions of a device and to specify uniform data access. The function blocks implemented in each fieldbus device provide information on the tasks which a device can accept in the whole of the automation strategy.

In the case of sensors these are typically the following blocks:
- 'Analog Input' or
- 'Discrete Input' (digital input)

Actuating valves normally have the function blocks:
- 'Analog Output' or
- 'Discrete Output' (digital output)

For control tasks there are the blocks:
- PD controller or
- PID controller

More information on this can be found from Section 11 onwards.
In the field indicator, the following function blocks are available:
- Input selector
- PID
- Integrator
- Arithmetic

5.3.6 Fieldbus based process control

With the FOUNDATION Fieldbus™ field devices can carry out simple process control functions themselves, thereby relieving pressure on the superior process control system. Here the Link Active Scheduler (LAS) coordinates data exchange between the sensor and controller and makes sure that two field devices cannot access the bus at the same time. To do this, configuration software such as the NI-FBUS Configurator from National Instruments is used to connect the various function blocks to the desired control strategy – generally graphically (→ 27).

5.3.7 Device description

For commissioning, diagnosis and configuration, make sure that process control systems or superior configuration systems can access all device data and that the operating structure is uniform.
The device-specific information required for this is stored as so-called device description data in special files (the 'Device Description'- DD). This enables the device data to be interpreted and shown via the configuration program. The DD is thus a kind of 'device driver'.
On the other hand, a CFF file (CFF = Common File Format) is required for the network configuration in the OFF-line mode.
These files can be acquired as follows:

– Free of charge via the Internet: www.endress.com
– Via the Fieldbus Foundation Organization: www.fieldbus.org

5.4 Configuration of the indicator and FF functions

The FF communication system will only function properly if correctly configured. You can obtain special configuration and operating programs from various manufacturers for the configuration.

Process control systems	Asset management systems
Endress+Hauser ControlCare	National Instruments NI-Configurator (≥ 3.1.1)
Emerson DeltaV	Emerson AMS and Handheld FC375
Rockwell Control Logix/FFLD	
Honeywell PKS Experion	
Yokogawa Centum CS3000	

These can be used for configuring both the FF functions and all of the device-specific parameters. The predefined function blocks allow uniform access to all the network and fieldbus device data.

Note!
A detailed step-by-step description of the procedure for commissioning the FF functions is given on → 27 together with information on configuring device-specific parameters.

System files

You require the following files for commissioning and configuring the network:
- Commissioning → device description (DD: *.sym, *.ffo)
- Network configuration → CFF file (Common File Format)

5.5 Hardware settings

DIP switches inside the field indicator housing are used to enable and disable hardware write protection. When write protection is active, parameters cannot be modified. The current write protection status is displayed in the WRITE_LOCK parameter (Resource Block, see Section 11).

ESD – electrostatic discharge
Protect the terminals from electrostatic discharge. Failure to observe this may result in destruction or malfunction of parts of the electronics.

To set the DIP switches, proceed as follows:

1. Open the housing by removing the front cover.
2. Configure the DIP switch on the electronics accordingly. Switch to ON = function enabled, switch to OFF = function disabled.
3. Close the housing front cover and secure it with the 4 screws.

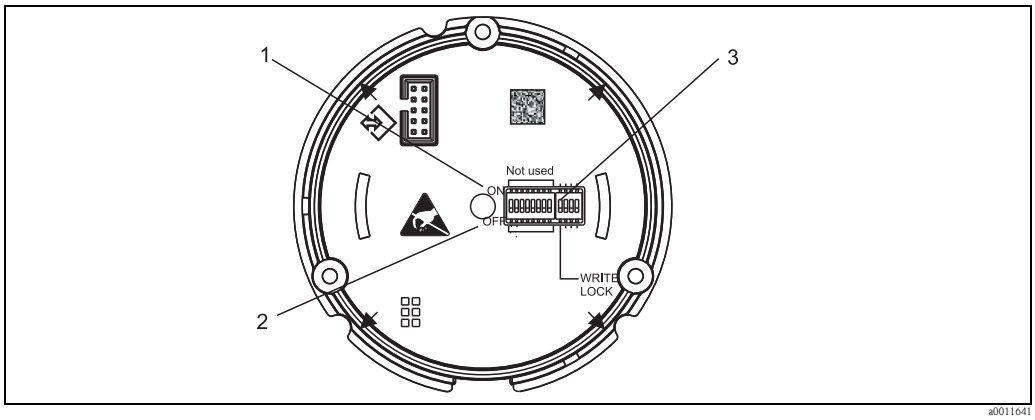

Fig. 15: Hardware settings via DIP switches

1 Switch position ON
2 Switch position OFF
3 Write lock

6 Commissioning

6.1 Function check

Before commissioning the measurement point make sure that all final checks have been carried out:
- Checklist “Post-installation check”, → 📄 9
- Checklist “Post-connection check”, → 📄 18

Note!
- The FOUNDATION Fieldbus interface's technical data must be maintained in accordance with IEC 61158-2 (MBP).
- The bus voltage of 9 to 32 V and the current consumption of approx. 11 mA at the indicator can be checked using a normal multimeter.

6.2 Switching on the indicator

Once the final checks have been successfully completed, it is time to switch on the supply voltage. The field indicator performs a number of internal test functions after power-up. As this procedure progresses, the following sequence of messages appears on the display:

Step	Display
1	All segments on
2	All segments off
3	Device name
4	Firmware version
5	Device revision
6a	A published value
6b	The current status message Note! If the switch-on procedure fails, the appropriate status message is displayed, depending on the cause. A detailed list of the status messages, as well as the measures for troubleshooting, can be found in Section 9, 'Troubleshooting'.

The device is ready for operation after approx. 8 seconds! Normal indicating mode commences as soon as the switch-on procedure is completed. Various measured values and/or status values appear on the display.

6.3 Commissioning

Note the following points:

- The files required for commissioning and network configuration can be obtained as described on → 📄 23.
- In the case of the FOUNDATION Fieldbus™, the device is identified in the host or configuration system by means of the device ID (DEVICE_ID). The DEVICE_ID is a combination of the manufacturer ID, device type and device serial number. It is unique and can never be assigned twice. The DEVICE_ID of the device is composed as follows:
  DEVICE_ID = 452B4810CF-XXXXXXXXXXX
  452B48 = Endress+Hauser
  10CF = RID1x
  XXXXXXXXXXX = device serial number (11-digit)

6.3.1 Initial commissioning

The indicator offers two operation modes – the listener mode or the standard function block connection.

Listener Mode	Function block connection
Quick commissioning - no function block connection required	Flexible integration
Pure display function	Universally applicable since all function blocks can be used
Less traffic on the bus	

Listener mode

In the Listener Mode the device will "listen to" values on the bus which have to be displayed. The device still has its own device address and is normally communicating on the FOUNDATION Fieldbus™. Although there is no function block connection within the device needed. For this the cyclic data on the bus will be analyzed and all publishing addresses on the bus will be analyzed and the publishing addresses within the range of 0x10 to 0x2F will be displayed in a parameter field. For each of the 8 channels a corresponding address can be chosen. In the following step the first published value of the chosen address will be listed. The chosen value will be displayed on the device.
If an address is publishing more than one value, the next value can be chosen manually. After reconfiguration of the bus or deletion of a publishing device, this address with an activated listener mode will generate a configuration error within the indicator. If only the displayed value of the device is no longer published, the indicator will switch automatically to the next available published value of the same address.

Note!
The Listener Mode of the device is activated in the Display Transducer Block (Display Value Settings of each channel). By default, the Listener Mode is activated in channel 1. The indicator will automatically display the first value of the publishing device with the lowest address.
In case the indicator is publishing, these values are not available in the listener mode. Please use the function block connection to display such values.

Function block connection

The following description takes you step by step through commissioning of the device and all necessary configurations for the FOUNDATION Fieldbus™.

1. Open the configuration program.
2. Load the device description files or the CFF file into the host system or the configuration program. Make sure you are using the right system files.
3. Note the DEVICE_ID on the device nameplate for identification in the process control system (see Section 2 'Identification').
4. Switch the device on.

The first time you establish a connection, the device reacts as follows in the configuration system:

– EH_RID14-xxxxxxxxxxx (tag name PD-TAG for RID14) or EH_RID16-xxxxxxxxxxx (tag name PD-TAG for RID16)
– 452B4810CF-xxxxxxxxxxx (DEVICE_ID)
– Block structure:

Block description	Permanent	Block class
Resource	YES	Extended
Display Transducer	YES	Manufacturer-specific
Advanced Diagnostic	YES	Manufacturer-specific
PID	NO	Standard

Block description	Permanent	Block class
Input Selector 1	NO	Standard
Input Selector 2	NO	Standard
Arithmetic	NO	Standard
Integrator	NO	Standard

Note!
The device is delivered from the factory with the bus address “247” and is thus in the address range for readdressing field devices. A lower bus address should be assigned to the device for commissioning.

5. Using the DEVICE_ID noted, identify the field device and assign the desired tag name (PD_TAG) to the fieldbus device in question.
   Factory setting:
   EH_RID14-xxxxxxxxxxx (for RID14, xxx... = serial number) or
   EH_RID16-xxxxxxxxxxx (for RID16, xxx... = serial number).

Configuring the "Resource Block" (base index 400)

6. Open the Resource Block.
7. When the device is delivered, the hardware write protection is disabled so the write parameters can be accessed via the FF. Check the status via the WRITE_LOCK parameter:
   – Write protection enabled = LOCKED
   – Write protection disabled = NOT LOCKED
   Disable the write protection if necessary, → 25.
8. Enter the desired name for the block (optional).
   Factory setting: RS_xxxxxxxxxxx
   Set the operating mode in the MODE_BLK parameter group (TARGET parameter) to AUTO.

Configuring the "Transducer Blocks"

The individual Transducer Blocks comprise various parameter groups arranged by device-specific functions:

Onsite display functions → Transducer Block “TB_DISP_xxxxxxxxxxx”
Advanced diagnostics → Transducer Block “TB_ADVDIAG_xxxxxxxxxx”

9. Enter the desired name for the block (optional). For factory settings, see the table above. Set the operating mode in the MODE_BLK parameter group (TARGET parameter) to AUTO.
10. Once you have specified the active LAS (→ 22) download all the data and parameters to the field device.
11. Set the operating mode in the MODE_BLK parameter group (TARGET parameter) to AUTO. This is only possible, however, under two conditions:
    – The function blocks are correctly connected to one another.
    – The Resource Block is in the AUTO operating mode.

System configuration / connecting function blocks:

12. A final “overall system configuration” is necessary so that the operating mode of the Input Selector, PID, Arithmetic, Integrator function blocks can be set to AUTO and the field device is integrated in the system application.
    For this purpose, configuration software, e.g. NI-FBUS Configurator from National Instruments, is used to connect the function blocks to the desired control strategy (mostly using graphic display) and then the time for processing the individual process control functions is specified.

7 Maintenance

No special maintenance work is required on the device.

8 Accessories

Various accessories, which can be ordered separately from your supplier, are available for the device. Detailed information on the order code in question can be obtained from your service organization. When ordering accessories, please specify the serial number of the device!

Type	Order number
Fieldbus connector (FF): ■ NPT ½" → 7/8" – 150 mm – 250 mm ■ M20 → 7/8" – 150 mm – 250 mm	 71005803 71005804 71005805 71005806
Pipe mounting kit ■ with plastic mounting plate ■ with stainless steel mounting plate	 71089844 71091611

9 Trouble-shooting

9.1 Troubleshooting instructions

Always start troubleshooting with the checklists below if faults occur after start up or during operation. This takes you directly (via various queries) to the cause of the problem and the appropriate remedial measures.

Note!
In the event of a serious fault, an indicator might have to be returned to the manufacturer for repair. Follow the instructions in → Chap. 9.4 before returning the indicator to Endress+Hauser.

Check local display	
No display visible - No connection to the fieldbus host system	1. For fault elimination, see below: 'Faulty connection to the fieldbus host system' 2. Other possible causes of errors: – Electronics module defective ➞ Test with spare electronics module ➞ Order spare part – Housing (internal electronics) defective ➞ Test with spare housing ➞ Order spare part 3. Field indicator defective → Replace indicator
No display visible - However, connection established to the fieldbus host system	1. Check whether the display module is correctly connected to the electronics module, → 10. 2. Display defective ➞ Test with spare display ➞ Order spare part. 3. Electronics module defective ➞ Test with spare electronics module ➞ Order spare part.

↓

Faulty connection to the fieldbus host system	
No connection can be made between the fieldbus host system and the indicator. Check the following points:	
Fieldbus connection	Check the data cable
Fieldbus connector (optional)	Check pin assignment / wiring, → 14
Fieldbus voltage	Check that a min. bus voltage of 9 V DC is present at the +/- terminals. Permitted range: 9 to 32 V DC
Network structure	Check permissible fieldbus cable length and number of spurs, → 15
Basic current	Is there a basic current of min. 11 mA?
Terminating resistors	Has the FOUNDATION Fieldbus H1 been terminated correctly? Each bus segment must always be terminated with a bus terminator at both ends (start and finish). Otherwise there may be interference in data transmission.
Current consumption Permissible feed current	Check the current consumption of the bus segment: The current consumption of the bus segment in question (= total of basic currents of all bus users) must not exceed the max. permissible feed current of the bus power supply unit.
Error messages in the FF configuration system	
→ Chap. 9.2	

↓

Problems when configuring function blocks	
Transducer Blocks: The operating mode cannot be set to AUTO.	Check whether the operating mode of the Resource Block is set to AUTO → MODE_BLK parameter group / TARGET parameter.

Transducer Blocks: The manufacturer-specific parameters are not visible.	The device description file (Device Description, DD) has not yet been loaded to the host system or the configuration program? → Download the file to the configuration system. For information on where to obtain the DD, → 📄 23 ✎ Note! Make sure you are using the correct system files for integrating field devices into the host system. Relevant version information can be queried with the device by means of the following functions/parameters: FF interface: ■ Resource Block → DD_REV parameter Example: Display in DEV_REV parameter → 01 Display in the DD_REV parameter → 01 (the smallest possible DD revision) Device description file (DD) required → 0101.sym / 0101.ffo ✎ Hinweis! Please always use the latest DD revision.
▼	
Other errors (application errors without messages)	
Some other error has occurred.	Possible causes and remedial measures → Chap. 9.2

9.2 Status messages

The device displays warnings or alarms as status messages. If errors occur during commissioning, these errors are displayed immediately. This takes place in the configuration program by means of the parameter in the Adv. Diagnostic Block or on the mounted display. A distinction is made here between the following 4 status categories:

Status category	Description	Error category
F	Fault detected ('Failure')	ALARM
M	Maintenance necessary	WARNING
C	Device is in the service mode (check)	
S	Specifications not observed ('Out of specification')	

WARNING or ALARM error category:
The display alternates between the displayed values and the error message (= letter in question plus the defined error number, e.g. "F283").
In case that more than one value is displayed the display alternates between the values and the error message in the following way:

- e.g. channel 1, channel 2 and channel 3 are configured to display a value
- value of channel 1 => error message => value of channel 2 => error message => value of channel 3 => error message => value of channel 1 => ...

In the case that no value is to be displayed and an error occurs, the display alternates between "-----" and the error message.

✎ Note!

1. As long as the error message is active the alternating time is set to 2 seconds. After the error has been removed the alternating time will return to its normal value written into the Parameter "DISP_ALTERNATING_TIME"
2. If the ALARM "F437" is generated by a channel the value of that channel will be replaced on the display by "-----"

Category	No.	Status messages – CURRENT_STATUS_NUMBER in the 'Advanced Diagnostics' Transducer Block – Local display	Display symbol	Cause of error / remedy
F-	261	Device status message (FF): Electronic board defective F-261.	No bargraph displayed	Cause of error: Error in the electronics. Remedy: Device defective, replace
F-	283	Device status message (FF): Memory error F-283	Display symbol ⚠ & No bargraph displayed	Cause of error: Error in memory. Remedy: Device defective, replace
C-	561	Device status message (FF): Display overflow C-561	No bargraph, display symbol ⚠; value will be displayed as "-----"	Cause of error: Value is too long to be displayed Remedy: Change "DISPLAY_FORMAT"
F-	437	Device status message (FF): Configuration error F-437	No bargraph displayed	Cause of error: Example: Incorrect configuration; an address in Listener Mode was entered that is not available; a value has been chosen for dispalying but the according block has not been instanced Remedy: Check the configuration of the blocks; the parameter CURRENT_STATUS_MAINTENANCE shows you which block causes the failure
C-	501	Device status message (FF): Device preset C-501	No bargraph, no symbol	Cause of error: Device reset is performed. Remedy: Message is only displayed during reset.

9.3 Spare parts

When ordering spare parts, please specify the serial number of the device!

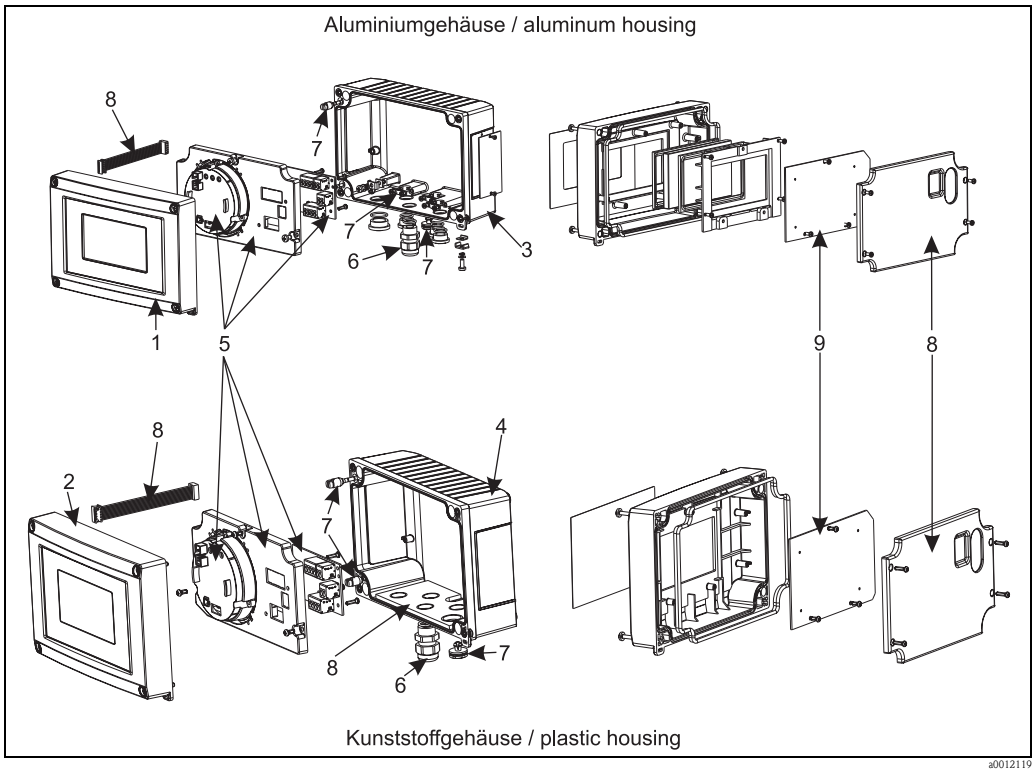

Fig. 16: Spare parts of the FOUNDATION Fieldbus™ indicator

Pos. Nr.	Beschreibung	Bestellnr.
3	Housing bottom part aluminum (metric thread)	RIA16X-GD
	Housing bottom part aluminum (NPT1/2 thread)	RIA16X-GE
6	Cable gland M16x1.5 PA RAL7035	51004048
7	Small parts kit: Goretex filter, 2x hinge bolts, cable shield ground clamp (metal set = 5 x bracket + bolt / washers)	RIA16X-GG
8	Spare parts kit cover + connection parts (contains cover plate for front part, counter plate for cable glands (plastic housing) + ribbon cable main board -> display board	RIA16X-GF
9	LC display incl. display board	RIA16X-DA
-	Cable gland NPT 1/2 D4-8.5, IP68	51006845
-	Adapter M16x1.5 NPT1/2	71085029
-	Wall / pipe mounting kit (W08)	71089844

9.4 Return

For later reuse or to return the device to the service organization of your supplier, the device must be packed in such a way as to protect it from impact and damage. The original packaging material offers the best protection here.
When sending the unit in to be checked, please enclose a note with a description of the error and the application.

9.5 Disposal

The device contains electronic components and must, therefore, be disposed of as electronic waste in the event of disposal. Please pay particular attention to the local regulations governing waste disposal in your country.

9.6 Software history and overview of compatibility

Release
The release number on the nameplate and in the Operating Instructions indicates the device release: XX.YY.ZZ (example 01.02.01).

XX Change to main version.
No longer compatible. The device and Operating Instructions change.

YY Change to functions and operation.
Compatible. Operating Instructions change.

ZZ Fixes and internal changes.
Operating Instructions do not change.

Date	Software version	Software modifications	Documentation
12/2009	1.00.00	Original software	BA284R/09/en/12.09 71092450

10 Technical data

10.0.1 Communication

- FOUNDATION Fieldbus™ H1, IEC 61158-2
- FDE (Fault Disconnection Electronic) = 0 mA
- Data transmission rate: supported baud rate = 31.25 kBit/s
- Signal coding = Manchester II
- LAS (link active scheduler), LM (link master) function is supported:
  Thus, the indicator can assume the function of a link active scheduler (LAS) if the current link master (LM) is no longer available. The device is supplied as a BASIC device. To use the device as an LAS, this must be defined in the distributed control system and activated by downloading the configuration to the device.
- In accordance with IEC 60079-27, FISCO/FNICO

Breakdown information: Status message as per FOUNDATION Fieldbus™ specification.

Mains voltage filter: 50/60 Hz

Current consumption: ≤ 11 mA

Switch-on delay: 8 s

Data of the FOUNDATION Fieldbus interface

Basic data

Device Type	10CF (hex)
Device Revision	01 (hex)
Node Address	Default: 247
ITK Version	5.2.0
ITK Certification Driver No.	IT064000
Link Master-capable (LAS)	Yes
Link Master / Basic Device selectable	Yes; factory setting: Basic Device
Number of VCRs	58
Number of Link Objects in VFD	64

Virtual communication relationships (VCRs)

Permanent Entries	58
Client VCRs	0
Server VCRs	5
Source VCRs	8
Sink VCRs	0
Subscriber VCRs	35
Publisher VCRs	10

Link settings

Slot time	4
Min. inter PDU delay	12
Max. response delay	40

Blocks

Block description	Block index	Permanent	Block execution time	Block class
Resource	400	YES		Extended
Display Transducer	500	YES		Manufacturer-specific
Advanced Diagnostic	600	YES		Manufacturer-specific
PID	700	NO	100 ms	Standard
Input Selector 1	800	NO	35 ms	Standard
Input Selector 2	900	NO	35 ms	Standard
Arithmetic	1000	NO	50 ms	Standard
Integrator	1100	NO	60 ms	Standard

Brief description of the blocks

Resource Block:
The Resource Block contains all the data that clearly identify and characterize the device. It is like an electronic device nameplate. In addition to parameters that are needed to operate the device on the fieldbus, the Resource Block also makes other information available, such as the order code, device ID, software revision, order ID etc.

Display Transducer:
The parameters of the "Display" Transducer Block allow the configuration of the display.

Advanced Diagnostic:
All the parameters for automatic monitoring and diagnosis are grouped together in this Transducer Block.

PID:
This function block contains input channel processing, proportional integral-differential control (PID) and analog output channel processing. The following can be implemented: basic controls, feedforward control, cascade control and cascade control with limiting.

Input Selector (ISEL):
The block for selecting a signal (Input Selector Block – ISEL) allows the user to choose up to four inputs and generates an output based on the configured action.

Integrator (INT):
The Integrator Block integrates one or two variables over time. The Block compares the integrated or totalized value to limit values and generates a discrete output signal if the limit value is reached. It can be selected from six integration types.

Arithmetic (ARITH):
The Arithmetic function block permits standard computing operations and compensations. It supports the addition, subtraction, multiplication and division of values. Furthermore, mean values are calculated, and flow values are compensated (linear, quadratic compensation), in this block.

10.0.2 Power supply

Electrical connection

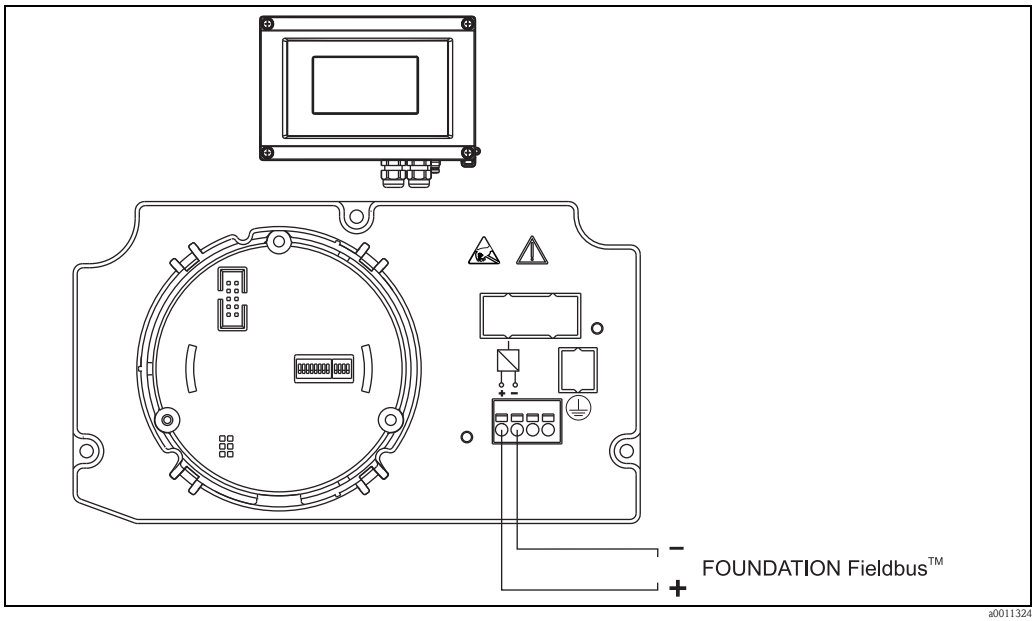

Abb. 17: Terminal assignment of the field indicator.

Supply voltage

Voltage is supplied via the fieldbus.
U = 9 to 32 V DC, polarity-independent (max. voltage U_b = 35 V).

Cable entry

The following cable entries are available:

- Thread NPT1/2
- Thread M16
- 2x adapter NPT1/2
- 2x gland M16

10.0.3 Installation

Installation instructions

Mounting location
Wall or pipe mounting (see 'Accessories')
Orientation
No restrictions, the orientation depends on the readability of the display.

10.0.4 Environment

Ambient temperature limits

-40 to +80 °C (-40 to 176 °F)

Note!
The display can react slowly at temperatures < -20 °C (-4 °F).
The readability of the display is no longer guaranteed at temperatures < -30 °C (-22 °F).

Storage temperature

-40 to +80 °C (-40 to 176 °F)

Altitude

Up to 4000 m (13100 ft.) above mean sea level in accordance with IEC 61010-1, CSA 1010.1-92

Climate class

According to IEC 60654-1, Class C

Humidity	■ Condensation permitted as per IEC 60 068-2-33 ■ Max. rel. humidity: 95% as per IEC 60068-2-30
Degree of protection	IP 67. NEMA 4X.
Shock and vibration resistance	10 to 2000 Hz for 5g as per IEC 60 068-2-6
Electromagnetic compatibility (EMC)	**CE EMC conformity** The device complies with all the requirements of IEC 61326-1:2006 and NAMUR NE21:2007. This recommendation is a consistent determination as to whether the devices used in laboratories and in distributed control systems are immune to interference, thus increasing their functional safety.

ESD (electrostatic discharge)	IEC 61000-4-2	6 kV cont., 8 kV air	
Electromagnetic fields	IEC 61000-4-3	0.08 to 4 GHz	10 V/m
Burst (fast transients)	IEC 61000-4-4	1 kV	
Surge	IEC 61000-4-5	1 kV asym.	
Conducted RF	IEC 61000-4-6	0.01 to 80 MHz	10 V

Measuring category	Measuring category II as per IEC 61010-1. The measuring category is provided for measuring on power circuits that are directly connected electrically with the low-voltage network.
Degree of contamination	Pollution degree 2 as per IEC 61010-1.

10.0.5 Mechanical construction

Design, dimensions

Plastic housing for general applications, or optional aluminum housing

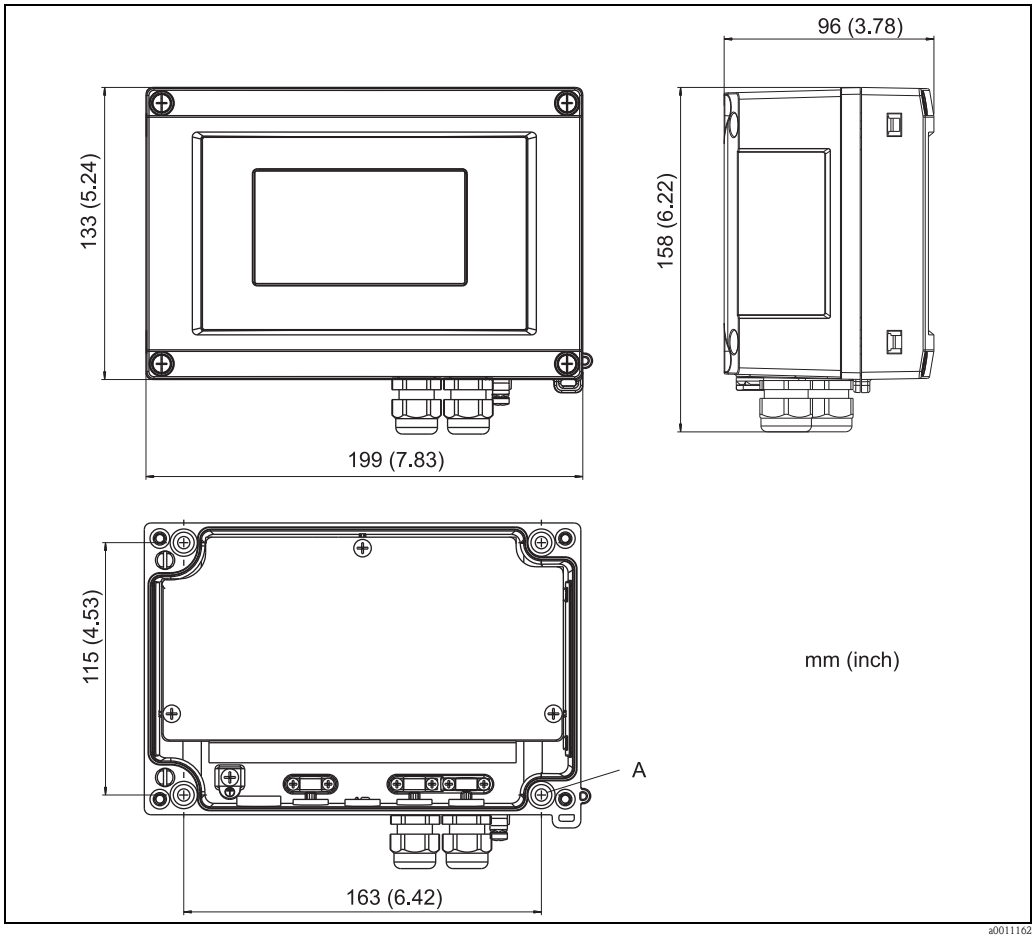

Fig. 18: Dimensions in mm (dimensions in inches in brackets)

A: Bore for mounting directly on the wall or on optional mounting plate with 4 screws Ø5 mm (0.2")

Weight

- Plastic housing: approx. 500 g (1.1 lb)
- Aluminum housing: approx. 1.7 kg (3.75 lb)

Material

Housing	**Nameplate**
Fiber-glass reinforced plastic PBT-GF30	Laser inscription
Aluminum AlSi12 (optional)	Aluminum AlMgl, black anodized

Terminals

Screw terminals for cables up to max. 2.5 mm^2 (14 AWG) plus ferrule

10.0.6 Human interface

Display elements

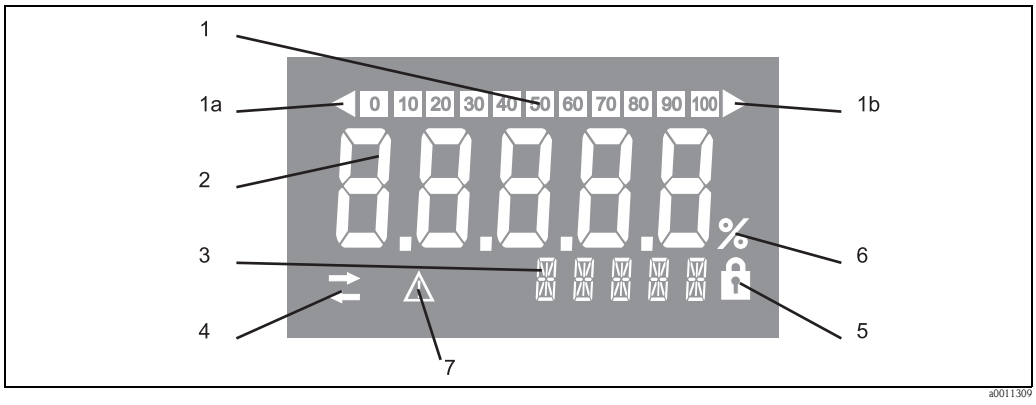

Fig. 19: LC display of the field indicator

Item 1: bar graph display in increments of 10% with indicators for underranging (item 1a) and overranging (item 1b)
Item 2: measured value display, digit height 26 mm (1.02"), status indication "Bad measured value status"
Item 3: 14-segment display for units and messages
Item 4: 'Communication' symbol
Item 5: 'Parameters cannot be modified' symbol
Item 6: '%' unit
Item 7: 'Uncertain measured value status' symbol

- Display range
  -9999 to +99999

Remote operation

Configuration
The configuration of FOUNDATION Fieldbus™ functions and of device-specific parameters is performed via fieldbus communication. Special configuration systems provided by various manufacturers are available for this purpose.

Distributed control systems	Asset management systems
Endress+Hauser ControlCare	National Instruments NI-Configurator (≥ 3.1.1)
Emerson DeltaV	Emerson AMS und Handheld FC375
Rockwell Control Logix/FFLD	-
Honeywell PKS Experion	-
Yokogawa Centum CS3000	-

10.0.7 Certificates and approvals

CE mark	The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.
Ex-approval	Information about currently available Ex versions (ATEX, FM, CSA, etc.) can be supplied by your E+H Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.
Other standards and guidelines	■ IEC 60529: Degrees of protection provided by enclosures (IP code) ■ IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use ■ IEC 61326-Serie: Electromagnetic compatibility (EMC requirements) ■ NAMUR: International user association of automation technology in process industries (www.namur.de)
UL	Recognized component to UL61010-1
CSA GP	CSA General Purpose

10.0.8 Documentation

■ Overview brochure: System components - Indicators with control unit for field and panel mounting, power supplies, barriers, transmitters, energy managers and surge arresters: FA016K/09

11 Operation via FOUNDATION™ Fieldbus

11.1 Block model

In the FOUNDATION™ Fieldbus all the device parameters are categorized according to their functional properties and task and are generally assigned to three different blocks. A block may be regarded as a container in which parameters and the associated functionalities are contained. A FOUNDATION™ Fieldbus device has the following block types:

- A Resource Block (device block):
  The Resource Block contains all the device-specific features of the unit.
- One or more Transducer Blocks:
  The Transducer Blocks contain the measuring and device-specific parameters of the device.
- One or more function blocks: The function blocks contain the device's automation functions. We distinguish between different function blocks, e.g. Integrator function block, Arithmetic function block. Each of these function blocks is used to execute different application functions.

Depending on how the individual function blocks are arranged and connected, various automation tasks can be realized. In addition to these blocks, a field device may have other blocks, e.g. several Input Selector function blocks if more than one process variable is available from the field device.

RID1x has the following blocks:

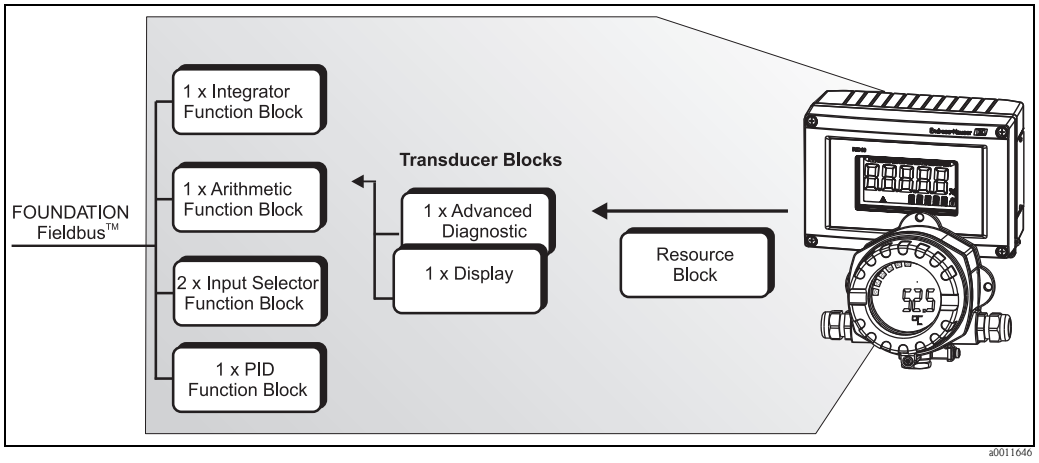

Fig. 20: Block model RID1x

11.2 Resource Block (device block)

The Resource Block contains all the data that clearly identify and characterize the field device. It is an electronic version of a nameplate on the field device. In addition to parameters that are needed to operate the device on the fieldbus, the Resource Block makes information such as the order code, device ID, hardware revision, software revision, device release etc. available.
A further task of the Resource Block is the management of overall parameters and functions that have an influence on the execution of the remaining function blocks in the field device. The Resource Block is thus a central unit that also checks the device status and thereby influences or controls the operability of the other function blocks and thus also of the device. As the Resource Block does not have any block input and block output data, it cannot be linked to other blocks. The most important functions and parameters of the Resource Block are listed below.

11.2.1 Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group. The Resource Block supports the following operating modes:
- AUTO (automatic mode)
- OOS (out of service)

Note!
The 'Out of Service' (OOS) operating mode is also displayed by means of the BLOCK_ERR parameter. In the OOS operating mode, all write parameters can be accessed without restriction if write protection has not been enabled.

11.2.2 Block status

The current operating status of the Resource Block is displayed in the RS_STATE parameter.
The Resource Block can assume the following states:
- STANDBY
  The Resource Block is in the OOS operating mode. It is not possible to execute the remaining function blocks.
- ONLINE LINKING
  The configured connections between the function blocks have not yet been established.
- ONLINE
  Normal operating status, the Resource Block is in the AUTO operating mode.
  The configured connections between the function blocks have been established.

11.2.3 Write protection

DIP switches inside the housing allow device parameter write protection to be disabled or enabled. The WRITE_LOCK parameter shows the status of the hardware write protection. The following statuses are possible:
- LOCKED =
  The device data cannot be altered via the FOUNDATION™ Fieldbus interface.
- NOT LOCKED =
  The device data can be altered via the FOUNDATION™ Fieldbus interface.

11.2.4 Alarm detection and processing

Process alarms provide information on certain block states and events.
The status of the process alarms is communicated to the fieldbus host system by means of the BLOCK_ALM parameter. The ACK_OPTION parameter allows you to specify whether an alarm has to be acknowledged by means of the fieldbus host system. The following process alarms are generated by the Resource Block:

Block process alarms

The following block process alarms of the Resource Block are displayed by means of the BLOCK_ALM parameter:
- OUT OF SERVICE

Write protection process alarm

If the write protection is disabled, the alarm priority specified in the WRITE_PRI parameter is checked before the status change is relayed to the fieldbus host system. The alarm priority specifies the behavior in the event of an active write protection alarm WRITE_ALM.

Note!
If the option of a process alarm was **not** activated in the ACK_OPTION parameter, this process alarm must only be acknowledged in the BLOCK_ALM parameter.

11.2.5 Resource Block FF parameters

The following table shows all the specified FOUNDATION™ Fieldbus parameters of the Resource Block.

Resource Block			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
38	Acknowledge Option (ACK_OPTION)	AUTO - OOS	This parameter is used to specify whether a process alarm must be acknowledged at the time of alarm recognition by the fieldbus host system. If this option is enabled, the process alarm is acknowledged automatically. **Factory default:** The option is not enabled for any alarm, the alarms must be acknowledged.
37	Alarm Summary (ALARM_SUM)	AUTO - OOS	Displays the current status of the process alarms in the Resource Block. In addition the process alarms can also be disabled in this parameter group.
4	Alert Key (ALERT_KEY)	AUTO - OOS	Use this function to enter the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. **User input:** 1 to 255 **Factory default:** 0
36	Block Alarm (BLOCK_ALM)	AUTO - OOS	The current block status appears on the display with information on pending configuration, hardware or system errors, including information on the alarm period (date, time) when the error occurred. The block alarm is triggered in the event of the following block errors: OUT OF SERVICE ✎ Note! If the option of the alarm has **not** been enabled in the ACK_OPTION parameter, the alarm can only be acknowledged via this parameter.
6	Block Error (BLOCK_ERR)	Read only	The active block errors appear on the display. **Display:** OUT OF SERVICE The block is in the "Out of Service" mode.
44	Capability Level (CAPABILITY_LEVEL)	Read only	Indicates the capability level that the device supports.
30	Clear Fault State (CLR_FSTATE)	AUTO - OOS	This parameter can be used to manually disable the security behavior of the Analog Output and Discrete Output function blocks.
33	Confirm Time (CONFIRM_TIME)	AUTO - OOS	Specifies the confirmation time for the event report. If the device does not receive confirmation within this time then the event report is sent to the fieldbus host system again. **Factory default:** 640000 1/32 ms
20	Cycle Selection (CYCLE_SEL)	AUTO - OOS	Displays the block execution method used by the fieldbus host system. ✎ Note! The block execution method is selected by the fieldbus host system.

Resource Block			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
19	Cycle Type (CYCLE_TYPE)	Read only	Displays the block execution method supported by the device. **Display:** SCHEDULED Timed block execution method BLOCK EXECUTION Sequential block execution method MANUF SPECIFIC Manufacturer specified
9	DD Resource (DD_RESOURCE)	Read only	Displays the reference source for the device description in the device. **Display:** (NULL)
13	DD Revision (DD_REV)	Read only	Displays the revision number of the ITK-tested device description.
12	Device Revision (DEV_REV)	Read only	Displays the revision number of the device.
46	Device Tag (DEVICE_TAG)	Read only	Tag name/device TAG.
11	Device type (DEV_TYPE)	Read only	Displays the device identification number in hexadecimal numerical format. **Display:** 0 x 10CF hex for RID1x
45	Electronic Name Plate Version (ENP_VERSION)	Read only	Version of the ENP (electronic name plate).
28	Fault State (FAULT_STATE)	Read only	Current status display of the security behavior of the Analog Output and Discrete Output function blocks.
17	Features (FEATURES)	Read only	Displays the additional options supported by the device. **Display:** REPORTS FAULTSTATE SOFT W LOCK
18	Feature Selection (FEATURES_SEL)	AUTO - OOS	For selecting the additional functions supported by the device.
51	Firmware Version (FIRMWARE_VERSION)	Read only	Displays the version of the device software.
25	Free Time (FREE_TIME)	Read only	Displays the free system time (in percent) available for execution of further function blocks. ✎ Note! Since the function blocks of the device are preconfigured, this parameter always displays the value 0.
24	Free Space (FREE_SPACE)	Read only	Displays the free system memory (in percent) available for execution of further function blocks. ✎ Note! Since the function blocks of the device are preconfigured, this parameter always displays the value 0.
14	Grant Deny (GRANT_DENY)	AUTO - OOS	Enables or restricts the access authorization of a fieldbus host system to the field device.

Resource Block			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
15	Hard Types (HARD_TYPES)	Read only	Displays the input signal type for the Analog Input function block.
43	Hardware Version (HARDWARE_VERSION)	Read only	Displays the version of the device hardware.
41	ITK Version (ITK_VER)	Read only	Displays the version number of the supported ITK test.
32	Limit Notify (LIM_NOTIFY)	AUTO - OOS	This parameter is used to specify the number of event reports that can exist unconfirmed at the same time. **Options:** 0 to 3 **Factory default:** 0
10	Manufacturer ID (MANUFAC_ID)	Read only	Displays the manufacturer's ID number. **Display:** 0 x 452B48 = Endress+Hauser
31	Max Notify (MAX_NOTIFY)	Read only	Displays the maximum number of event reports supported by the device that can exist unconfirmed at the same time. Display: 3
22	Memory Size (MEMORY_SIZE)	Read only	Displays the available configuration memory in kilobytes. ✎ Note! This parameter is not supported.
21	Minimum Cycle Time (MIN_CYCLE_T)	Read only	Displays the minimum execution time.
5	Block Mode (MODE_BLK)	AUTO - OOS	Displays the current (Actual) and desired (Target) operating mode of the Resource Block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal). **Display:** AUTO - OOS The Resource Block supports the following operating modes: **AUTO** (automatic operation) In this mode the execution of the remaining blocks (ISEL, Arithmetic, Integrator and PID function block) is permitted. **OOS** (out of service) The block is in the "Out of Service" mode. In this mode execution of the remaining blocks (ISEL, Arithmetic, Integrator and PID function block) is blocked. These blocks cannot be set to AUTO mode. ✎ Note! The current operating status of the Resource Block is also shown via the RS_STATE parameter.
52	MS Resource Directory (MS_RESOURCE_ DIRECTORY)	Read only	Displays the resource directory for the ENP.

Resource Block			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
23	Nonvolatile Cycle Time (NV_CYCLE_T)	Read only	Displays the time interval for which the dynamic device parameters are stored in the nonvolatile memory. The time interval displayed relates to storage of the following dynamic device parameters: ■ OUT ■ PV ■ FIELD_VAL ✎ Note! Since the device does not store the dynamic device parameters in the nonvolatile memory, this parameter always displays the value 0.
48	Order Code /Identification (ORDER_CODE)	Read only	Displays the order code for the device.
49	Order Code Part 2 (ORDER_CODE_PART2)	Read only	Display the second part of the order code.
50	Order ident (ORDER_IDENT)	Read only	Display the order ident number.
16	Restart (RESTART)	AUTO - OOS	This parameter is used to reset the device in various ways. **Options:** ■ Restart UNINITIALIZED ■ RUN ■ Restart RESOURCE (restart the Resource Block) ■ Restart with DEFAULTS (restart with the specified default values as per FF-Spec. (only FF bus parameters)) ■ Restart PROCESSOR ■ Restart Order Configuration (all the parameters are reset to the original order configuration) ■ Restart PRODUCT DEFAULTS (resets all the device parameters to the default values) ■ Restart ENP: only for service reasons.
7	Resource State (RS_STATE)	Read only	Displays the current operating status of the Resource Block. **Display:** **STANDBY** The Resource Block is in the OOS operating mode. It is not possible to execute the remaining blocks. **ONLINE LINKING** The configured connections between the function blocks have not yet been made. **ONLINE** Normal operating status, the Resource Block is in the AUTO operating mode. The configured connections between the function blocks are established.
47	Serial Number (SERIAL_NUMBER)	Read only	Displays the device serial number.
42	Service Locking (SERVICE_LOCKING)	AUTO - OOS	Only for service reasons.
29	Set Fault State (SET_FSTATE)	AUTO - OOS	This parameter can be used to manually enable the security behavior of the device.

Resource Block			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
26	Shed Remote Cascade (SHED_RCAS)	AUTO - OOS	Specifies the monitoring time for checking the connection between the fieldbus host system and a function block in the RCAS operating mode. When the monitoring time elapses, the function block changes from the RCAS operating mode to the operating mode selected in the SHED_OPT parameter. **Factory default:** 640000 1/32 ms
27	Shed Remote Out (SHED_ROUT)	AUTO - OOS	Specifies the monitoring time for checking the connection between the fieldbus host system and the PID function block in the ROUT operating mode. When the monitoring time elapses, the PID function block changes from the ROUT operating mode to the operating mode selected in the SHED_OPT parameter (see FOUNDATION Fieldbus™ Function Blocks manual on the supplied CD-ROM (BA062S/04)). **Factory default:** 640000 1/32 ms
3	Strategy (STRATEGY)	AUTO - OOS	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory default:** 0 ✎ Note! This data is neither checked nor processed by the Resource Block.
1	Static Revision (ST_REV)	Read only	The revision status of the static data appears on the display. ✎ Note! The revision status is incremented on each modification of static data.
2	Tag Description (TAG_DESC)	AUTO - OOS	Entry of a user-specific text for unique identification and assignment of the block.
8	Test Read Write (TEST_RW)	AUTO - OOS	✎ Note! This parameter is required only for interoperability tests and has no meaning in normal operation.
35	Update Event (UPDATE_EVT)	Read only	Indicates whether static block data have been altered, including date and time.
40	Write Alarm (WRITE_ALM)	AUTO - OOS	Displays the status of the write protected alarm. ✎ Note! The alarm is triggered if the write protection is disabled.
34	Write Lock (WRITE_LOCK)	Read only	Display status of write protection **Display:** **LOCKED** Device data cannot be modified **NOT LOCKED** Device data can be modified **UNINITIALIZED**

Resource Block			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
39	Write Priority (WRITE_PRI)	AUTO - OOS	Specifies the behavior of a write protected alarm ("WRITE_ALM" parameter). **User input:** 0 = The write protection alarm is not evaluated. 1 = No report to the fieldbus host system in the event of a write protection alarm. 2 = Reserved for block alarms. 3-7 = The write protection alarm is output with the appropriate priority (3 = low priority, 7 = high priority) to the fieldbus host system as a user notice. 8-15 = The write protection alarm is output with the appropriate priority (8 = low priority, 15 = high priority) to the fieldbus host system as a critical alarm. **Factory default:** 0

11.3 Transducer Blocks

The Transducer Blocks of the RID1x contain all the device-specific parameters. All the settings directly connected with the display are made here.

11.3.1 Selecting the operating mode

The operating mode is set by means of the MODE_BLK parameter group (page 51). The Transducer Block supports the following operating modes:
- AUTO (automatic mode)
- OOS (out of service)

Note!
The OOS block status is also displayed by means of the BLOCK_ERR parameter (page 51).

11.3.2 Accessing the manufacturer-specific parameters

To access the manufacturer-specific parameters, the hardware write protection must be deactivated (see Section 5.5).

11.3.3 Transducer Block FF parameters

The following table lists all the specified FOUNDATION Fieldbus parameters of the Transducer Blocks. The device specific parameters are described from page 56ff.

Transducer Block (FF parameters)			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
1	Static revision (ST_REV)	Read only	The revision status of the static data appears on the display. ✎ Note! The revision status parameter is incremented on each modification of static data. This parameter is reset to 0 in all blocks in the event of a factory reset.
2	Tag description (TAG_DESC)	AUTO - OOS	Use this function to enter a user-specific text of max. 32 characters for unique identification and assignment of the block. **Factory setting:** (_____) no text
3	Strategy (STRATEGY)	AUTO - OOS	Parameter for grouping and thus faster evaluation of blocks. Grouping is carried out by entering the same numerical value in the STRATEGY parameter of each individual block. **Factory setting:** 0 ✎ Note! These data are neither checked nor processed by the Transducer Blocks.
4	Alert key (ALERT_KEY)	AUTO - OOS	Use this function to enter the identification number of the plant unit. This information can be used by the fieldbus host system for sorting alarms and events. **User input:** 1 to 255 **Factory setting:** 0
5	Block Mode (MODE_BLK)	AUTO - OOS	Displays the current (Actual) and desired (Target) operating mode of the corresponding Transducer Block, the permitted modes (Permitted) supported by the Resource Block and the normal operating mode (Normal). **Display:** AUTO OOS ✎ Note! The Transducer Block supports the following operating modes: ■ AUTO (automatic mode): The block is executed. ■ OOS (out of service): The block is in the "Out of Service" mode. The process variable is updated, but the status of the process variable changes to BAD.

Transducer Block (FF parameters)			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
6	Block Error (BLOCK_ERR)	Read only	The active block errors appear on the display. **Display:** **OUT OF SERVICE** The block is in the "out of service" operating mode. The following block errors are only shown in the Sensor Transducer Blocks: ■ **MAINTENANCE NEEDED** The device must be checked since an active device error is pending. The detailed cause of the error can be called up in the "Advanced Diagnostic" Transducer Block by means of the "CURRENT_STATUS_CATEGORY" and "CURRENT_STATUS_NUMBER" parameters. ■ **LOST STATIC DATA / LOST_NV_DATA** The memory is inconsistent. ■ **POWER-UP:** Status message during the startup procedure. ■ **BLOCK CONFIGURATION ERROR:** The block was configured incorrectly. ■ **0x0000:** No active block error present. An exact error description as well as information on rectifying faults can be found in Section 9.2.
7	Update Event (UPDATE_EVT)	AUTO - OOS	Indicates whether static block data have been altered, including date and time.
8	Block Alarm (BLOCK_ALM)	AUTO - OOS	The current block status appears on the display with information on pending configuration, hardware or system errors, including information on the alarm period (date, time) when the error occurred. ✎ Note! ■ In addition, the active block alarm can be acknowledged in this parameter group. ■ The device does not use this parameter to display a process alarm since this is generated in the BLOCK_ALM parameter of the Analog Input function block.
9	Transducer Type (TRANSDUCER_TYPE)	Read only	The Transducer Block type appears on the display. **Display:** ■ Display Transducer Block: Custom Display Transducer ■ Advanced Diagnostic Block: Custom Adv. Diag. Transducer
10	Transducer Error (XD_ERROR)	Read only	The active device error appears on the display. **Possible display:** ■ No Error (normal status) ■ Electronics failure ■ Data Integrity Error ■ Mechanical failure ■ Configuration Error ■ Calibration error ■ General Error ✎ Note! Summarized device status/condition, more precise information on the pending error(s) is available by means of the manufacturer-specific error display. This can be read via the Transducer Block “Advanced Diagnostic” in the “CURRENT_STATUS_CATEGORY” and "CURRENT_STATUS_NUMBER" parameters. An exact error description as well as information on rectifying faults can be found in Section 9.2.

11.3.4 Transducer Block “Display”

The Display Transducer Block contains all necessary parameters to configure the display function.

Note!
Also the Listener Mode is activated via this Transducer Block!

Transducer Block “DISPLAY” (E+H parameters)			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
11	DISP_ALTERNATING_ TIME	AUTO - OOS	Time interval value in seconds for alternating the display of different measured values.
12	DISP_AVAILABLE_ PUBLISHER	Read only	List of all devices publishing values to the segment. Note! Only publishing devices from address range 0x10 to 0x2F are displayed in this parameter. If a device in the high address range is publishing, it will not be shown here. Although its value can also be made available by entering the publishers address in the parameter DISP_VALUE_x_LISTENER_DEVICE.
13 16 19 22 25 28 31 34	DISP_VALUE_1_ANALOG DISP_VALUE_2_ANALOG DISP_VALUE_3_ANALOG DISP_VALUE_4_ANALOG DISP_VALUE_5_ANALOG DISP_VALUE_6_ANALOG DISP_VALUE_7_ANALOG DISP_VALUE_8_ANALOG	Read only	This block shows the current analog display value. The block supports: ▪ **DISP_VALUE_1[...8]_STATUS:** Status of the current analog display value. The Source of this value is selected through the parameter "Source analog", or with activated "Listener mode" through the parameters "Listener device" and "Listener value select". ▪ **DISP_VALUE_1[...8]_VALUE:** The current analog value. This value is selected through the parameter "Source analog" or with activated "Listener mode" through the parameters "Listener device" and "Listener value select".
14 17 20 23 26 29 32 35	DISP_VALUE_1_DIGITAL DISP_VALUE_2_DIGITAL DISP_VALUE_3_DIGITAL DISP_VALUE_4_DIGITAL DISP_VALUE_5_DIGITAL DISP_VALUE_6_DIGITAL DISP_VALUE_7_DIGITAL DISP_VALUE_8_DIGITAL	Read only	This block shows the current digital display value. The block supports: ▪ **DISP_VALUE_1[...8]_STATUS:** Status of the current discrete display value. This value is selected through the parameter "Source digital" or with activated "Listener mode" through the parameters "Listener device" and "Listener value select". ▪ **DISP_VALUE_1[...8]_VALUE:** The current discrete value. This value is selected through the parameter "Source digital" or with activated "Listener mode" through the parameters "Listener device" and "Listener value select".
15 18 21 24 27 30 33 36	DISP_VALUE_1_SETTINGS DISP_VALUE_2_SETTINGS DISP_VALUE_3_SETTINGS DISP_VALUE_4_SETTINGS DISP_VALUE_5_SETTINGS DISP_VALUE_6_SETTINGS DISP_VALUE_7_SETTINGS DISP_VALUE_8_SETTINGS	AUTO - OOS	This parameter defines all values for the setup of the display. Fllowing parameters are included: **DISP_VALUE_1[...8]_LISTENER_MODE:** Activates the "Listener mode". In this mode the device is able to show values published to the bus by other devices. The device acts as a passive bus sharing unit and listens to other devices. A list of all device addresses of available publishers on the segment can be seen in parameter "Available publishers". Select the device in "Listener device" and its value in "Listener device value select".
			DISP_VALUE_1[...8]_LISTENER_DEVICE: With active "Listener mode" select a publishers adresse to show its values on the display.
			DISP_VALUE_1[...8]_LISTENER_VALUE_SELECT: After selecting a publisher’s address in parameter "Listener device", the device shows the first published value on the display. You can select the next published value by choosing "Next value". Note! When an address is written, the parameter "LISTENER_VALUE" will always be set to 1. By using "LISTENER_VALUE_SELECT" the next values can be selected.

Transducer Block “DISPLAY” (E+H parameters)			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
			DISP_VALUE_1[...8]_LISTENER_VALUE: The currently choosen value of a publishing device. The address of this device is selected in "Listener device" and the value in "Listener value select" starting with 1.
			DISP_VALUE_1[...8]_SOURCE_ANALOG: Select an analog type input of a function block to show its value on the display. Available parameters are: ■ Off ■ ISEL1.IN_1 ■ ISEL1.IN_2 ■ ISEL1.IN_3 ■ ISEL1.IN_4 ■ ISEL1.OUT ■ ISEL2.IN_1 ■ ISEL2.IN_2 ■ ISEL2.IN_3 ■ ISEL2.IN_4 ■ ISEL2.OUT ■ PID.IN ■ PID.OUT ■ PID.SP ■ INTG.IN_1 ■ INTG.IN_2 ■ INTG.OUT ■ AR.IN ■ AR.IN_1 ■ AR.IN_2 ■ AR.IN_3 ■ AR.OUT
			DISP_VALUE_1[...8]_SOURCE_DIGITAL: Select an digital type input of a function block to show its value on the display. Available parameters are: ■ Off ■ ISEL1.DISABLE_1 ■ ISEL1.DISABLE_2 ■ ISEL1.DISABLE_3 ■ ISEL1.DISABLE_4 ■ ISEL2.DISABLE_1 ■ ISEL2.DISABLE_2 ■ ISEL2.DISABLE_3 ■ ISEL2.DISABLE_4
			DISP_VALUE_1[...8]_DESC: Enter a free text with maximum 16 characters. This text is displayed below the value. It will scroll if the text is longer than 5 characters.
			DISP_VALUE_1[...8]_FORMAT: Number of places after decimal point for the display. Available parameters are: ■ Auto (the device automatically sets the position of the decimal point to fill all 5 digits of the display) ■ XXXXX ■ XXXX.X ■ XXX.XX ■ XX.XXX ■ X.XXXX
			DISP_VALUE_1[...8]_BGMIN: Enter the minimum (0%) value for bargraph presentation.

Transducer Block "DISPLAY" (E+H parameters)			
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**
			DISP_VALUE_1[...8]_BGMAX: Enter the maximum (100%) value for bargraph presentation.
			DISP_VALUE_1[...8]_PERCENT: Switch the percent symbol on/off. No recalculation of the displayed value is done.
			DISP_VALUE_1[...8]_SETUP_DIGITAL: Select a representation of digitals values. This setting is valid once a digital source is selected. Availabel parameters are: ■ 1 = On; 0 = Off ■ 0 = On; 1 = Off ■ 1 = Open; 0 = Close ■ 0 = Open; 1 = Close ■ display as decimal value

11.3.5 Transducer Block "Advanced Diagnostic"

The Advanced Diagnostic Block informs about the current device status and the last status. As well it indicates for which channel the current diagnostic event of the value appears.
It contains the minimum and maximum values for each analog channel.

Transducer Block "ADVANCED DIAGNOSTIC" (E+H parameters)				
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**	
11	CURRENT_STATUS_ NUMBER	Read only	Shows the current diagnostic and its category. F = Failure M = Maintenance S = Out of Specification C = Function check	
12	CURRENT_STATUS_DESC	Read only	Shows a description to the current message.	
13	CURRENT_STATUS_ MAINTENANCE	Read only	Diagnostic number	Description
			F437	■ Input Selector 1 is not instantiated, but used as source ■ Input Selector 2 is not instantiated, but used as source ■ PID is not instantiated, but used as source ■ Arithmetic block is not instantiated, but used as source ■ Integrator block is not instantiated, but used as source ■ Listener mode and source analog is switched on, switch one off ■ Listener mode and source digital is switched on, switch one off ■ Source analog and source digital is switched on, switch one off ■ Listener mode, source analog and source digital is switched on, switch two off ■ Device address for listener mode is not available, change address to valid publisher

Transducer Block "ADVANCED DIAGNOSTIC" (E+H parameters)				
Parameter Index	**Parameter**	**Write access with operating mode (MODE_BLK)**	**Description**	
			C561	■ Choose different display format
			F283	■ Restart device, if error still resists, exchange electronics
			F261	■ Exchange electronics
14	CURRENT_STATUS_ CHANNEL	Read only	This Parameter displays the Display channel were the 'Current diagnostics' message appeared.	
15	CURRENT_STATUS_ COUNT	Read only	This parameter shows the current amount of non- good diagnostic messages.	
16	LAST_STATUS_NUMBER	AUTO - OOS	Shows the last diagnostic number and its category.	
17	LAST_STATUS_DESC	AUTO - OOS	Shows a discription to the last diagnostic message.	
18	LAST_STATUS_CHANNEL	AUTO - OOS	This parameter displays in which display channel the 'Last diagnostics' appeared.	
19 21 23 25 27 29 31 33	CH1_MIN_INDICATOR CH2_MIN_INDICATOR CH3_MIN_INDICATOR CH4_MIN_INDICATOR CH5_MIN_INDICATOR CH6_MIN_INDICATOR CH7_MIN_INDICATOR CH8_MIN_INDICATOR	AUTO - OOS	Indicates the minimum appeared value on display channel 1[...8] (value 1 to 8). This value is saved to non- volatile Memory in a cycle of 10 minutes.	
20 22 24 26 28 30 32 34	CH1_MAX_INDICATORCH 2_MAX_INDICATORCH3_ MAX_INDICATORCH4_MA X_INDICATORCH5_MAX_I NDICATORCH6_MAX_IND ICATORCH7_MAX_INDIC ATORCH8_MAX_INDICAT OR	AUTO - OOS	Indicates the maximum appeared value on display channel 1[...8] (value 1 to 8). This value is saved to non- volatile memory in a cycle of 10 minutes.	
35	RESET_ALL_INDICATORS	AUTO - OOS	Resets all min- and max- values to "0".	

11.4 PID function block (PID controller)

A PID function block contains the input channel processing, the proportional integral-differential control (PID) and the analog output channel processing. The configuration of the PID function block depends on the automation task. The following can be realized: Basic controls, feed forward control, cascade control, cascade control with limiting.
The possibilities available for processing measured values within the PID function block include: signal scaling and limiting, operating mode control, actuating, limiting control, limit detection and signal status propagation.
A detailed description of the PID function block can be found in the FOUNDATION Fieldbus™ Function Blocks manual on the supplied CD-ROM (BA062S/04).

11.5 Input Selector function block

The block for selecting a signal (Input Selector Block – ISEL) allows the user to choose up to four inputs and generates an output based on the configured action.
A detailed description of the Input Selector function block can be found in the FOUNDATION Fieldbus™ Function Blocks manual on the supplied CD-ROM (BA062S/04).

11.6 Arithmetic function block

The Arithmetic function block provides the ability to configure a range extension function for a primary input and applies the nine different arithmetic types as compensation to or augmentation of the range extended input. All operations are selected by parameter and input connection.
The nine arithmetic functions are Flow Compensation Linear, Flow Compensation Square Root, Flow Compensation Approximate, Btu Flow, Traditional Multiply and Divide, Average, Summer, Fourth Order Polynomial, and Simple HTG Compensate Level.
This Arithmetic function block supports mode control (Auto, Man, OOS). There is no standard alarm detection in this block.
A detailed description of the Arithmetic function block can be found in the FOUNDATION Fieldbus™ Function Blocks manual on the supplied CD-ROM (BA062S/04).

11.7 Integrator function block

The Integrator (INT) function block integrates one variable or the sum or difference between two variables over time. The block compares the integrated or accumulated value to pre-trip and trip limits and generates discrete output signals when the limits are reached. This function block can also be used as a totalizer.
You choose one of seven integrator types that determine whether the integrated value increases from 0 or decreases from the setpoint (SP). The block has two inputs and can integrate positive, negative, or net flow. This capability is useful to calculate volume or mass variation in vessels or as an optimization tool for flow ratio control.
The Integrator function block supports mode control, demand reset, a reset counter, and signal status calculation. There are no standard alarms in this function block. Custom alarms are supported.
A detailed description of the Integrator function block can be found in the FOUNDATION Fieldbus™ Function Blocks manual on the supplied CD-ROM (BA062S/04).

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