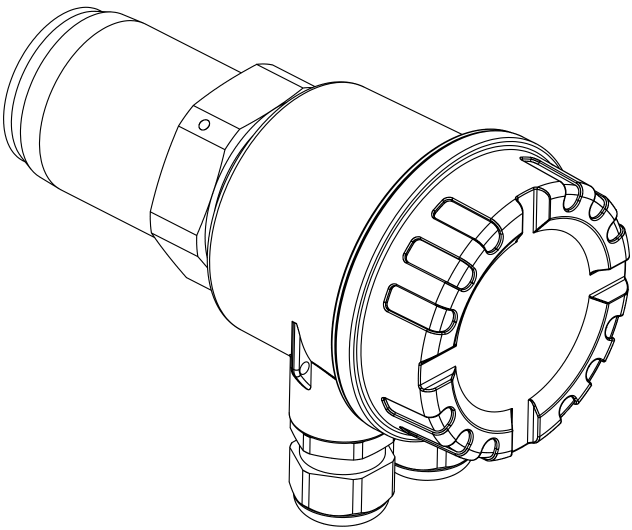
BA01136F/97/EN/07.20
71467968

Products Solutions Services

Operating Instructions
Solimotion FTR20

Flow indicator for bulk solids



Endress+Hauser
People for Process Automation

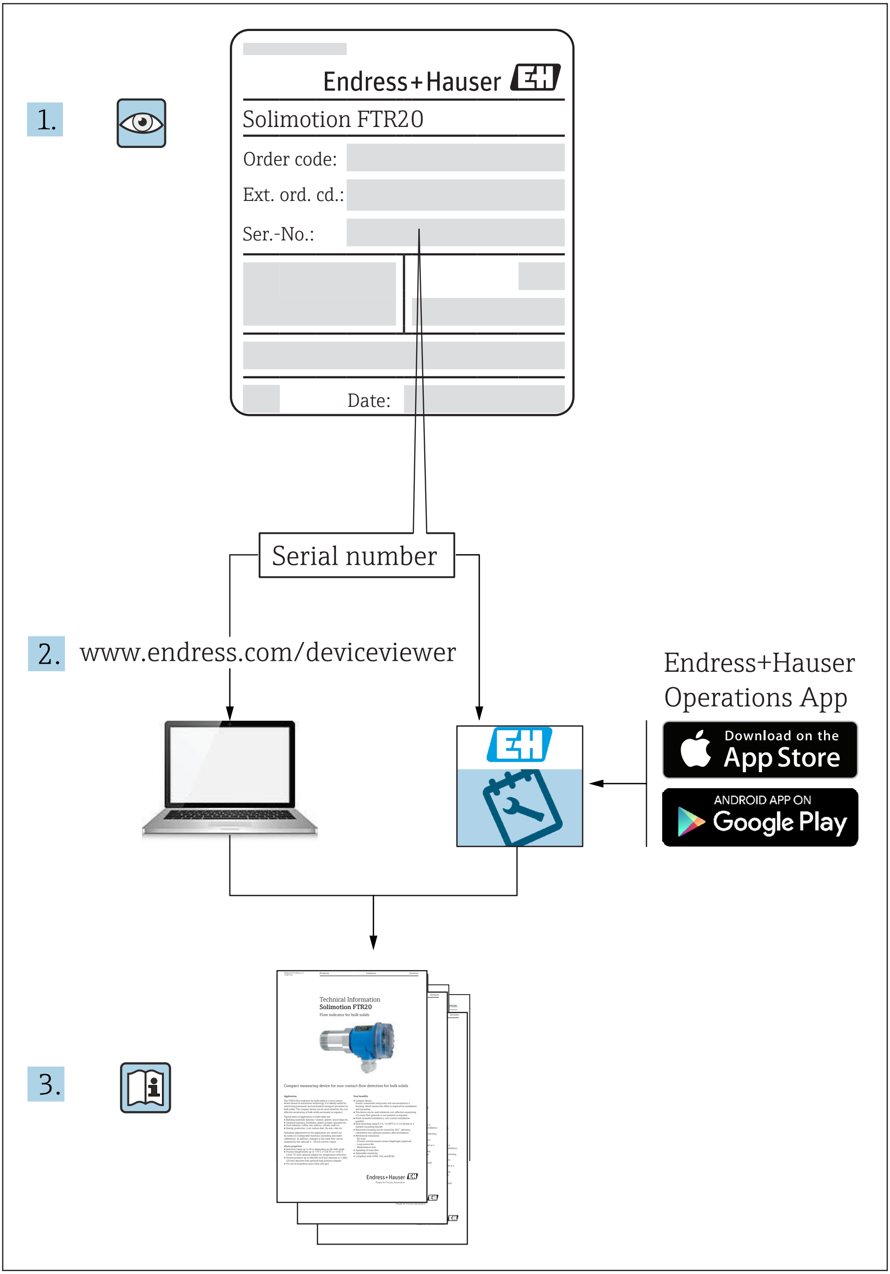

1.
Endress+Hauser
Solimotion FTR20
Order code:
Ext. ord. cd.:
Ser.-No.:
Date:
Serial number
2.
www.endress.com/deviceviewer
Endress+Hauser
Operations App
Download on the
App Store
ANDROID APP ON
Google Play
3.

Table of contents

1 About this document

1.1 Document function

These operating instructions contain all the information that is required in the various phases of the life cycle of the device: From product identification, incoming acceptance and storage, to installation, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 Safety symbols

⚠ WARNING

This warning alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

NOTICE

This note contains information on procedures and other facts that do not entail a risk of personal injury.

1.2.2 Electrical symbols

⎓ Direct current

~ Alternating current

⏚ Protective earth connection
A terminal which has to be grounded before other connections can be established.

1.2.3 Tool symbols

Flat-blade screwdriver

Phillips head screwdriver

Allen key

Open-ended wrench

1.2.4 Symbols for different types of information

✓ Permitted
Indicates procedures, processes or actions that are permitted.

Tip
Indicates additional information.

Reference to documentation

Reference to page

Reference to figure

1., 2., 3. Series of steps

1.2.5 Device-specific symbols

LED on
Indicates an illuminated LED

LED off
Indicates a non-illuminated LED

Configuration mode
Indicates the function number or value

Normal operation
Indicates only the signal strength of the bulk solids movement

Key (+)
Indicates the key for increasing a function value

Key (-)
Indicates the key for reducing a function value

Minimum bulk flow
Indicates a minimum or absent bulk flow

Maximum bulk flow
Indicates a maximum bulk flow

1.2.6 Symbols in graphics

A, B, C ... View

1, 2, 3 ... Item number

Hazardous area

Safe area (non-hazardous area)

1.3 Documentation

The document types listed are available:
In the Download area of the Endress+Hauser website: www.endress.com → Downloads

1.3.1 Standard documentation

Document	Purpose and content of the document
Technical information TI00447F/97/EN	**Planning aid for your device** This document contains all the technical specifications for the device and provides an overview of all the items that can be ordered for use in conjunction with or as part of the device.

1.3.2 Supplementary device-dependent documentation

Depending on the approval, safety instructions (XA) are supplied with the device when it is delivered. These safety instructions are an integral part of the operating instructions.

Feature 010	Approval	Safety instructions
BA	ATEX II 1/2D Ex ta/tb IIIC T102°C Da/Db IP66 ATEX II 2D Ex tb IIIC T102°C Db IP66	XA00524F/97/A3
CB	CSA C/US Class II, Div. 1, Group E-G	XA01245F/97/EN
IA	IECEx Ex ta/tb IIIC T102°C Da/Db IP66 IECEx Ex tb IIIC T102°C Db IP66	XA00544F/97/EN

2 Basic safety instructions

2.1 Requirements for personnel

The personnel for installation, commissioning, diagnostics and maintenance must meet the following requirements:
- Trained, qualified specialists: Must be qualified for this specific role and task
- Authorized by the plant operator
- Familiar with national regulations
- Before starting work: Read and make sure you have understood the instructions in the manual and supplementary documentation as well as the certificates (depending on the application)
- Follow the instructions and comply with the general requirements

Operating personnel must meet the following requirements:
- Must be instructed and authorized according to the requirements of the task by the plant operator
- Follow the instructions in this manual

2.2 Designated use

The device described in these Instructions is intended only for movement detection of bulk products and the detection of changes of a mass flow. Depending on the version ordered, the device can also measure potentially explosive, flammable, poisonous and oxidizing fluids.

To ensure that the device remains in proper condition for the operation time:
- Use the device only for fluids against which the process-wetted materials are adequately resistant.
- Observe the limit values (→ 📄55).

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

Verification for borderline cases:
- For special fluids and fluids for cleaning, Endress+Hauser is glad to provide assistance in verifying the corrosion resistance of fluid-wetted materials, but does not accept any warranty or liability.

Possible burn hazard from touching surfaces!
- For elevated fluid temperature, ensure protection against contact to prevent burns.

The Solimotion FTR20 flow indicator is approved for use in hazardous areas.

⚠ WARNING

Proceed in accordance with the safety instructions.
→ 📄8

2.3 Workplace safety

When working on and with the device:
- Wear the required personal protective equipment in accordance with national regulations.

2.4 Operational safety

Risk of injury!
- The device may only be operated if it is in perfect working order and is free from faults.
- The operator is responsible for ensuring that the device operates without incident.

Hazardous area
To eliminate danger to persons or the plant when the device is used in the hazardous area (e.g. explosion protection):
- Check the nameplate to verify whether the ordered device can be used as intended in the hazardous area.
- Observe the specifications in the separate supplementary documentation, which is an integral part of these operating instructions.

2.5 Product safety

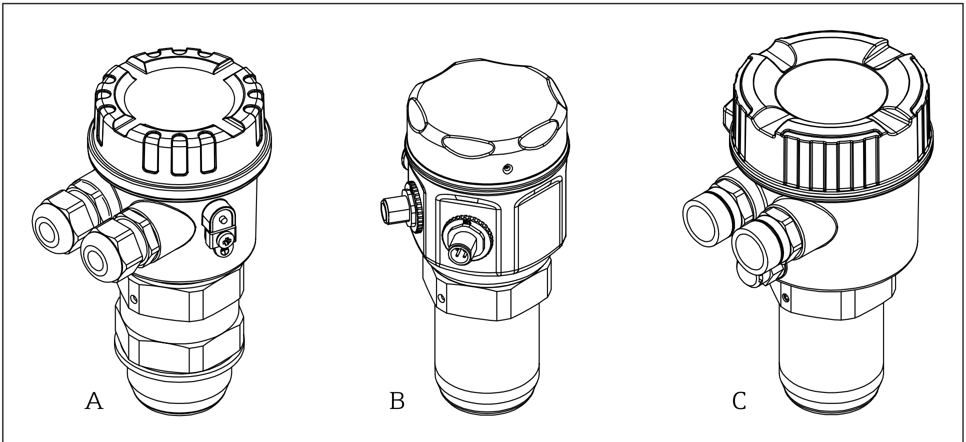
This state-of-the-art device has been tested to make sure that it is designed and manufactured in accordance with good engineering practice and operates safely and reliably. It left the factory in perfect working order.
It meets the general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU Declaration of Conformity. Endress+Hauser confirms this by displaying the CE mark on the device.

3 Product description

The Solimotion FTR20 flow indicator for bulk solids works using microwave technology and detects the movement of bulk solids and changes in the mass flow of a solid flow.

3.1 Product design

Different versions of the devices used to make the Solimotion FTR20 flow indicator are available; the choice of devices that are used depends on the specific application, as well as factors such as the types of area for which they are approved and the electrical connection.



1 *Product versions*

Versions	Examples		
	A	B	C
Housing	F16 Polyester	F15 Stainless steel	F34 Aluminium
Electrical connection	M20 gland, plastic	Connector M12 (Binder series 713/763)	½ NPT thread, metal
Process connection	G 1½ thread	R 1½ thread	1½ NPT thread

Details about the available device variants can be viewed in the product configurator on the Endress+Hauser homepage www.endress.com.

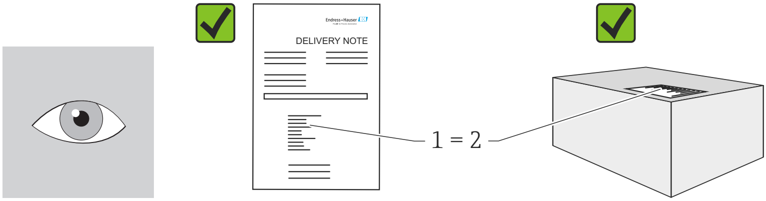
3.2 Functional principle

The FTR20 transmits a signal that is reflected by the moving bulk solids. In doing so, the device measures the strength of the reflected, frequency-shifted energy (Doppler effect) and uses it to form a display value or output signal.

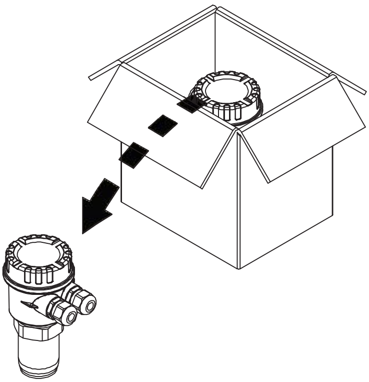
Details about Technical data
→ TI00447F/97/EN

4 Incoming acceptance and product identification

4.1 Incoming acceptance



Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?



Are the goods undamaged?
Do the specifications on the nameplate correspond to the order information and the delivery note?

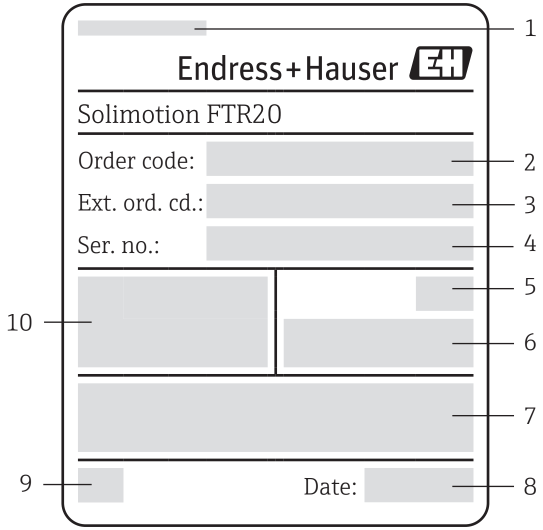
If one of the conditions is not satisfied:
Contact your Endress+Hauser sales center

4.2 Product identification

You can identify your device in the following ways:
- Using the nameplate specifications
- Using the order code with a breakdown of the device features on the delivery note
- Entering the serial numbers from the nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer): All information about the device will be displayed.

For an overview of the scope of the technical documentation provided, refer to the following:
- The "Additional documentation" section
- The *W@M Device Viewer*: Enter the serial number from the nameplate (www.endress.com/deviceviewer)

4.3 Nameplate



2 *Example of a nameplate*

1 *Place of manufacture*
2 *Order code*
3 *Extended order code*
4 *Serial number*
5 *Degree of protection (IP rating)*
6 *Ambient temperature range, optional text for approval*
7 *Operating instructions and safety instructions for the device*
8 *Date of manufacture: Year-Month*
9 *CE mark*
10 *Input and output parameters*

4.4 Storage and transportation

Please note the following points:
- Store in the original packaging to ensure protection from shock.
- The permitted storage temperature is -40 to +80 °C (-40 to +176 °F); storage at the temperature limits is only permitted for a limited time (maximum 48 hours).

4.5 Disposal of packaging

The carton is environmentally compatible and 100% recyclable in accordance with European Directive 2004/12/EC on packaging (recyclability is confirmed by means of the RESY symbol on the carton).

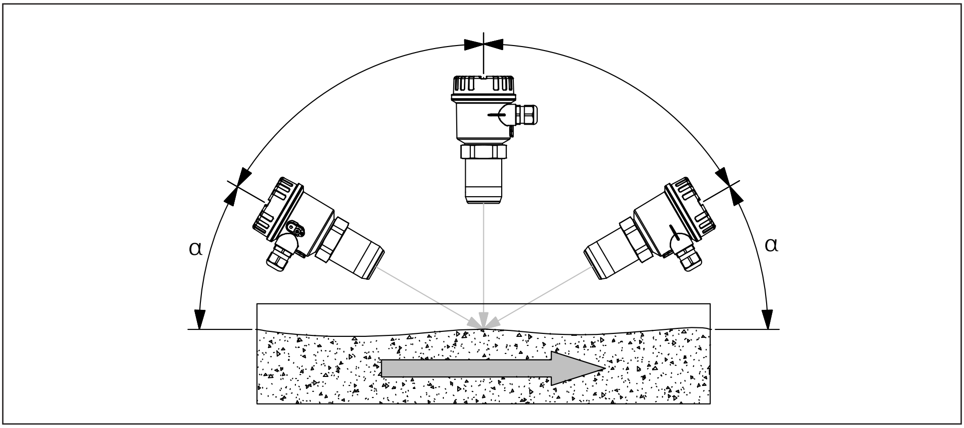
5 Installation

5.1 Installation requirements

The Solimotion FTR20 flow indicator for bulk solids comes with a standard thread (R 1½ as per EN 10226, 1½ NPT as per ANSI/ASME B1.20.1 or G 1½ as per ISO 228-1) as a process connection. This enables easy installation in existing container couplings or nozzles.

For devices intended for use in hazardous areas, please read the information and comply with the instructions in the Ex documentation (XA).

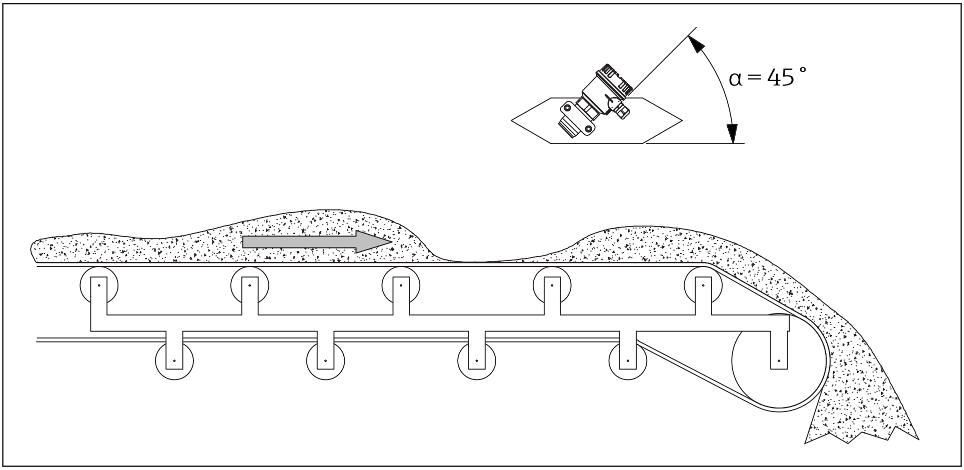
For optimal orientation after installation in the process, the electronics housing can be rotated as desired (by 360 °).



3 *Installation position*

NOTICE

- Any orientation is possible for the FTR20 flow indicator for bulk solids. However, a small angle α may increase the signal quality.
- We recommend an angle of 45 ° for applications with material detection on conveyor belts.



4 *Installation position for material detection on conveyor belt*

NOTICE

- Choose a location to install the device where application-specific influences will be minimal.
- With vibrating mounting locations it is recommended to use devices with encapsulated electronics (see ordering structure "Accessory mounted").

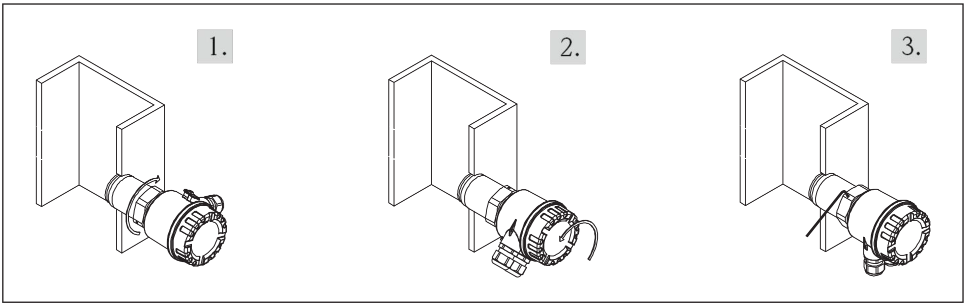
For devices intended for use in hazardous areas, please read the information and comply with the instructions in the Ex documentation (XA).

5.2 Installing the FTR20

5.2.1 Direct mounting with threaded connection

The simplest mounting method is by screwing into the process wall. To do this, a corresponding internal thread (Rp 1½, 1½ NPT or G 1½) must be available in the process.

5.2.1.1 Installation with self-sealing connection thread (R 1½ and 1½ NPT)

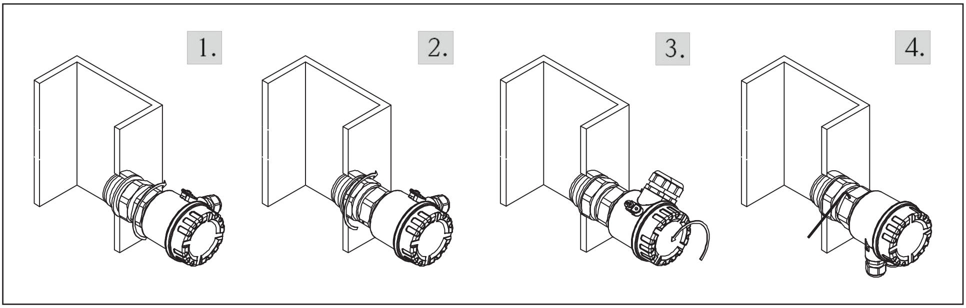


5 *Installation with self-sealing connection thread*

Installation procedure:

1. Screw the R 1½ or 1½ NPT self-sealing connecting thread into existing screw-in thread.
   55 mm (AF)
2. Align the housing of the electronics.
3. Fix the housing in place.
   2 mm

5.2.1.2 Installation with non-self-sealing connection thread (G 1½)



6 *Installation with non-self-sealing connection thread*

Installation procedure:

1. Slide the enclosed process seal over the process connection and screw the non-self-sealing connection thread G 1½ into the existing screw-in thread.
   55 mm (AF)
2. Tighten the lock nut on the connection thread.
   55 mm (AF)
3. Align the housing of the electronics.
4. Fix the housing in place.
   2 mm

NOTICE

- If the process connection is not screwed far enough into the process wall, there is a risk that material will accumulate in front of the FTR20, thereby damping the microwave signal.
- If, on the other hand, the process connection is screwed too far into the process, there is a risk of damage occurring as a result of large product items falling.

5.2.2 Installation with accessories

A choice of different process adapters is available from the range of accessories, depending on where you want to install the device and on the process conditions.

NOTICE

- For more information on the range of available accessories → 📄54
- For more information on the various installation options → 📖TI00447F/97/EN

5.3 Post-installation check

❑	Is the device undamaged (visual inspection)?
❑	Does the device conform to the measuring point specifications? For example: ▪ Process temperature ▪ Process pressure ▪ Ambient temperature
❑	Are the measuring point identification and labeling correct (visual inspection)?
❑	Is the device adequately protected from moisture and direct sunlight?
❑	Is the device properly secured?

6 Electrical connection

6.1 Connection requirements

NOTICE

Please note the following points before connecting up the device:
- The voltage supply must match the voltage specified on the nameplate.
- Switch off the supply voltage before connecting the device.
- Connect a potential matching line to the terminal to be used on the FTR20 before connecting the device to the power supply.
- When connecting to the public power supply, a power switch for the device must be installed within easy reach of the device. The switch is to be identified as a disconnecting device for the device (EN/IEC 61010).
- The cable glands and connectors are permitted for connecting fixed cables and lines only. The operator must ensure adequate strain relief.
- The device is to be attached so that the cable gland is protected from mechanical damage (degree of mechanical hazard "low" – impact energy: 4 joules).
- Unused guide openings must be sealed off using sealing plugs, the plastic transport sealing plug does not meet this requirement and must therefore be replaced during installation.

For devices intended for use in hazardous areas, please read the information and comply with the instructions in the Ex documentation (XA).

6.1.1 Required tools

Connection	Tool
Terminals and screwed contact of the optional M12 plug connector, Binder series 713/763	0.6 x 3.5 mm
Potential equalization	PZ2
Cable glands (F16 plastic housing)	SW25
Cable glands (F15 stainless steel housing, F34 aluminium housing and optional Harting HAN8D plug connector)	SW22
Cable gland (optional M12 plug connector, Binder series 713/763)	SW13
Crimp contacts optional Harting HAN8D plug connector	Suitable crimping tool

6.1.2 Connecting cable requirements

The connecting cables provided by the customer must fulfil the following requirements:
- Electrical safety in accordance with applicable national regulations.
- Permitted temperature range → 55
- Normal installation cable with at least three wires
- Cable cross-sections: 0.2 to 2.5 mm^2 or AWG 24 to 12
- The terminals are only approved for connecting fixed cables. The operator must provide suitable strain relief.

The optional enclosed plug connectors must fulfil the following requirements:
- Clamping range of the connection cable:
  - 6 ... 8 mm (M12 plug connector, Binder series 713/763)
  - 7 ... 10.5 mm (Harting HAN8D plug connector)
- Cable cross-sections: max. 0.75 mm^2 or AWG 18
- The plug connectors are only approved for connecting fixed cables. The operator must provide suitable strain relief.

NOTICE

For the electrical connection with connectors there are suitable prefabricated connection cables available as accessory (→ 📄54).

6.2 Potential equalization

The following requirements apply to the potential equalization:
- The potential equalization must be connected to the external ground terminal on the FTR20.
- For optimal electromagnetic compatibility, the potential equalization line should be as short as possible.
- The recommended cable cross-section is 2.5 to 4 mm^2.
- The potential equalization for the FTR20 must be integrated into the existing potential equalization on site.

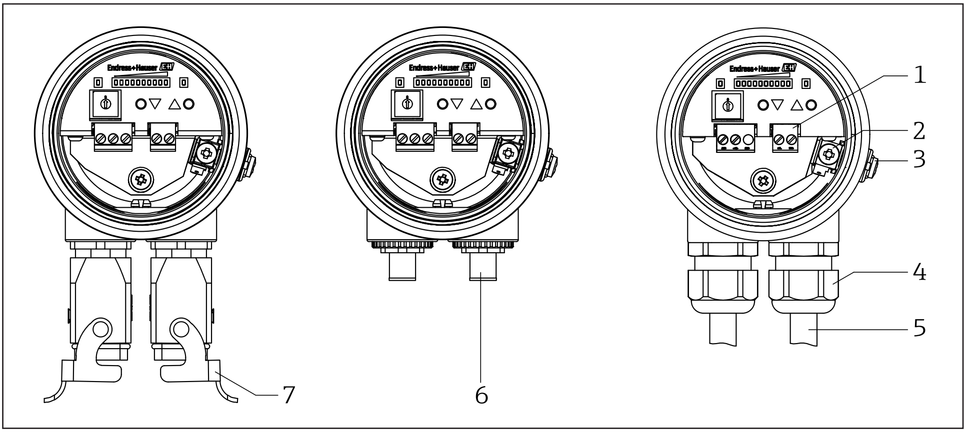
6.3 Connecting the device

There are terminals on the inside or connectors on the outside for the electrical connection.

NOTICE

- For the electrical connection with connectors there are suitable mating connectors available for ordering according to the product configurator or as accessory.
- Prefabricated connection cables with suitable mating connectors are also available as accessory.
- For more information on the range of available accessories → 📄54

6.3.1 Connection of F16 housing (plastic)



7 Device connection F16 housing

1 *Connection terminals*
2 *Internal potential equalization connection*
3 *External potential equalization connection*
4 *Cable gland (clamping areas 5 to 10 mm as per EN 50262 or 7 to 10 mm as per UL-514 B)*
5 *Connection cable*
6 *M12 connector (Binder series 713/763)*
7 *Harting connector type HAN8D*

Procedure of connection with terminals and cable glands:

1. Insert cable into cable gland, tighten cap nut until the rubber seal is touched all around and then tighten cap nut with by ½ turn.
2. Connect the protective ground.
3. Connect the power supply and signal output.

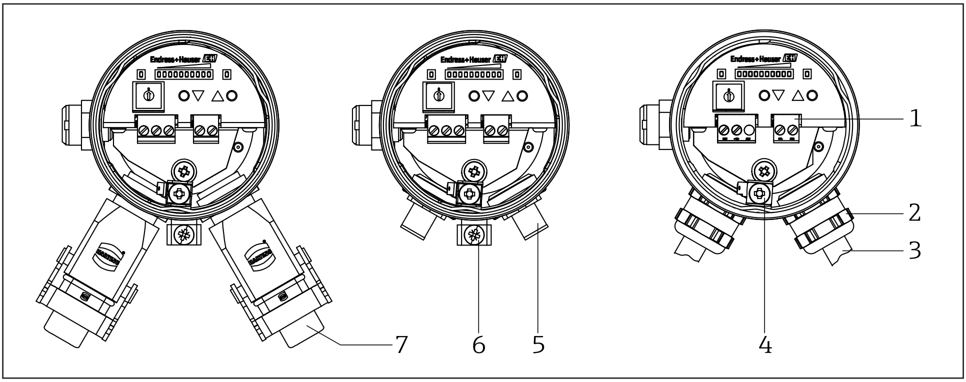
Procedure of connection with connectors:

1. Connect the protective ground.
2. Connect the connectors and fix them.

NOTICE

- For the electrical connection with connectors there are suitable mating connectors available for ordering according to the product configurator or as accessory.
- Prefabricated connection cables with suitable mating connectors are also available as accessory.
- For more information on the range of available accessories → 54

6.3.2 Connection of F15 housing (stainless steel)



8 Device connection F15 housing

1 Connection terminals
2 Cable gland (clamping area 7 to 10.5 mm)
3 Connection cable
4 Internal potential equalization connection
5 M12 connector (Binder series 713/763)
6 External potential equalization connection (only for device versions with connector)
7 Harting connector type HAN8D

Procedure of connection:

1. Insert cable into cable gland, tighten the cap nut (torque of up to 10 Nm).
2. Connect the protective ground.
3. Connect the power supply and signal output.

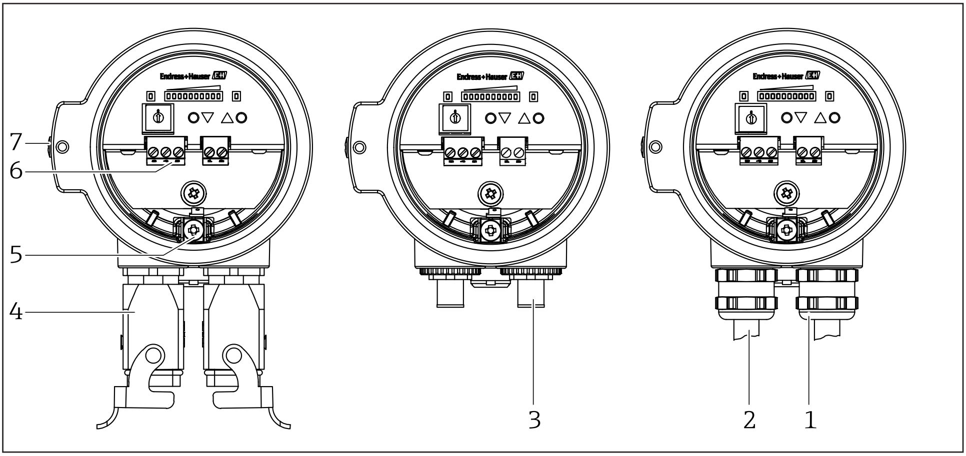
Procedure of connection with connectors:

1. Connect the protective ground.
2. Connect the connectors and fix them.

NOTICE

- For the electrical connection with connectors there are suitable mating connectors available for ordering according to the product configurator or as accessory.
- Prefabricated connection cables with suitable mating connectors are also available as accessory.
- For more information on the range of available accessories → 54

6.3.3 Connection of F34 housing (aluminium)



9 *Device connection F34 housing*

1 *Cable gland (clamping area 7 to 10.5 mm)*
2 *Connection cable*
3 *M12 connector (Binder type 713/763)*
4 *Harting connector type HAN8D*
5 *Internal potential equalization connection*
6 *Connection terminals*
7 *External potential equalization connection*

Procedure of connection:

1. Insert cable into cable gland, tighten the cap nut (torque of up to 10 Nm).
2. Connect the protective ground.
3. Connect the power supply and signal output.

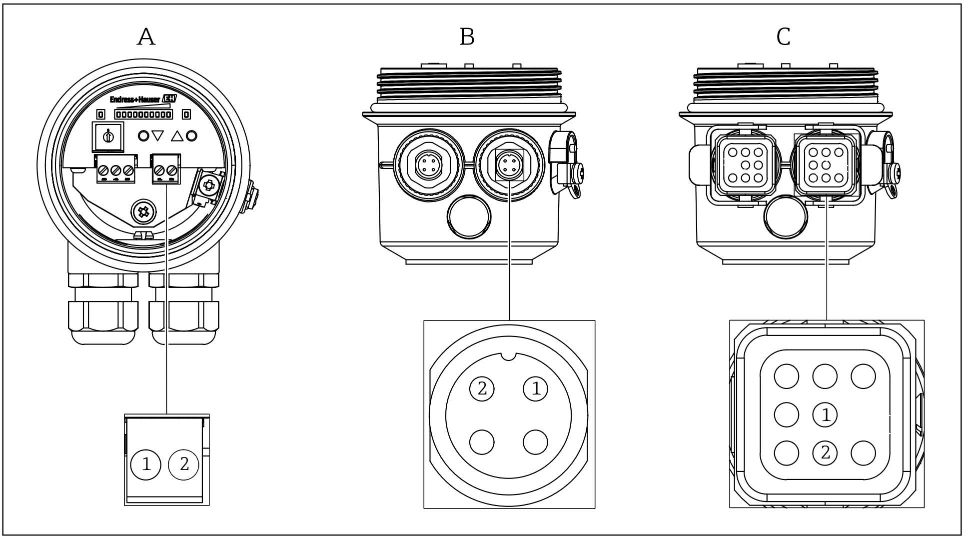
Procedure of connection with connectors:

1. Connect the protective ground.
2. Connect the connectors and fix them.

NOTICE

- For the electrical connection with connectors there are suitable mating connectors available for order according to the product configurator or also as accessory.
- Prefabricated connection cables with suitable mating connectors are also available as accessory.
- For more information on the range of available accessories → 54

6.3.4 Power supply connection



10 *Power supply connection (connector 1)*

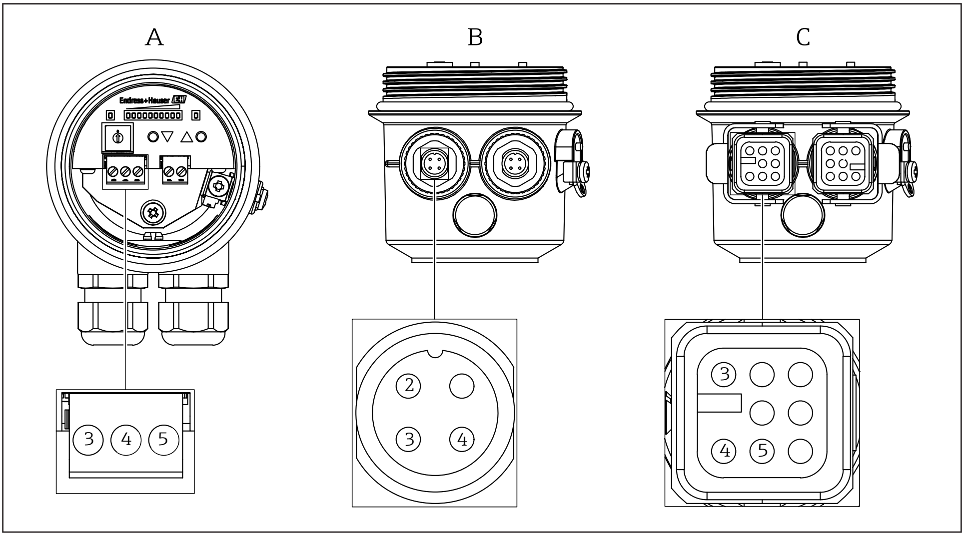
A *Terminal assignment power supply*
B *Pin assignment power supply connector 1 (Binder)*
C *Pin assignment power supply connector 1 (Harting)*

Depending on the device version selected, a power supply with the following values can be connected to the FTR20:
- ~ 85 to 253 V, 50/60 Hz
- ⎓ 20 to 60 V or ~ 20 to 30 V, 50/60 Hz

Electrical connection	Power supply
Connection terminals	Terminal 1 – 2
M12 connector (Binder series 713/763)	Connector 1, contact 1 – 2
Harting connector type HAN8D	Connector 1, contact 1 – 2

NOTICE
- The polarity of the supply voltage can be set as required.
- The electrical connection with connector is only available for the power supply with ⎓ 20 ... 60 V or ~ 20 ... 30 V, 50/60 Hz (ordering option "E").

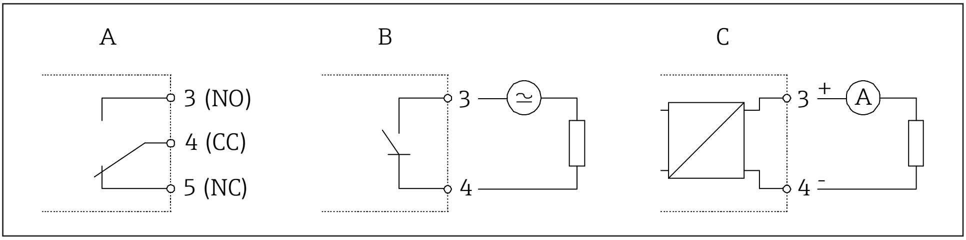
6.3.5 Signal output connection



11 *Signal output connection (connector 2)*

A Terminal assignment signal output
B Pin assignment signal output connector 1 (Binder)
C Pin assignment signal output connector 1 (Harting)

6.3.5.1 Signal outputs



12 *Signal outputs*

A Relay
B Solid-state relay
C Current

6.3.5.2 Relay

The following characteristic data apply for the relay signal output (floating switchover contact):
- Switching capacity: ~ 250 V / 4 A, ⎓ 125 V / 0.4 A or 30 V / 4 A
- Switching frequency: max. 2 Hz

Electrical connection	Relay		
Connection terminals	Terminal 3 (NO)	Terminal 4 (CC)	Terminal 5 (NC)
M12 connector (Binder series 713/763)	Connector 2		
	Terminal 2 (NO)	Terminal 3 (CC)	Terminal 4 (NC)
Harting connector type HAN8D	Connector 2		
	Terminal 3 (NO)	Terminal 4 (CC)	Terminal 5 (NC)

NOTICE
- The contact material is also suitable for switching small-signal circuits. However, this is possible only if no inductive loads or higher currents have been switched previously.
- For a high switching frequency, please use the solid-state relay.
- When using the Harting connector type HAN8D the maximum switching voltage is ⎓ 120 V or ~ 50 V.

6.3.5.2 Solid-state relay

The following characteristic data apply for the solid-state relay signal output (switching contact of a semiconductor relay):
- Switching capacity: ~ 30 V / 0.4 A or ⎓ 40 V / 0.4 A
- Switching frequency: max. 2 Hz

Electrical connection	Solid-state relay
Connection terminals	Terminal 3 – 4
M12 connector (Binder series 713/763)	Connector 2, contact 3 – 4
Harting connector type HAN8D	Connector 2, contact 3 – 4

NOTICE

The polarity of the solid-state relay can be set as required.

6.3.5.3 Current output

The following characteristic data apply for the current output:
- 4-20 mA, active
- Max. load: 600 Ω

Electrical connection	Current output
Connection terminals	Terminal 3 (+) – 4 (–)
M12 connector (Binder series 713/763)	Connector 2, contact 3 (+) – 4 (–)
Harting connector type HAN8D	Connector 2, contact 3 (+) – 4 (–)

6.4 Post-connection check

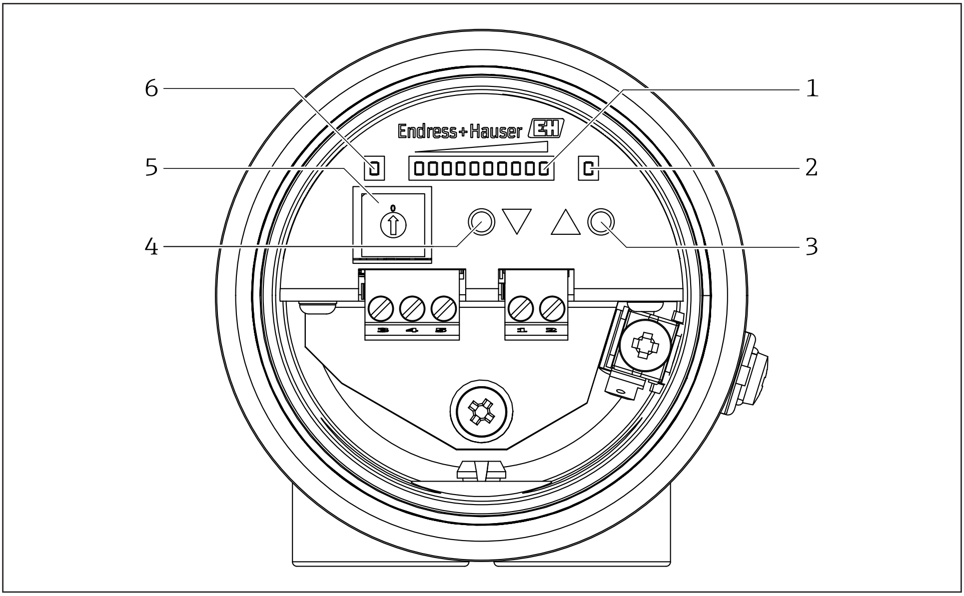
❑	Are the device and the connecting cable(s) undamaged (visual inspection)?
❑	Do the cables used comply with the requirements?
❑	Do the mounted cables have adequate strain relief?
❑	Are all cable glands or connectors installed, firmly tightened and correctly sealed?
❑	Does the supply voltage match the specifications on the nameplate?
❑	Is the terminal assignment correct?
❑	If power supply is switched on: Is the device operational (at least the green LED illuminated)?
❑	Is the housing cover installed and firmly tightened?
❑	For Ex version only: Is the lid safeguard installed correctly?

7 Operability

7.1 Overview

The Solimotion FTR20 is configured using a function selection switch (encoding switch) and two operating buttons (adjustment to the sensitivity needed for clear and unambiguous material flow detection). The parameter configuration is stored internally and is retained even after the supply voltage is disconnected.

No other operator intervention is necessary during operation.



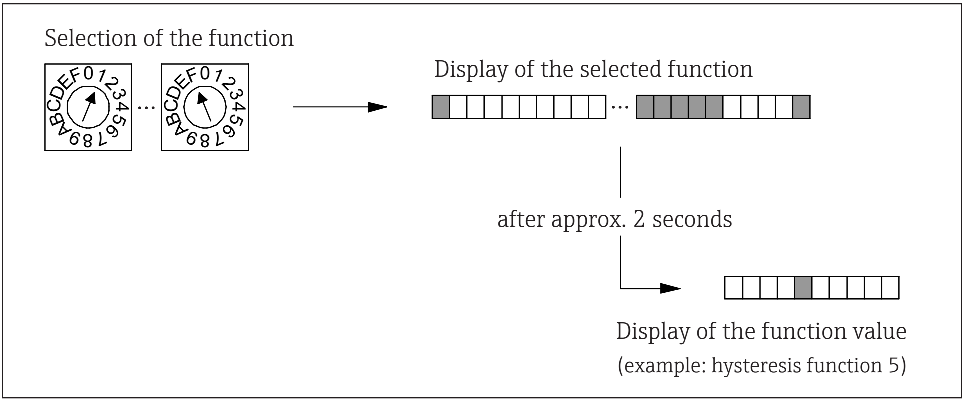
13 *Display and operation elements*

1 Display
- Signal strength in normal mode
- Function number and function value in configuration mode
2 Switch output LED (yellow), relay and solid-state relay
3 Operating button for increase or toggle
4 Operating button for decrease or toggle
5 Function selection switch
6 Ready LED (green)

NOTICE

- The device is in operating mode in encoding switch position "0" only. All other positions are for parameter configuration. The FTR20 flow indicator for bulk solids continues to work in the background, changed settings are taken into account directly.
- Remember to reset the encoding switch to the initial position "0" (= operation) when you have finished configuring settings.

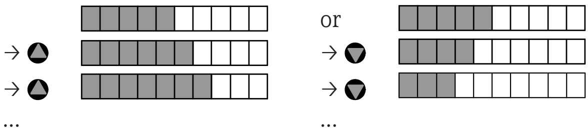
7.2 Structure and function of the operating menu



14 *Operation of the FTR20*

Procedure of parametrization:

1. Select any function (overview → 57)
   → Encoding switch 1 to F
   → The display shows the selected function for two seconds.
   Example function 3:
2. Setting the selected function
   Example: Function 3 (manual calibration for moving bulk solids)
   → You can use the two operating buttons and to increase or decrease the sensitivity.



3. The configured value is stored as soon as the function is switched. The value can be displayed again at any time by selecting the corresponding parameter configuration function and changed if necessary.
4. Once parameter configuration is complete (i.e. once the flow indicator has been adapted to the bulk solids in question), the encoding switch must be returned to the "0" position. The Solimotion FTR20 is now ready for operation.

8 Commissioning

8.1 Installation and function check

Make sure that the post-installation and post-connection checks have been carried out before you commission your measuring point:
- "Post-installation check" checklist → 16
- "Post-connection check" checklist → 25

NOTICE

You can write down all selected settings for documentation purposes (table → 56).

8.2 Switching on the device

The Solimotion FTR20 will be switched on by an applied power supply.

The green LED glows when power supply is applied.

8.3 Configuring the device

The Solimotion FTR20 can be calibrated under the following conditions:

Calibration in the process for moving bulk solids
- Automatic calibration for moving bulk solids (Function 1, → 29), sufficient for most applications

Additional calibration functions (required for specific applications only):
- Manual calibration for moving bulk solids (Function 3, → 29), ideally after the automatic calibration
- Configuring detection range and gain (Function B and C, → 31), fine adjustment ideally after an automatic and/or manual calibration

Calibration in the process for unmoving bulk solids
- Automatic calibration for unmoving bulk solids (Function 2, → 30), sufficient for most applications

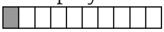
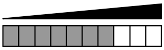
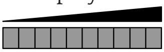
Additional calibration functions (required for specific applications only):
- Manual calibration for unmoving bulk solids (Function 4, → 30), ideally after the automatic calibration
- Configuring detection range and gain (Function B and C, → 31), fine adjustment ideally after an automatic and/or manual calibration

Calibration outside the process
- Configure the detection range and gain (Function B and C, → 31)

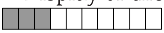
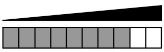
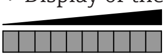
Additional settings for optimal adaptation
→ 39

8.3.1 Calibration with movement of bulk solids

The automatic calibration with movement of bulk solids (**Function 1**) is adequate for most applications. If the bulk solids movement after an automatic calibration is not detected as desired, you can adjust the Solimotion to the application manually using an additional manual calibration.

1. Set encoding switch to Position 1
   → Display of the function number
   
   After 2 seconds: Display of the current signal strength, example:
   
2. Simultaneously press the and keys on the device with maximum solid flow
   → Automatic calibration is carried out
   → Display of the signal strength with maximum solid flow
   
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

Optional: Additional manual calibration with movement of bulk solids (Function 3)
Using the manual calibration, which is ideally carried out after the automatic calibration, the Solimotion can be adapted to the application manually if necessary.

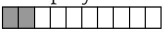
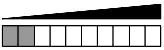
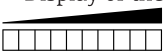
1. Move the encoding switch to position 3
   → Display of the function number
   
   After 2 seconds: Display of the current signal strength, example:
   
2. Press the or key on the device to achieve an increase or reduction of the signal strength with maximum solid flow
   → Display of the signal strength with maximum solid flow (all 10 LEDs illuminate)
   
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

NOTICE

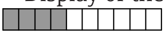
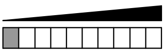
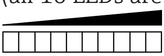
- The Solimotion FTR20 is calibrated if,
  a) for moving bulk solids, the switch point (LED 5) of the switch output is exceeded reliably.
  b) For the current output, only one or two (minimum solid flow) or at least six LEDs (maximum solid flow) are illuminated.
- A repeated automatic calibration (function 1 or function 2) resets any calibration carried out earlier.

8.3.2 Calibration with no movement of bulk solids or minimum solid flow

The automatic calibration with no movement of bulk solids or minimum solid flow (**function 2**) is adequate for most applications. If movement is detected anyways after an automatic calibration with no movement of bulk solids (for example, movement in the area surrounding the measuring point), the Solimotion can be manually adapted to the application using an additional manual calibration.

1. Move the encoding switch to position 2
   → Display of the function number
   
   After 2 seconds: Display of the current signal strength, example:
   
2. Simultaneously press the ▲ and ▼ keys on the device with no movement of bulk solids or minimum solid flow
   → Automatic calibration is carried out
   → Display of the signal strength with no movement of bulk solids or minimum solid flow
   
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

Optional: Additional manual calibration with no movement of bulk solids or minimum solid flow (function 4)
Using the manual calibration, which is ideally carried out after the automatic calibration, the Solimotion can be adapted to the application manually if necessary.

1. Move the encoding switch to position 4
   → Display of the function number
   
   After 2 seconds: Display of the current signal strength, example:
   
2. Press the ▲ or ▼ key on the device to achieve an increase or reduction of the signal strength with no movement of bulk solids or minimum solid flow
   → Display of the signal strength with no movement of bulk solids or minimum solid flow (all 10 LEDs are not lit)
   
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

NOTICE
→ 29

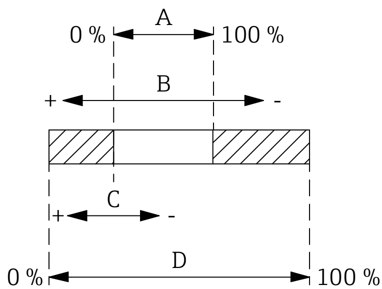
8.3.3 Gain and detection range (Function B and C)

The "Gain" and "Detection range" functions are for fine adjustment after an automatic and/or manual calibration; for most applications they are not needed. Alternatively, a calibration even without the process is possible only with these functions.

The functions are particularly helpful in the following cases:
- Calibration for bulk solids with bad reflection properties or low solid flow
- Mapping of movements in the area surrounding the measuring point with no movement of bulk solids
- Calibration of the Solimotion outside of the process
- Adoption of the calibration parameters with a device replacement at the same measuring point

Introduction
The Solimotion FTR20 detects the movement of a wide variety of bulk solids. The total detection range (0 to 100 % ≙ minimum to maximum possible signal strength) is designed to be correspondingly wide. This way even products with bad reflection properties (small signal strengths), such as rigid polystyrene foam, can be detected.

Since the signal strengths with most applications do not cover the entire detection range, this can be adapted with function B "Gain" and function C "Detection range".

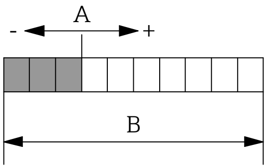


15 *Gain and detection range*

A Configured detection range
B Shift of the detection range within the total detection range
C Specification of the width of the detection range by shifting the lower range
D Total available detection range

If the reflection properties of the bulk solids in the application are very bad, the detection range (function C) should be decreased and shifted in the direction of smaller signal strengths using the gain (function B).

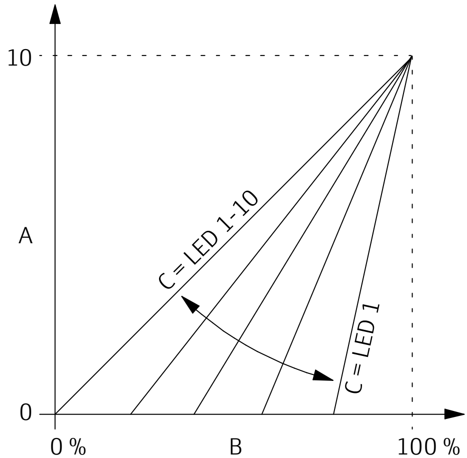
8.3.3.1 Detection range (function C)



16 Detection range settings

A Configured detection range (here 3 LEDs)
B Maximum possible detection range depending on the gain

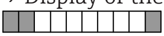
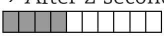
The detection range can be configured depending on the gain (function B) in the range from 1 to a maximum of 10 LEDs (corresponds to the maximum possible detection range).



17 Detection range depending on gain

A Illuminated LEDs of the signal strength display
B Total available detection range
C Setting in function C

The detection range is configured as follows:

1. Move the encoding switch to position C
   → Display of the function number
   
   → After 2 seconds: Display of the configured detection range, example:
   

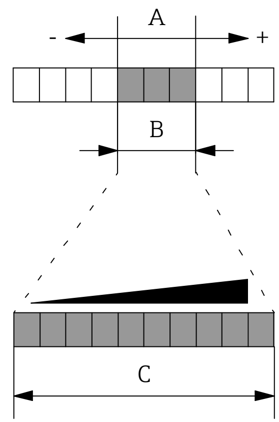
2. Press the or key on the device to increase or decrease the detection range depending on the gain
→ Display of the changed detection range, example:
 (detection range decreased by 1 LED)
3. Move the encoding switch to the initial position 0
→ Display of the current signal strength

NOTICE

- If the difference between maximum and minimum signal strength in the process is large (fluctuations in the solid flow), a larger detection range should be selected.
- If the difference between maximum and minimum signal strength in the process is small (fluctuations in the solid flow), a smaller detection range should be selected.
- Adjust the detection range and gain until the display of the signal strength has reliably exceeded/undershot the upper and lower switch point (→ 31) (switch output) or the desired output signal has been output (output current).

8.3.3.2 Gain (function B)

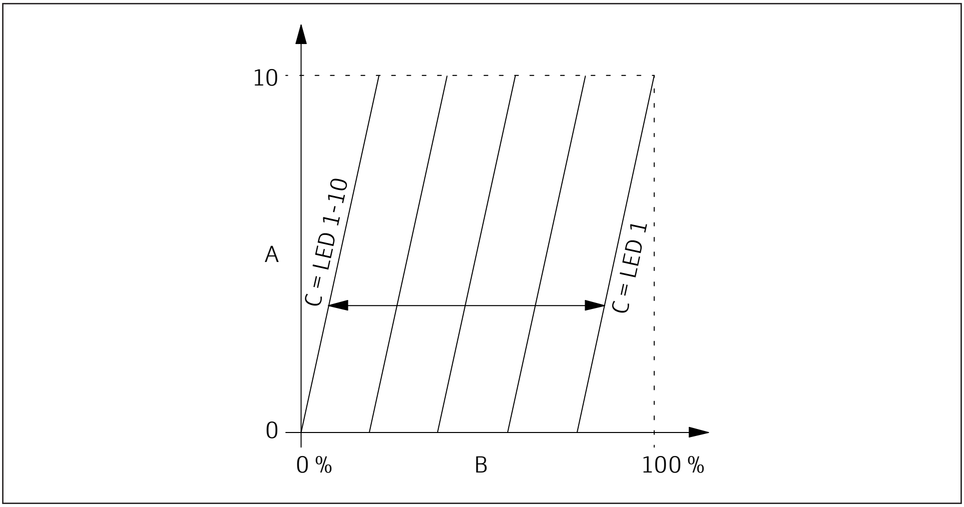
The configured detection range (**function C**) can be shifted within the maximum possible range using the gain.



18 Gain settings

A	*Configured detection range (function C); here, for example, 3 LEDs*
B	*Gain; here, for example, 7 LEDs*
C	*LED signal strength display*

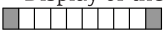
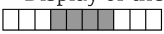
Depending on the detection range, it can be configured in the range from 1 to a maximum of 10 LEDs in 20 increments (2 increments correspond to 1 LED).
The smaller the detection range selected, the larger the gain selected can be (→ 32).



19 Gain

A Illuminated LEDs of the signal strength display
B Total available detection range
C Setting in function B

The gain is configured as follows:

1. Move the encoding switch to position B
   → Display of the function number
   
   → After 2 seconds: Display of the configured gain, example:
   
2. Press the ▲ or ▼ key on the device to increase or decrease the gain depending on the detection range (see the following table)
   → Display of the changed gain, example:
    (gain increased by 2 LEDs)
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

NOTICE

- If bulk solids with bad reflection properties (small signal strength) are detected, the detection range should be shifted in the direction of smaller signal strengths (high gain).
- If bulk solids with good reflection properties (large signal strength) are detected, the detection range should be shifted in the direction of larger signal strengths (low gain).
- Adjust the detection range and gain until the display of the signal strength has reliably exceeded/undershot the upper and lower switch point (→ 🗎31) (switch output) or the desired output signal has been output (output current).

Overview of the dependency between detection range and gain

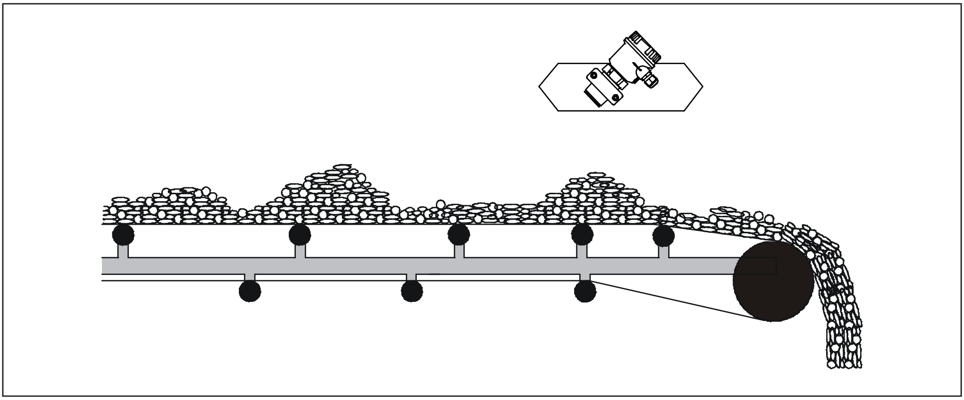
Detection range	Maximum gain
■□□□□□□□□□	□□□□□□□□□■
■■□□□□□□□□	□□□□□□□■■□
■■■□□□□□□□	□□□□□□■■■□
■■■■□□□□□□	□□□■■■■□□□
■■■■■□□□□□	□■■■■■□□□□
■■■■■■□□□□	■■■■■□□□□□
■■■■■■■□□□	■■■■□□□□□□
■■■■■■■■□□	■■■□□□□□□□
■■■■■■■■■□	■■□□□□□□□□
■■■■■■■■■■	■□□□□□□□□□

NOTICE

- For the calibration it is advisable first to carry out the automatic calibration in function 1 or 2, in order to start with meaningful values.
- The adjustable gain depends on the configured detection range and vice versa.
- Carrying out another automatic calibration (function 1 or function 2) overrides all previous calibration values.
- When changing devices, the configured values can be directly applied here; another calibration of the application is not required.

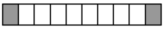
8.3.4 Example of bulk solids detection on a conveyor belt

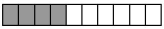
The bulk solids for which movement is to be detected are transported via a conveyor belt. Due to process fluctuations, the belt is loaded unevenly.



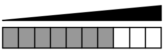
20 Bulk solids detection on a conveyor belt

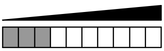
Default setting of the Solimotion FTR20 (→ 47)

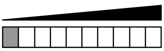
 Gain (function B)

 Detection range (function C)

Signal strength display in this particular example with the default settings:

 maximum loading (current output: 15.2 mA)

 minimum loading (current output: 8.8 mA)

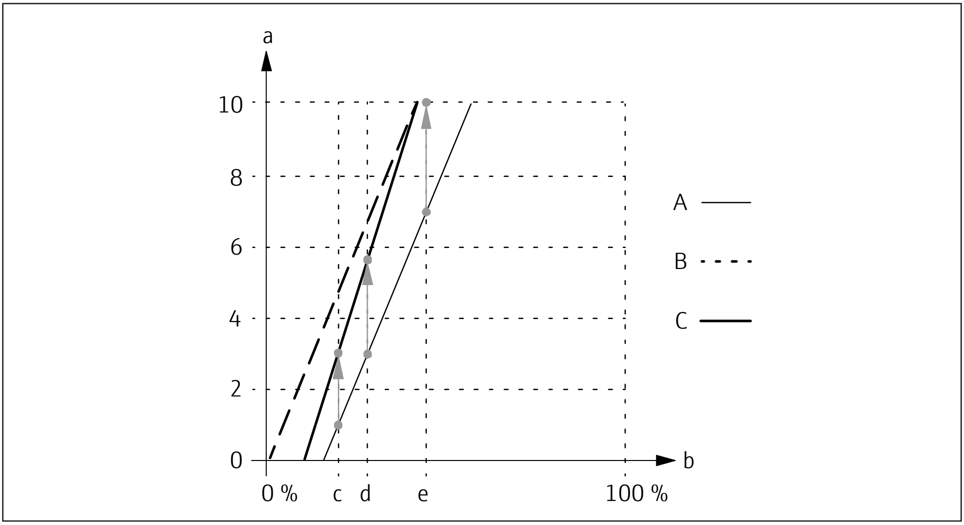
 no loading (current output: 5.6 mA)

NOTICE

A calibration of the switch output and the current output is explained on the following pages, based on the bulk solids detection on a conveyor belt presented above. These settings are only examples of a configuration using functions B and C.

8.3.4.1 Example: Calibrate switch output

For example, the Solimotion FTR20 with switch output should be calibrated such that the output relay remains closed despite the fluctuating signal strength (if loading of the belt is low (= minimum signal strength), the switch point (LED 5) must remain reliably exceeded). If the belt is empty, the switch point must not be exceeded.



21 *Calibrating switch output*

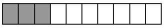
A	*Default setting*
B	*Gain increased by 2 LEDs*
C	*New setting*
a	*Illuminated LEDs of the signal strength display*
b	*Total available detection range*
c	*Signal strength when belt is empty*
d	*Signal strength when belt loading is minimum*
e	*Signal strength when belt loading is maximum*

The calibration is carried out as follows:

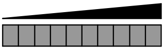
1. Increasing the gain (**function B**) by 2 LEDs to 7 (shifting the detection range in the direction of smaller signal strengths)
   → Display of the maximum belt loading (dashed curve) now with 10 LEDs
   → The minimum loading is displayed with 6 to 7 LEDs
   → The empty belt is displayed with 4 to 5 LEDs
2. Reduction of the detection range (**function C**) by 1 LED to 3 in order to reduce the signal strength display of the measured signal strength of the empty belt
   → Display of the empty belt (bold curve) with 3 LEDs
   → The minimum loading is displayed with 5 to 6 LEDs
   → Exceeding of the switch point with low loading is ensured

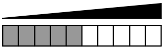
Setting of the Solimotion FTR20 after calibration of the switch output:

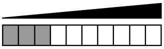
 Gain (function B)

 Detection range (function C)

Signal strength display **in this particular example** with new settings:

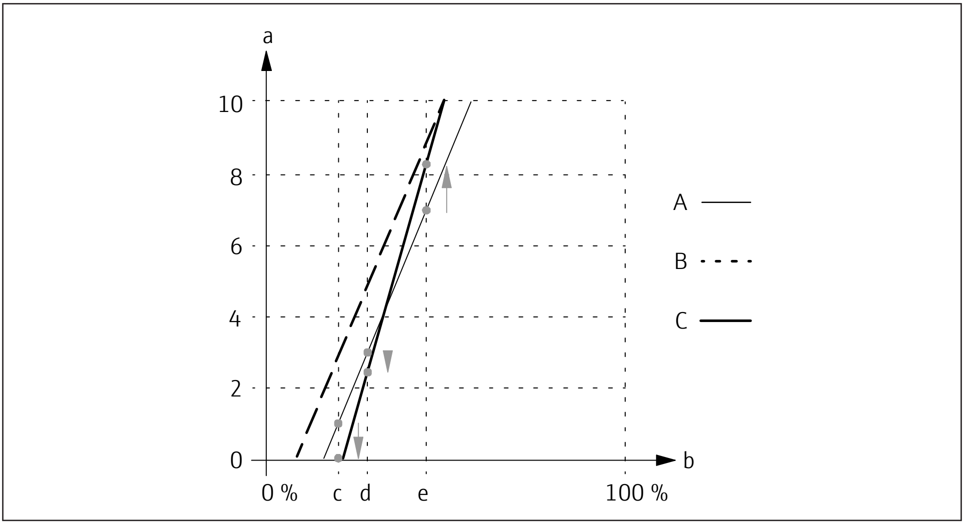
 maximum loading (current output: 20 mA)

 minimum loading (current output: 12 mA)

 no loading (current output: 8.8 mA)

8.3.4.2 Example: Calibrate current output

For example, the Solimotion FTR20 with current output should be calibrated such that the irregular loading height of the conveyor belt can be detected. The movement of the empty belt must not be detected.



22 Calibrating current output

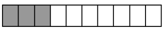
A Default setting
B Gain increased by 2 LEDs
C New setting
a Illuminated LEDs of the signal strength display
b Total available detection range
c Signal strength when belt is empty
d Signal strength when belt loading is minimum
e Signal strength when belt loading is maximum

The calibration is carried out as follows:

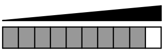
1. Increasing the gain (**function B**) by 1 LED to 6 (shifting the detection range in the direction of smaller signal strengths)
   → Display of the maximum belt loading (dashed curve) now with 9 LEDs
   → The minimum loading is displayed with 5 LEDs
   → The empty belt is displayed with 3 LEDs
2. Reduction of the detection range (**function C**) by 1 LED to 3 in order to reduce the signal strength display of the measured signal strength of the empty belt
   → Display of the empty belt (bold curve) with 0 LEDs
   → The minimum loading is displayed with 2 LEDs

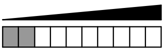
Setting of the Solimotion FTR20 after calibration of the current output:

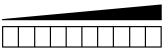
 Gain (function B)

 Detection range (function C)

Signal strength display **in this particular example** with new settings:

 maximum loading (current output: 18.4 mA)

 minimum loading (current output: 7.2 mA)

 no loading (current output: 4 mA)

8.4 Advanced settings

The following settings are optional and not required in most cases; it may make sense to use them only for special adaptations to the application and/or to the downstream analysis (process control system):

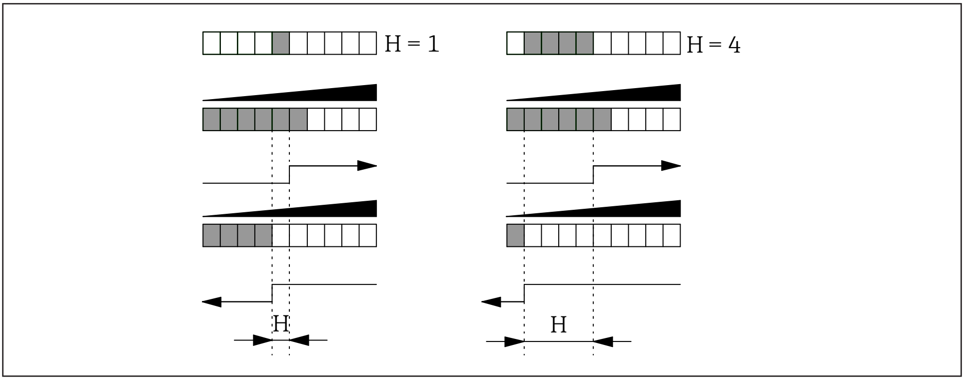
- Hysteresis (**function 5**): Adjusting of a switching hysteresis (only for signal output relay or solid-state relay, → 39)
- Limit signal function (**function 6**): Adjusting of the switching characteristics (only for signal output relay or solid-state relay, → 40)
- Switching delay (**function 7** and **function 8**): Adjusting of a switch-on and/or switch-off delay (only for signal output relay or solid-state relay, → 42)
- Damping (**function A**): Averaging of the detected signal strength (→ 44)

NOTICE

Overview of the factory defaults
→ 57

8.4.1 Hysteresis (function 5)

A hysteresis from 1 to 4 LEDs can be programmed for the switch output (change-over contact with relay, normally open contact with solid-state relay, of no significance for current output). The fixed switch point with increasing signal strength is at the transition from LED 5 to LED 6. For decreasing signal strength, the switch point can be configured between the transition from LED 5 to LED 4 (minimum hysteresis of an LED) and maximum between LED 2 to LED 1 (maximum hysteresis of four LEDs).



23 *Adjustment of the switching hysteresis*

H *Hysteresis*

The hysteresis is configured as follows:

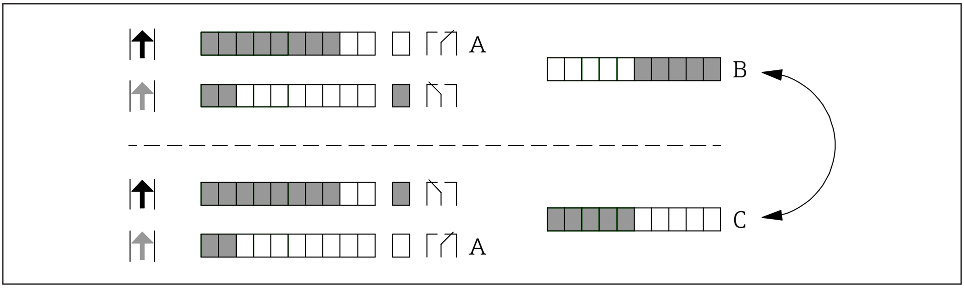
1. Move the encoding switch to position 5
   → Display of the function number
   
   → After 2 seconds: Display of the configured hysteresis, example:
   
2. Press the or key on the device in order to configure the hysteresis in the range from 1 to 4 LEDs
   → Display of the changed hysteresis, example:
    (hysteresis increased from 3 LEDs to 4 LEDs)
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

NOTICE

- A larger hysteresis can also be used to prevent the output from continuously switching with a fluctuating signal strength. If, for example, the signal strength continuously fluctuates between the third and eighth LED, the factory default hysteresis of an LED would lead to the switch output continuously switching when the fourth LED is undershot.
- This setting has no significance for the current output.

8.4.2 Limit signal function (function 6)

For devices with a relay and solid-state relay, the limit signal function determines the switching behavior upon exceeding and undershooting the limit value (upper limit value LED 5, lower limit determined by hysteresis).

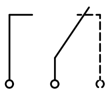
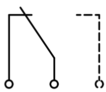
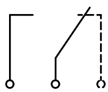
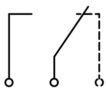
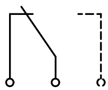


24 *Adjustment of limit signal function*

A *Rest position (supply voltage missing)*
B *Minimum safety*
C *Maximum safety (default setting)*

The limit signal function is configured as follows:

1. Move the encoding switch to position 6
   → Display of the function number
   
   → After 2 seconds: Display of the configured limit signal function, example:
   
2. Press the  or  key on the device in order to change between the two possible limit signal functions
   → Display of the changed limit signal function, example:
   
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

Output	Rest position	Setting	Exceeding of switch point (LED 5)	Undershooting hysteresis (function 5)
Relay (Contact 3-4-5) or **Solid-state relay** (Contact 3-4)	 3 4 5		 3 4 5	 3 4 5
			 3 4 5	 3 4 5

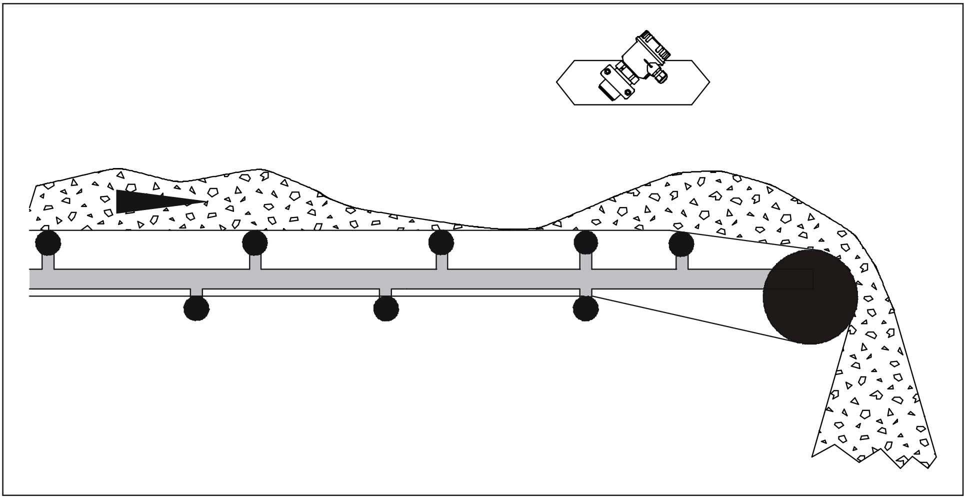
NOTICE

- These settings are for adapting the switching function to the downstream analysis (process control system).
- This setting has no significance for the current output.

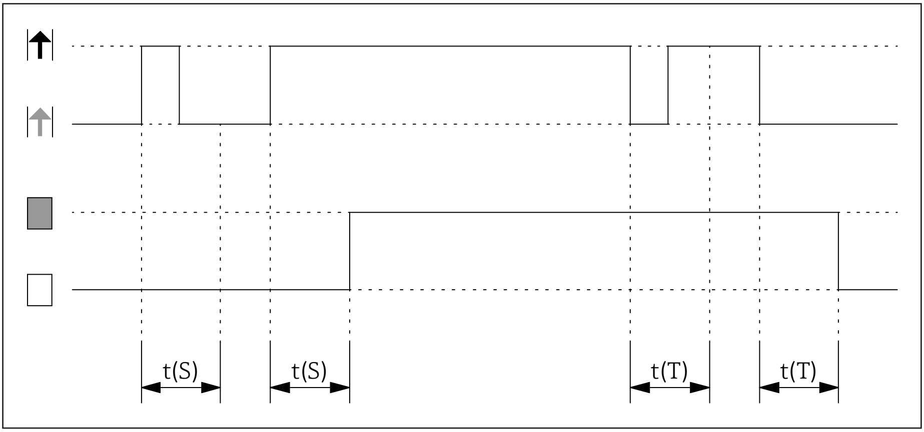
8.4.3 Switching delay (function 7 and 8)

An additional switch-on and/or switch-off delay can be configured for the switch output. This can be used, for example, to stabilize the switch output when the signal strength fluctuates greatly, so that the relay does not switch until the switch point has been exceeded or undershot for a corresponding time.

As long as the times in which no bulk solids are detected on the belt or are smaller than the switch-off delays, the switch output remains in the state "Bulk solids movement detected".



25 Example fluctuating material on conveyor belt



26 Adjustment of switching delays

t(S) Switch-on delay (function 7)
t(T) Switch-off delay (function 8)

Setting	Delay t(S), t(T)	Setting	Delay t(S), t(T)
□□□□□□□□□□	off	■■■■■■□□□□	2 s
■□□□□□□□□□	100 ms	■■■■■■■□□□	3 s
■■□□□□□□□□	200 ms	■■■■■■■■□□	5 s
■■■□□□□□□□	300 ms	■■■■■■■■■□	10 s
■■■■□□□□□□	500 ms	■■■■■■■■■■	20 s
■■■■■□□□□□	1 s		

The switching delays t(S) and t(T) are configured as follows:

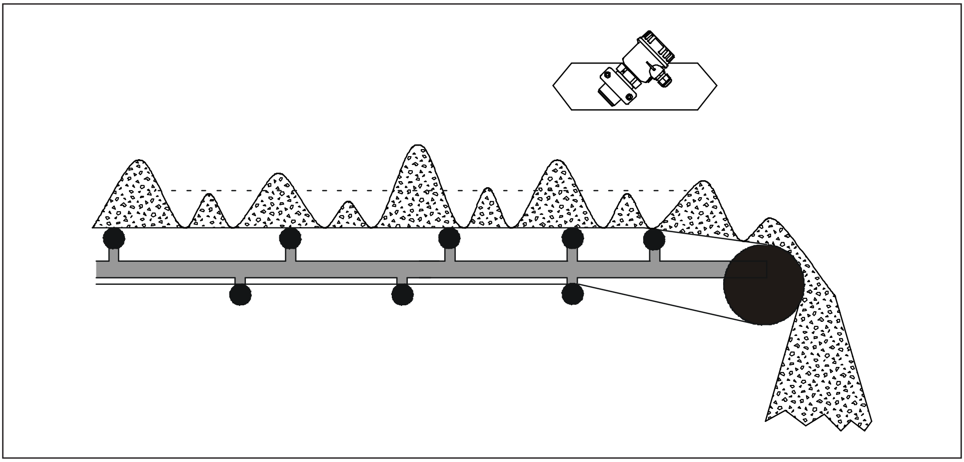
1. Move the encoding switch to position 7 (**switch-on delay t(S)**) or position 8 (**switch-off delay t(T)**)
   → Display of the function number, switch-off delay example
   ■■■■■■■■□□
   → After 2 seconds: Display of the configured delay time, example:
   □□□□□□□□□□ (switch-off delay = off)
2. Press the ▲ or ▼ key on the device to configure the delay time
   → Display of the changed delay time, example:
   ■■■□□□□□□□ (switch-off delay = 300 ms)
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

NOTICE

- The delays impact only the switch outputs (relay and solid-state relay); they have no significance for the current output.
- If the process conditions are unstable, the signal strength can be calmed with a parameterizable damping (function A).

8.4.4 Damping (function A)

For unstable process conditions, the display of the signal strength can be stabilized by a configurable damping; averaging of the output signal takes place here over the set time.



27 Example heavy fluctuating material on conveyor belt

Changing conveyor loads can lead to unstable signal strengths; these are stabilized using a configured damping (averaging over the set time).

Setting	Damping	Setting	Damping
□□□□□□□□□□	off	■■■■■■□□□□	2 s
■□□□□□□□□□	100 ms	■■■■■■■□□□	3 s
■■□□□□□□□□	200 ms	■■■■■■■■□□	5 s
■■■□□□□□□□	300 ms	■■■■■■■■■□	10 s
■■■■□□□□□□	500 ms	■■■■■■■■■■	20 s
■■■■■□□□□□	1 s		

The damping is configured as follows:

1. Move the encoding switch to position A
   → Display of the function number

   → After 2 seconds: Display of the configured damping, example:
   (damping = 200 ms)
2. Press the or key on the device to configure the damping
   → Display of the changed damping, example:
   (damping increased to 500 ms)
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

NOTICE

- The set time not only damps the signal strength display, but also impacts the switch output (for example, a delayed switching) and the current output (rises/falls with a delay).
- If only the switch output is to be stabilized, it is advisable to configure a switch-on and/or off delay (→ 42).
- The switch-on and/or off delay and damping can be combined, which causes the detection to be significantly slower.

8.5 Resetting to factory defaults (function F)

You can reset the Solimotion FTR20 to its factory defaults with this function as follows:

1. Move the encoding switch to position F
   → Display of the function number

   → All LEDs go out after 2 seconds.
2. Press the and keys on the device to set it to the factory defaults
   → All LEDs illuminate as confirmation.
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

Function		Description	Default value
0		Display of the signal strength	–
1		Automatic configuration with movement of bulk solids	–
2		Automatic configuration with no movement of bulk solids	–
3		Manual configuration with movement of bulk solids	–
4		Manual configuration with no movement of bulk solids	–
5		Hysteresis	

Function		Description	Default value
6	■■■■■■□□□□	Limit signal function	■■■■■□□□□□
7	■■■■■■■□□□	Switch-on delay	□□□□□□□□□□
8	■■■■■■■■□□	Switch-off delay	□□□□□□□□□□
9	■■■■■■■■■□	Simulation	–
A	■■■■■■■■■■	Damping	□□□□□□□□□□
B	■□□□□□□□□■	Gain	□■■■■□□□□□
C	■■□□□□□□□■	Detection range	■■■■□□□□□□
D	■■■□□□□□□■	- has no function -	–
E	■■■■□□□□□■	- has no function -	–
F	■■■■■□□□□■	Reset to factory settings	–

8.6 Simulation

The Solimotion FTR20 gives you the ability to simulate a signal and thereby an output variable, independent of the process, for example, in order to configure a downstream PLC or a data logger.

The simulation is carried out as follows (function 6 = standard setting):

1. Move the encoding switch to position 9
   → Display of the function number
   ■■■■■■■■■□
   → After 2 seconds: Display of the simulated signal strength
   □□□□□□□□□□ (signal strength = 0 LEDs, switch output: not switched, current output: 4 mA)
2. Press the ▲ or ▼ key on the device to configure the desired signal strength
   → Display of the changed simulated signal strength, example:
   ■■■■■■■■□□ (signal strength = 8 LEDs, switch output: switched, current output: 16.8 mA)
3. Move the encoding switch to the initial position 0
   → Display of the current signal strength

NOTICE

The simulation ends as soon as the encoding switch is no longer at position 9.

9 Diagnostics and troubleshooting

9.1 General troubleshooting

Make sure beforehand that the following checks have been carried out:
- "Post-mounting check" checklist (→ 📄16)
- "Post-connection check" checklist (→ 📄25)

9.2 Diagnostic information

Error	Possible cause	Remedy
Green LED not lit	Supply voltage absent or too low	Check supply voltage
	FTR20 defective	Replace device or electronics module
Yellow LED (switch output) always illuminated, regardless of the signal strength display	FTR20 defective	Replace device or electronics module
Bulk solids that move are not detected	Incorrect settings	Check settings (→ 📄28)
	Incorrect installation	Check installation (→ 📄14)
	Beam path soiled	Check beam path and clean where necessary
Signal despite unmoving bulk solids	FTR20 is configured too sensitively (movements in the area surrounding the measuring point are detected)	Check settings (→ 📄28)
Signal strength fluctuates heavily	Unstable application, reflections	Increase signal damping (→ 📄44)
Switch point (switch output) is not exceeded	Incorrect settings	Check settings (→ 📄28)
Switch output switches continuously	Unstable application	Increase hysteresis (→ 📄39) or switching delay (→ 📄42) / increase gain (→ 📄33)

9.3 Resetting the device

To avoid errors that can be caused by an incomplete and/or faulty configuration, you can reset the device to the delivery condition (→ 📄47).

10 Maintenance

No special maintenance work is required.

10.1 Maintenance recommendation

If medium is building up, however, we recommend regularly checking the beam path and cleaning where appropriate. This can be done using:
- PTFE or ceramic disk at the process connection
- Sight glass fitting or technical special product solutions with PTFE or ceramic disk (optional accessories)
- Materials the customer uses in the process that allow media to pass through

10.2 Endress+Hauser services

Endress+Hauser offers a variety of services for maintenance like on-site inspection including maintenance or device testing.

Contact your Endress+Hauser sales center for information on services and spare parts.

11 Repair

The flow indicator for bulk solids Solimotion FTR20 is not to be repaired on-site.

11.1 General notes

11.1.1 Repair policy

The Endress+Hauser repair policy provides that repairs to the modularly designed devices can be carried out by Endress+Hauser Service or customers with corresponding training.

Spare parts are combined in useful kits and are accompanied by the associated replacement instructions. For more information on service and spare parts, please contact Endress+Hauser Service.

11.1.2 Repairing Ex-certified devices

When repairing Ex-certified devices, please also note the following:

- Ex-certified devices may be repaired only by properly trained personnel or Endress+Hauser Service.
- Relevant standards, national regulations and safety instructions (XA) and certificates must be observed.
- Only original Endress+Hauser spare parts may be used.
- When ordering spare parts, please note the device designation on the nameplate. Parts may only be replaced with the same parts.
- Carry out repairs according to the instructions. Following a repair, the individual testing prescribed for the device must be carried out.
- A certified device may be converted to another certified version by Endress+Hauser Service only.
- All repairs and modifications must be documented.

11.1.3 Replacing the electronics or a device

After replacing the electronics or a device, a new calibration is required, since the settings are saved in the electronic insert.

If you are still able to read out the settings before making the replacement, make note of them (→ 🗎56) and reenter them after the replacement. If this is no longer possible, the device has to be recalibrated (→ 🗎28).

NOTICE

The device variants with connector and extended ordering option "electronics encapsulated" can only be repaired by the manufacturer.

Details about the available device variants can be viewed in the product configurator on the Endress+Hauser homepage www.endress.com.

11.2 Spare parts

Electronic inserts are available for all device versions of the FTR20. Specifications for the electronics you need are located on the nameplate.

NOTICE

- All spare parts for the device, including the order code, are listed and can be ordered at the Internet site www.endress.com/deviceviewer (W@M Device Viewer). If available, the corresponding Installation Instructions can also be downloaded there.
- Each electronic insert is identified by an order number. When making a replacement, please make sure that only the correct electronics are installed.

⚠ WARNING

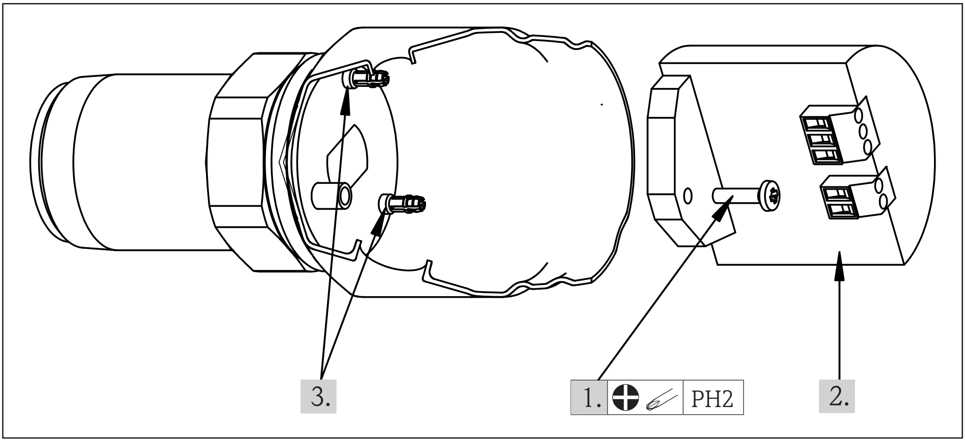
- In the case of devices certified for potentially explosive areas, installation of incorrect electronics leads to loss of conformity, which means the device is no longer permitted to be operated in a hazardous area.
- Selection of an incorrect supply voltage can lead to the immediate destruction of the electronics.
- Selection of an incorrect signal output can lead to the downstream machine getting damaged.

11.2.1 Available electronics

71125444	FTR20-AA1A****, F15/F16 (Datecode up to 04.2016)	without approval
71324391	FTR20-AA1A****, F15/F16 (Datecode from 05.2016)	
71324394	FTR20-AA1A****, F34	
71125445	FTR20-AA1E****, F15/F16 (Datecode up to 04.2016)	
71324392	FTR20-AA1E****, F15/F16 (Datecode from 05.2016)	
71324418	FTR20-AA1E****, F34	
71125447	FTR20-AA2A****, F15/F16	
71324420	FTR20-AA2A****, F34	
71125449	FTR20-AA2E****, F15/F16	
71324423	FTR20-AA2E****, F34	
71125450	FTR20-AA3A****, F15/F16	
71324425	FTR20-AA3A****, F34	
71125451	FTR20-AA3E****, F15/F16	
71324426	FTR20-AA3E****, F34	
71125452	FTR20-BA1A****, F15/F16 (Datecode up to 04.2016)	ATEX
71324427	FTR20-BA1A****, F15/F16 (Datecode from 05.2016)	
71324429	FTR20-BA1A****, F34	
71125453	FTR20-BA1E****, F15/F16 (Datecode up to 04.2016)	
71324428	FTR20-BA1E****, F15/F16 (Datecode from 05.2016)	
71324431	FTR20-BA1E****, F34	
71125454	FTR20-BA2A****, F15/F16	
71324433	FTR20-BA2A****, F34	
71125455	FTR20-BA2E****, F15/F16	
71324436	FTR20-BA2E****, F34	
71125456	FTR20-BA3A****, F15/F16	
71324442	FTR20-BA3A****, F34	
71125457	FTR20-BA3E****, F15/F16	
71324444	FTR20-BA3E****, F34	

▪ 71258332 ▪ 71258333 ▪ 71258334 ▪ 71258335 ▪ 71258336 ▪ 71258337	FTR20-CA1A**** FTR20-CA1E**** FTR20-CA2A**** FTR20-CA2E**** FTR20-CA3A**** FTR20-CA3E****	~~EX~~ CSA
▪ 71258338 ▪ 71258339 ▪ 71258340 ▪ 71258341 ▪ 71258342 ▪ 71258344	FTR20-CB1A**** FTR20-CB1E**** FTR20-CB2A**** FTR20-CB2E**** FTR20-CB3A**** FTR20-CB3E****	EX CSA
▪ 71125458 ▪ 71324447 ▪ 71324468 ▪ 71125459 ▪ 71324466 ▪ 71324470 ▪ 71125460 ▪ 71324471 ▪ 71125461 ▪ 71324473 ▪ 71125462 ▪ 71324476 ▪ 71125463 ▪ 71324477	FTR20-IA1A****, F15/F16 (Datecode up to 04.2016) FTR20-IA1A****, F15/F16 (Datecode from 05.2016) FTR20-IA1A****, F34 FTR20-IA1E****, F15/F16 (Datecode up to 04.2016) FTR20-IA1E****, F15/F16 (Datecode from 05.2016) FTR20-IA1E****, F34 FTR20-IA2A****, F15/F16 FTR20-IA2A****, F34 FTR20-IA2E****, F15/F16 FTR20-IA2E****, F34 FTR20-IA3A****, F15/F16 FTR20-IA3A****, F34 FTR20-IA3E****, F15/F16 FTR20-IA3E****, F34	EX IECEx

11.2.2 Replacing the electronics



28 *Replacing the electronics*

The electronics are attached to two self-clamping spacers and secured with a screw. To replace the electronics, proceed as follows:

1. Loosen the screw
2. Detach the electronic insert by pulling it from the two spacers and take it out of the device vertically
3. Insert the new electronic insert into the housing vertically, gently push it onto the spacers to snap it in and fasten it with the screw (1 … 2 Nm)

11.3 Return

The device has to be returned in the event of repair, incorrect delivery or incorrect ordering. As an ISO-certified company and due to legal regulations, Endress+Hauser is obligated to use particular handling techniques for all returned products that have come into contact with a medium.

To ensure the safe, proper and fast return of your device:
Learn about the procedure and basic conditions at the Endress+Hauser Internet site
www.services.endress.com/return-material

NOTICE

Preprinted form of the "Declaration of Contamination"
→ TI00447F/97/EN

11.4 Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), our products are marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Such products may not be disposed of as unsorted municipal waste and can be returned to Endress+Hauser for disposal at conditions stipulated in our General Terms and Conditions or as individually agreed.

11.4.1 Device removal

Perform the installation and connection steps from the "Installing the FTR20" (→ 14) and "Connecting the device" (→ 18) in reversed order, taking into account the safety guidelines.

⚠ WARNING

Danger to persons from process conditions! Take care in the presence of dangerous process conditions, such as high temperatures or aggressive or corrosive media.

11.4.2 Disposing of the device

⚠ WARNING

Danger to personnel and the environment from media that are hazardous to health.
Ensure that the device and all cavities are free of any residual media that are hazardous to health or the environment, e.g. substances that have seeped into crevices or diffused through plastic.

NOTICE

Observe the following when disposing of the device:
- Comply with the applicable national regulations.
- Ensure proper separation by substance types and recycling of the device components.

12 Accessories

Detailed information on accessories can be found in the technical documentation → TI00447F/97/EN

Designation	Additional information
Mating connector	▪ M12 Binder series 713/763, 4-pole ▪ Harting HAN8D
Prefabricated connection cable	▪ M12 Binder series 713/763, 4-pole, length 2 m or 5 m ▪ Harting HAN8D, length 2 m or 5 m
Mounting bracket	▪ Aluminum ▪ Plastic
Installation flange	▪ Rp 1½ in accordance with EN 1092-1: DN40/PN40 to DN100/PN16, 316Ti ▪ 1½ NPT in accordance with ANSI/ASME: 1½" to 3 NPT", 150 lbs, 316Ti ▪ G 1½ in accordance with ISO 228-1: DN40/PN40 to DN100/PN16, 316Ti ▪ Optionally available with inspection certificate in accordance with EN 10204-3.1
Window	▪ Welding assembly: DN 50 to DN 100, Tmax +200 °C, unpressurized, 316Ti ▪ Welding assembly: DN 50 to DN 100, Tmax +200 °C, Pmax 1 MPa (10 bar), 316Ti ▪ Flange assembly: DN 50 to DN 100, Tmax +200 °C, Pmax 2.5 MPa (25 bar), 316Ti
High-temperature adapter	▪ R 1½/Rp 1½, 55 mm (AF), 316Ti (also suitable for devices with thread ISO 228 G 1½) ▪ 1½ NPT, 55 mm (AF), 316Ti ▪ Optionally available with inspection certificate in accordance with EN 10204-3.1
Extension	For high-temperature adapters and other accessories: 225 to 525 mm (8.86 to 20.67 in), R 1½/Rp 1½ (also suitable for devices with thread ISO 228 G 1½) or 1½ NPT, 55 mm (AF), 316Ti
High-pressure adapter	▪ Process connection: G 1½ in accordance with ISO 228-1 ▪ Device connection: G 1½ in accordance with ISO 228-1 (also suitable for R 1½ in accordance with EN 10226) or 1½ NPT in accordance with ANSI/ASME ▪ Material: 316Ti (window allowing radiation to pass through: PTFE) ▪ Optionally available with inspection certificate in accordance with EN 10204-3.1
Weather protection cover	▪ 316L ▪ Adaptable to the installation situation
Weld-in nozzle	FAR50 → TI01362F/97/EN
Insertion adapter	FAR51 → TI01368F/97/EN
Process adapter	FAR52 → TI01369F/97/EN
Spacer tube	FAR53 → TI01370F/97/EN
Plug	FAR54 → TI01371F/97/EN
Wave guide	FAR55 → TI01372F/97/EN

13 Technical specifications

Further information on the technical specifications can be found in the technical documentation
→ TI00447F/97/EN

Power supply	
Supply voltage	▪ ~ 85 … 253 V, 50/60 Hz ▪ ⎓ 20 … 60 V or ~ 20 … 30 V, 50/60 Hz
Power consumption	▪ Max. 9 VA (~ 85 … 253 V, 50/60 Hz) ▪ Max. 2.4 W (⎓ 20 … 60 V) or 4 VA (~ 20 … 30 V, 50/60 Hz)
Environment	
Ambient temperature	-40 to +70 °C (-40 to +158 °F)
Ambient pressure	80 to 110 kPa (0.8 to 1.1 bar) absolute
Degree of protection	IP66 (IP20 if the housing is open)
Process	
Process temperature	▪ -40 to +70 °C (-40 to +158 °F) ▪ -40 to +450 °C (-40 to +842 °F) with optional high-temperature adapter
Process pressure	▪ 50 to 680 kPa (0.5 to 6.8 bar) absolute ▪ 80 to 510 kPa (0.8 to 5.1 bar) absolute with optional high-temperature adapter ▪ 50 to 2000 kPa (0.5 to 20 bar) absolute with optional high-pressure adapter

14 Appendix

14.1 Settings of the Solimotion FTR20

You can make a note of your settings for documentation purposes using the following table:

Order code: **FTR20 -**	
Instrument number:	

Function/meaning	Value range	Setting
5 = ■■■■■□□□□□ Hysteresis	□□□□■□□□□□ (Minimum) ... □□■■■■□□□□ (Maximum)	□□□□□□□□□□
6 = ■■■■■■□□□□ Limit signal function (Min./Max. safety, relay output only)	■■■■■□□□□□ Relay switches for moving bulk solids or □□□□□■■■■■ Relay switches for non-moving bulk solids	□□□□□□□□□□
7 = ■■■■■■■□□□ Switching delay (response delay)	□□□□□□□□□□ (off) ■□□□□□□□□□ (100 ms) ... (200/300/500 ms, 1/2/3/5/10 s) ■■■■■■■■■■ (20 s)	□□□□□□□□□□
8 = ■■■■■■■■□□ Switching delay (drop-out delay)		□□□□□□□□□□
A = ■■■■■■■■■■ Damping		□□□□□□□□□□
B = ■□□□□□□□□■ Gain	■□□□□□□□□□ (Minimum) ... □□□□□□□□□■ (Maximum)	□□□□□□□□□□
C = ■■□□□□□□□■ Detection range	■□□□□□□□□□ (Minimum) ... ■■■■■■■■■■ (Maximum)	□□□□□□□□□□

14.2 Overview of the device functions

Function		Description	Default value
0	□□□□□□□□□□	Display of the signal strength	–
1	■□□□□□□□□□	Automatic configuration with movement of bulk solids	–
2	■■□□□□□□□□	Automatic configuration with no movement of bulk solids	–
3	■■■□□□□□□□	Manual configuration with movement of bulk solids	–
4	■■■■□□□□□□	Manual configuration with no movement of bulk solids	–
5	■■■■■□□□□□	Hysteresis	□□□□■□□□□□
6	■■■■■■□□□□	Limit signal function	■■■■■□□□□□
7	■■■■■■■□□□	Switch-on delay	□□□□□□□□□□
8	■■■■■■■■□□	Switch-off delay	□□□□□□□□□□
9	■■■■■■■■■□	Simulation	–
A	■■■■■■■■■■	Damping	□□□□□□□□□□
B	■□□□□□□□□■	Gain	□■■■■□□□□□
C	■■□□□□□□□■	Detection range	■■■■□□□□□□
D	■■■□□□□□□■	- has no function -	–
E	■■■■□□□□□■	- has no function -	–
F	■■■■■□□□□■	Reset to factory settings	–

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