



AFRISO

EN

Technik für Umweltschutz

Messen. Regeln. Überwachen.

# Operating instructions



## Capacitance level indicator

**CapFox®**

Type: EFT 20

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ID: 900.100.0988

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## 1 About these operating instructions

These operating instructions describe the capacitance level indicator EFT 20 (also referred to as "product" in these operating instructions). These operating instructions are part of the product.

- You may only use the product if you have fully read and understood these operating instructions.
- Verify that these operating instructions are always accessible for any type of work performed on or with the product.
- Pass these operating instructions as well as all other product-related documents on to all owners of the product.
- If you feel that these operating instructions contain errors, inconsistencies, ambiguities or other issues, contact the manufacturer prior to using the product.

These operating instructions are protected by copyright and may only be used as provided for by the corresponding copyright legislation. We reserve the right to modifications.

The manufacturer shall not be liable in any form whatsoever for direct or consequential damage resulting from failure to observe these operating instructions or from failure to comply with directives, regulations and standards and any other statutory requirements applicable at the installation site of the product.

## 2 Information on safety

### 2.1 Safety messages and hazard categories

These operating instructions contain safety messages to alert you to potential hazards and risks. In addition to the instructions provided in these operating instructions, you must comply with all directives, standards and safety regulations applicable at the installation site of the product. Verify that you are familiar with all directives, standards and safety regulations and ensure compliance with them prior to using the product.

Safety messages in these operating instructions are highlighted with warning symbols and warning words. Depending on the severity of a hazard, the safety messages are classified according to different hazard categories.



**DANGER**

DANGER indicates a hazardous situation, which, if not avoided, will result in death or serious injury.

**NOTICE**

NOTICE indicates a hazardous situation, which, if not avoided, can result in equipment damage.

In addition, the following symbols are used in these operating instructions:



This is the general safety alert symbol. It alerts to injury hazards or equipment damage. Comply with all safety instructions in conjunction with this symbol to help avoid possible death, injury or equipment damage.



This symbol alerts to hazardous electrical voltage. If this symbol is used in a safety message, there is a hazard of electric shock.

## 2.2 Intended use

This product may only be used for continuous level measurement of liquids and bulk solids in open and closed containers, tanks or silos.

Any use other than the application explicitly permitted in these operating instructions is not permitted and causes hazards.

Verify that the product is suitable for the application planned by you prior to using the product. In doing so, take into account at least the following:

- All directives, standards and safety regulations applicable at the installation site of the product
- All conditions and data specified for the product
- The conditions of the planned application

In addition, perform a risk assessment in view of the planned application, according to an approved risk assessment method, and implement the appropriate safety measures, based on the results of the risk assessment. Take into account the consequences of installing or integrating the product into a system or a plant.

When using the product, perform all work and all other activities in conjunction with the product in compliance with the conditions specified in the operating instructions and on the nameplate, as well as with all directives, standards and safety regulations applicable at the installation site of the product.

## 2.3 Predictable incorrect application

The product must never be used in the following cases and for the following purposes:

### General

- As a part of an overfill alarm system according to WHG (German Water Protection Act)
- In corrosive liquids (only with PFA coating or FEP coating)

### Products not approved for use in hazardous areas

- Hazardous area
  - If the product is operated in hazardous areas, sparks may cause deflagrations, fires or explosions.
- Ambient temperature of less than -40 °C and higher than 85 °C

### Products approved for use in hazardous areas

- If used in hazardous areas / Ex zones: operation outside of the specified intrinsically safe limit values

- Use of the products outside of the specified hazardous areas
- Ambient temperature of less than -40 °C and higher than 75 °C

## **2.4 Qualification of personnel**

Only skilled, qualified persons with relevant education and experience to enable him or her to perceive risks and to avoid hazards which electricity can create are authorised to mount, commission, maintain and decommission this product.

Only appropriately trained persons who are familiar with and understand the contents of these operating instructions and all other pertinent product documentation are authorized to work on and with this product.

These persons must have sufficient technical training, knowledge and experience and be able to foresee and detect potential hazards that may be caused by using the product.

All persons working on and with the product must be fully familiar with all directives, standards and safety regulations that must be observed for performing such work.

## **2.5 Personal protective equipment**

Always wear the required personal protective equipment. When performing work on and with the product, take into account that hazards may be present at the installation site which do not directly result from the product itself.

## **2.6 Modifications to the product**

Only perform work on and with the product which is explicitly described in these operating instructions. Do not make any modifications to the product which are not described in these operating instructions.

## 3 Transport and storage

The product may be damaged as a result of improper transport or storage.

### NOTICE


#### INCORRECT HANDLING

- Verify compliance with the specified ambient conditions during transport or storage of the product.
- Use the original packaging when transporting the product.
- Store the product in a clean and dry environment.
- Verify that the product is protected against shocks and impact during transport and storage.

**Failure to follow these instructions can result in equipment damage.**

## 4 Product description

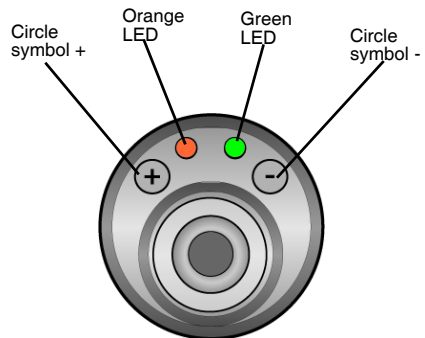
### 4.1 Overview of controls

Circle symbol 

- Entry in setup mode
- Setting 4 mA (0 V)
- Decrease values in predefined steps

Circle symbol 

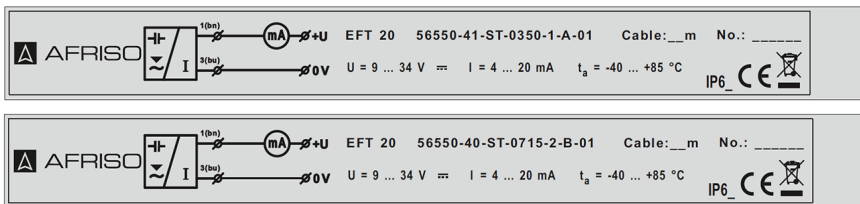
- Entry in setup mode
- Setting 20 mA (10 V)
- Increase values in predefined steps



*Figure 1: Top view of the level indicator*

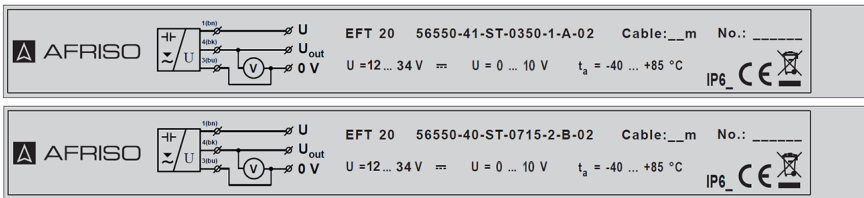
## 4.2 Product identification (nameplate)

Information on the nameplate of the products of series EFT 20- ... 01:



Manufacturer label:	AFRISO® logo
Wiring diagram and cable designation:	+U, 0 V
Product type:	EFT 20
Cable length:	Cable: _ _ m
Serial number of the product:	No.: _ _ _ _ - (from the left: year of manufacture, serial number)
Supply voltage:	$U = \text{DC } 9 \dots 34 \text{ V}$
Output current range:	$I = \text{DC } 4 \dots 20 \text{ mA}$
Operating temperature range:	$t_a = -40 \dots 85 \text{ }^\circ\text{C}$
Degree of protection:	IP6_ (see Protection after electrical connection)
CE marking:	CE
Symbol in accordance with Directive 2012/19/EU (WEEE) for proper disposal:	

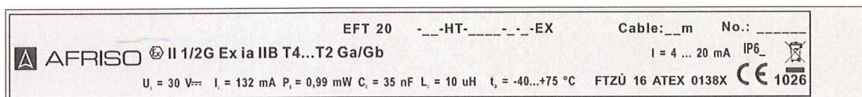
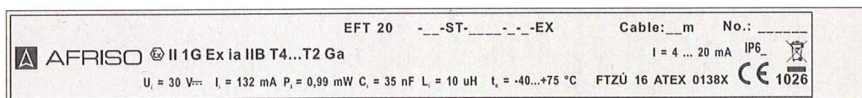
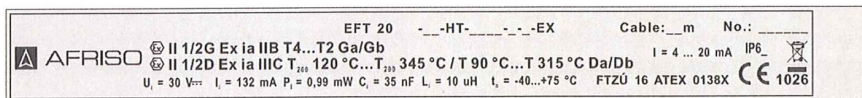
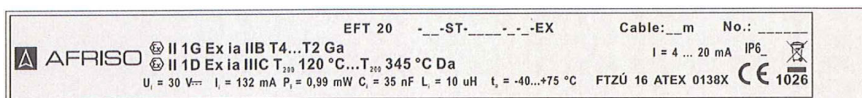
Information on the nameplate of the products of series EFT 20- ... 02:



Manufacturer label:	AFRISO® logo
Wiring diagram and cable designation:	+U, 0 V
Product type:	EFT 20
Cable length:	Cable: __ m
Serial number of the product:	No.: ____ - (from the left: year of manufacture, serial number)
Supply voltage:	$U = \text{DC } 12 \dots 34 \text{ V}$
Output voltage range	$U_{\text{out}} = \text{DC } 0 \dots 10 \text{ V}$
Operating temperature range:	$t_a = -40 \dots 85 \text{ }^\circ\text{C}$
Degree of protection:	IP6_ (see Protection after electrical connection)
CE marking:	CE
Symbol in accordance with Directive 2012/19/EU (WEEE) for proper disposal:	



Information on the nameplate of the products of series EFT 20- ... EX:



Manufacturer label:

AFRISO® logo

Product type:

EFT 20- ... EX

Cable length:

Cable: \_\_ m

Serial number of the product: No.: \_\_\_\_ - (from the left: year of manufacture, serial number)

Marking of explosion-protected devices:

Version (EX):

Ex II 1G Ex ia IIB T4 Ga;  
Ex II 1D Ex ia IIIC T120 °C Da

Version (EXHT):

Ex II 1/2G Ex ia IIB T4 Ga / Gb;  
Ex II 1/2D Ex ia IIIC T120 °C Da / Db

Limit values for intrinsically safe operation:

Ui = 30 V, li = 132 mA; Pi = 0.99 W;  
Ci = 35 nF; Li = 10 µH

Supply voltage:

U = DC 12 ... 34 V

Output current range:

I = DC 4 ... 20 mA


Operating temperature range: ta = -40 ... 75 °C

EU number of type examination certificate: FTZÚ 24 ATEX 00009X

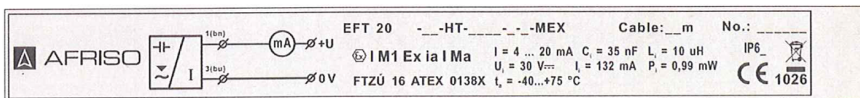
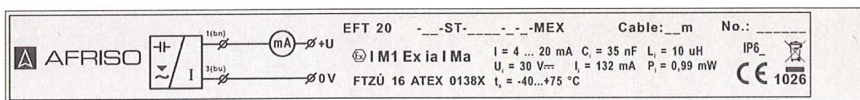
Degree of protection: IP6\_  
(see Protection after electrical connection)


CE marking: **CE**

Number of the notified body for the supervision of the ATEX quality management system: 1026

Symbol in accordance with Directive 2012/19/EU (WEEE)   
for proper disposal:

Information on the nameplate of the products of series EFT 20- ... MEX:



Manufacturer label:	AFRISO® logo
Wiring diagram and cable designation:	+U, 0 V
Product type:	EFT 20- ... MEX
Cable length:	Cable: _ _ m
Serial number of the product:	No.: _ _ _ _ - (from the left: year of manufacture, serial number)
Marking of explosion-protected devices:	Ⓔ I M1 Ex ia I Ma
Output current range:	I = DC 4 ... 20 mA
Limit values for intrinsically safe operation:	Ui = 30 V, Ii = 132 mA; Pi = 0.99 W; Ci = 35 nF; Li = 10 µH
Operating temperature range:	ta = -40 ... 75 °C
EU number of type examination certificate:	FTZÚ 24 ATEX 00009X
Degree of protection:	IP6_
CE marking:	CE
Number of the notified body for the supervision of the ATEX quality management system:	1026
Symbol in accordance with Directive 2012/19/EU (WEEE) for proper disposal:	

## 4.3 Measuring principle

The product is used for continuous capacitance level measurement in containers. With the capacitance measuring principle, the probe forms an electrical capacitor whose capacitance depends on the medium that surrounds the capacitor. In air, the capacitance is low; it increases the more the probe is submerged in the stored medium.

The level of the probe capacitance depends on the filling level in the container and on the dielectric properties of the stored medium, expressed by the material-dependent dielectric constant  $\epsilon_r$ .

The probe electronics determine the probe capacitance and supply a proportional current signal (4 ... 20 mA) or voltage signal (0 ... 10 V).

The probe protrudes from above into the tank whose level is to be measured. The probe is attached using a metal screw-in thread.

## 4.4 Versions of the level probes

- **EFT 20\_-20** Rigid mono probe without insulation for level measurement of bulk solids (cement, flour, sand, plastic granules) and for electrically non-conductive liquids (vegetable oils, diesel fuel, petrol). Maximum electrode length 2 m.
- **EFT 20\_-21** Rigid mono probe with FEP insulation for level measurement of electrically conductive liquids. Can also be used for contaminated liquids in metal containers, concrete collection containers, etc. Maximum electrode length 2 m.
- **EFT 20\_-22** Rigid mono probe with PFA insulation with higher resistance to diffusion of vapour and gas. For level measurement of water and other electrically conductive liquids in the food, pharmaceutical and chemical industries. Short-term use for high-temperature applications (for example, remediation with hot steam), or for volatile corrosive liquids is also possible. Maximum electrode length 2 m.

- **EFT 20\_-40** Coax probe without insulation for high-precision level measurement of uncontaminated, electrically non-conductive liquids (oils, diesel fuel, petrol). The measurement is independent of the shape of the container and the presence of objects in the immediate vicinity of the reference pipe.  
Maximum electrode length 1 m.
- **EFT 20\_-41** Coax probe with FEP insulation for high-precision level measurement of uncontaminated, electrically non-conductive liquids in plastic and glass containers. The measurement is independent of the shape of the container and the presence of objects in the immediate vicinity of the reference pipe.  
Maximum electrode length 1 m.
- **EFT 20\_-60** Flexible mono probe without insulation with weight for level measurement of bulk solids (such as grains, sand, crushed stone, cement).  
Maximum electrode length 6 m.

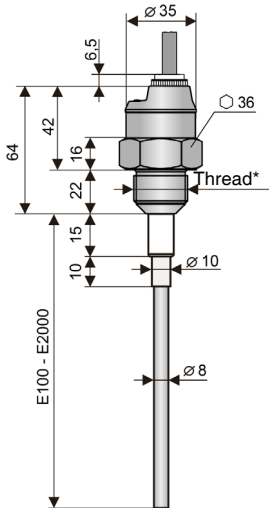
The product is manufactured in different versions:

- **ST** – for non-hazardous areas
- **HT** – high temperature version for non-hazardous areas
- **EX** – intrinsically safe version for hazardous areas (gas and dust EX)
- **MEX** – intrinsically safe version (mining); also as high temperature version

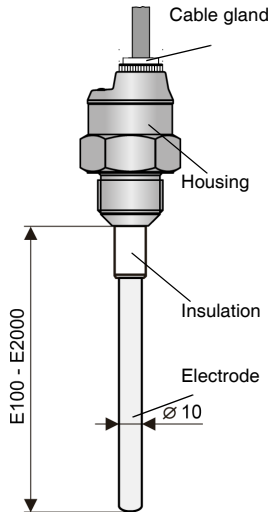
Versions for various process connections (metric thread and pipe thread, NPT thread, Tri-Clamp) are available.

## 4.5 Dimensions

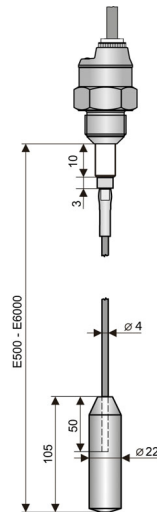
EFT 20\_-20



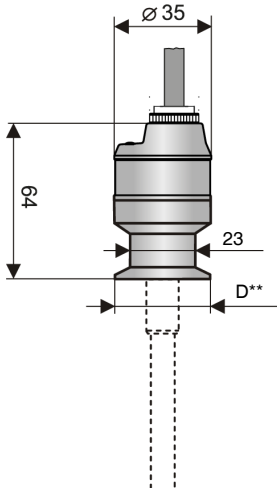
EFT 20\_-21.22



EFT 20\_-50



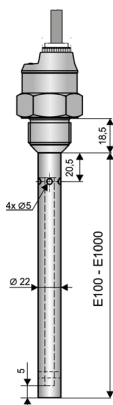
### Process connection Tri-Clamp



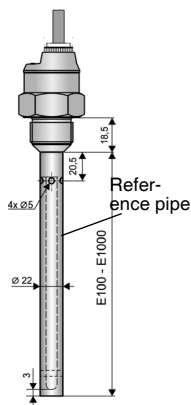
\* Thread: G 1, G 3/4, 3/4 NPT

\*\* D: Tri-Clamp DIN 32676, Ø 34 mm  
Tri-Clamp DIN 32676, Ø 50.5 mm  
All dimensions shown in mm.

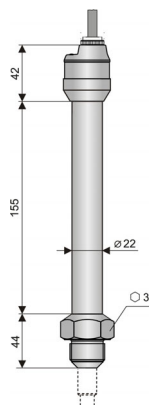
EFT 20\_-40



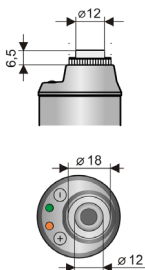
EFT 20\_-41



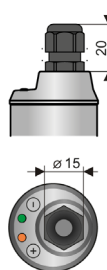
EFT 20\_-20HT



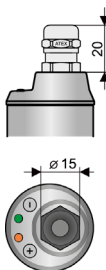
Version "A" with short stainless steel cable gland



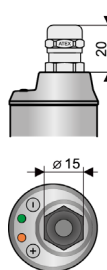
Version "B" with PVC cable gland M12 x 1.5



Version "C" with connector M12 x 1, 4-pin



Version "D" with dust-tight cable gland (ATEX)



## 4.6 Scope of delivery

- 1 x magnetic pin MP-8
- 1 x asbestos-free seal \*

\*Pressure resistance - see the table in the accessories data sheet

## 4.7 Approvals, conformities, certifications

The product complies with:

- EMC Directive (2014/30/EU)
- RoHS Directive (2011/65/EU)
- For the versions ... EX and ... MEX:  
ATEX Equipment Directive (2014/34/EU)

## 4.8 Technical specifications

### 4.8.1 General parameters

Parameter	Value
<b>General specifications</b>	
Weight (without electrode and cable)	
Version ST	Approx. 0.3 g
Version HT	Approx. 0.6 g
<b>Ambient conditions</b>	
Ambient temperature operation	See "Temperature resistance (versions ST, HT, EX, MEX)"
Ambient temperature storage	-10 ... 50 °C
Relative humidity	< 85 % non-condensing
<b>Electrical data</b>	
Supply voltage	
EFT-20-__-_-01	DC 9 ... 34 V
EFT-20-__-_-02	DC 12 ... 34 V
Current output	DC 4 ... 20 mA (2-wire)
Voltage output	DC 0 ... 10 V (3-wire)



Parameter	Value
Current input EFT-20_ - _ - _-01	3.75 ... 20.5 mA
EFT-20_ - _ - _-02	5 mA (open voltage output)
Non-linearity	Maximum 1 %
Temperature error	Maximum 0.05 %/K
Voltage error for current and voltage output	Maximum 0.3 $\mu$ A/V and 0.1 mV/V
Insulation resistance and dielectric strength (electrode - housing)	1 M $\Omega$ / DC 200 V
Capacitance (housing - connections) / dielectric strength	50 nF / AC 350 V
Capacitance (electrode - connections) / dielectric strength	47 nF / AC 350 V
Degree of protection (EN 60529) EFT-20_ - _ -C- - _	IP 67
EFT-20_ - _ -A(B,D)- - _	IP 68
Maximum load resistance of current output (with U = 24 V)	R <sub>max</sub> = 700 $\Omega$
PVC cable (version with cable gland)	2 x 0.75 mm <sup>2</sup> (EX, MEX) 3 x 0.5 mm <sup>2</sup> (0 ... 10 V) 2 x 0.5 mm <sup>2</sup> (4 ... 20 mA)

## 4.8.2 Electrical parameters (versions EX, MEX)

Parameter	Value
Supply voltage	DC 9 ... 30 V
Limit values for intrinsically safe operation	U <sub>i</sub> = DC 30 V; I <sub>i</sub> = DC 132 mA; P <sub>i</sub> = 0.99 W; C <sub>i</sub> = 35 nF; L <sub>i</sub> = 10 $\mu$ H
Cable parameters	L <sub>c</sub> < 0.8 $\mu$ H/m C <sub>c</sub> < 150 pF/m

## 4.8.3 Process connection

Name	Designation
Pipe thread	G1B
	G3/4B
Tapered pipe thread	3/4 NPT
Tri-Clamp	Tri-Clamp DIN 32676, Ø 34 mm
	Tri-Clamp DIN 32676, Ø 50.5 mm

## 4.8.4 Materials

Product component	Versions	Standard material*
<b>Wetted parts:</b>		
Housing	All	Stainless steel 1.4301 (AISI 304)
Rigid probe	All except EFT-20_-60	Stainless steel 1.4404 (AISI 316L)
Flexible probe	EFT-20_-60	Stainless steel 1.4401 (AISI 316)
Reference pipe	EFT-20_-40, 41	Stainless steel 1.4301 (AISI 304)
Insulation	EFT-20_- 20, 21, 22, 40, 41	PTFE
	EFT-20_- 60	PPS + GF40
Insulation of probe	EFT-20_- 21, 41	FEP
	EFT-20_- 22,	PFA
Weight	EFT-20_- 60	Stainless steel 1.4301 (AISI 304)
<b>Non-wetted parts_</b>		
Cable gland	EFT-20_-_-_-A	Stainless steel 1.4571 (AISI 316 Ti) / NBR
	EFT-20_-_-_-B	PA plastic / NBR
	EFT-20_-_-_-D	Nickel-plated brass / PA / CR rubber / NBR
Connector M12	EFT-20_-_-_-C	Nickel-plated brass / PA

\* Verify that the materials of the product are chemically resistant to the medium in your application.

## 4.8.5 Area classification (EN 60079-0, EN 60079-10-1, EN 60079-10-2)

EFT-20ST	Basic version for use in non-hazardous areas.
EFT-20HT	Version for high temperatures for use in non-hazardous areas.
EFT-20EX	Intrinsically safe version for use in hazardous areas (explosive gas atmospheres or explosive dust atmospheres) $\text{Ex}$ II 1 G Ex ia IIB T4 Ga; $\text{Ex}$ II 1 D Ex ia IIIC T120 °C Da with intrinsically safe power supply, the entire product zone 0 and 20.
EFT-20EXHT	Intrinsically safe version for high temperatures for use in hazardous areas (explosive gas atmospheres or explosive dust atmospheres) $\text{Ex}$ II 1/2 G Ex ia IIB T4 Ga/Gb; $\text{Ex}$ II 1/2 D Ex ia IIIC T120 °C Da/Db with intrinsically safe power supply, the electrode part zone 0 and 20, housing zone 1 and 21.
EFT-20MEX	Intrinsically safe version for use in mining areas where methane or coal dust is present $\text{Ex}$ I M1 Ex ia $\text{Ex}$ I Ma with intrinsically safe power supply.
EFT-20MEXHT	Intrinsically safe version for high temperatures for use in mining areas where methane or coal dust is present $\text{Ex}$ I M1 Ex ia I Ma with intrinsically safe power supply.

## 4.8.6 Temperature resistance (versions ST, HT, EX, MEX)

Version	Temperature $t_m$	Temperature $t_p$	Temperature $t_a$
EFT-20ST-20	-40 °C ... 300 °C	-40 °C ... 85 °C	-40 °C ... 85 °C
EFT-20ST-21, 22, 40, 41	-40 °C ... 200 °C	-40 °C ... 85 °C	-40 °C ... 85 °C
EFT-20ST-60	-40 °C ... 250 °C	-40 °C ... 85 °C	-40 °C ... 85 °C
EFT-20HT-20	-40 °C ... 300 °C	-40 °C ... 200 °C	-40 °C ... 85 °C
EFT-20HT-21, 22, 31, 40, 41	-40 °C ... 200 °C	-40 °C ... 200 °C	-40 °C ... 85 °C
EFT-20HT-60	-40 °C ... 250 °C	-40 °C ... 200 °C	-40 °C ... 85 °C

Version	Temperature $t_m$	Temperature $t_p$	Temperature $t_a$
EFT-20EX-20 EFT-20MEX-20	-40 °C ... 300 °C	-40 °C ... 75 °C	-40 °C ... 75 °C
EFT-20EX-21, 22, 40, 41 EFT-20MEX-21, 22, 40, 41	-40 °C ... 200 °C	-40 °C ... 75 °C	-40 °C ... 75 °C
EFT-20EX-60, EFT-20MEX-60	-40 °C ... 250 °C	-40 °C ... 75 °C	-40 °C ... 75 °C
EFT-20MEX(HT) – mining areas	Maximum 150 °C on any surface where coal dust can form deposits.		

Verify that no specified temperature range ( $t_p$ ,  $t_m$  or  $t_a$ ) is exceeded. The temperature ranges are described in the following illustration.

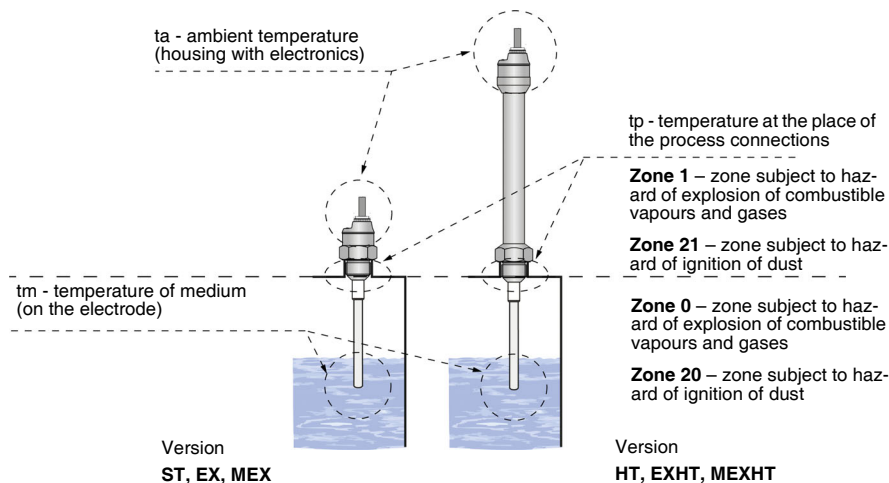


Figure 2: Representations of temperature ranges and hazardous areas

## 4.8.7 Pressure resistance

Version	Maximum operating pressure for temperature tp				
	Up to 30 °C	Up to 85 °C	Up to 120 °C	Up to 150 °C	Up to 200 °C
EFT-20-20	50 bar	25 bar	-	-	-
EFT-20-21, 22, 40, 41	50 bar	20 bar	-	-	-
EFT-20-60	1 bar	1 bar	-	-	-
EFT-20-20HT	50 bar	25 bar	15 bar	10 bar	5 bar
EFT-20-21, 22,40, 41HT	50 bar	20 bar	15 bar	10 bar	1 bar
EFT-20-60HT	1 bar	1 bar	1 bar	1 bar	1 bar

## 4.8.8 Basic settings

4 mA (0 V)	Capacitance of the electrode in free space, container is empty.
20 mA (10 V)	Capacitance 1 nF ( $\pm 20\%$ ), maximum level

## 5 Mounting

- ⇒ Verify that the product is protected from direct sunlight and other heat sources.
- ⇒ Verify that the product is protected from direct atmospheric influences if it is installed outdoors.
- ⇒ Verify compliance with the specified ambient conditions.

The cable gland of the electronic part must be firmly tightened. Product is fastened via a suitable mounting flange at the container.

Verify that the connection is firm and tight.

## 5.1 Preparing mounting

The product with insulated electrode is equipped with a protective cover at the end of the electrode.

1. Carefully remove the protective cover at the end of the electrode by hand prior to mounting.

The product consists of:

- Capacitance probe (rod or flexible probe)
- Electronics component with screw-in thread

The probe and the electronics component form a permanently connected unit.

The product may only be installed vertically. The probe protrudes from above into the tank whose level is to be measured.

### Earthing

If the product is mounted in a metal container, the housing does not need to be earthed separately.

If the product is mounted in a concrete container or silo, the product must be mounted on a metal plate.

1. Connect this metal plate to a metal object or to the steel reinforcements in the concrete.

If the product is mounted in plastic or glass containers without a reference pipe, the product must be mounted on a metal plate. The metal plate must be connected to a separate earth electrode.

1. Fasten the separate earth electrode to the outer wall or to the inner wall of the container.

The material of the separate earth electrode must be selected taking into account the working environment and properties of the medium being measured.

## Versions with rigid mono probe

EFT 20\_-20, 21, 22

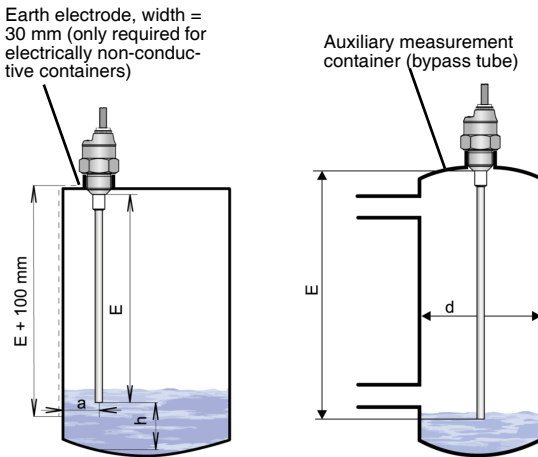


Figure 3: Mounting with rigid mono probe

E. The probe must be sufficiently long for the probe end to protrude into the medium at least 20 mm below the lowest measured level.

h. Distance to bottom at least 20 mm

a. Distance to wall at least approx.  $E/20$

d. Diameter of the auxiliary measurement container at least  $40 + E/20$

## Versions with coax probe

EFT 20\_-40, 41

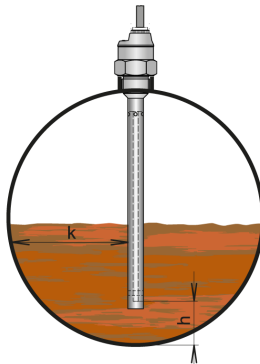


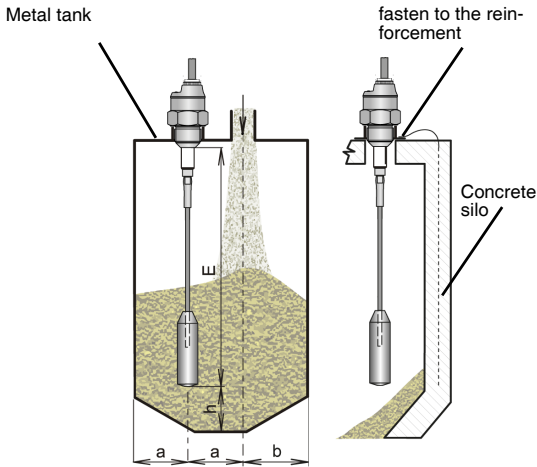
Figure 4: Mounting with a coax probe

h. Distance to bottom at least 20 mm

k. Any distance from wall

## Versions with flexible mono probe

For types: EFT 20\_-60



E. The probe must be sufficiently long for the probe end to protrude into the medium at least 20 mm below the lowest measured level.

h. Distance to bottom at least 100 mm

a. Distance to the wall at least probe length  $E$ , divided by 20 or, if possible, in the centre of the container

Figure 5: Mounting with flexible mono probe



## 5.2 Electrical connection



# DANGER

### ELECTRIC SHOCK

- Verify that the degree of protection against electric shock (protection class, double insulation) is not reduced by the type of electrical installation.

**Failure to follow these instructions will result in death or serious injury.**

---



# DANGER

### ELECTRIC SHOCK CAUSED BY LIVE PARTS

- Disconnect the mains voltage supply before performing the work and ensure that it cannot be switched on.
- Verify that no hazards can be caused by electrically conductive objects or media.

**Failure to follow these instructions will result in death or serious injury.**

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# DANGER

### MOUNTING IN HAZARDOUS AREA

- Positively verify the absence of any type of potentially explosive atmosphere during installation work.

**Failure to follow these instructions will result in death or serious injury.**

---



## **DANGER**

### **ELECTRIC SHOCK**

- Verify that the products are connected to a power supply unit supplying Protective Extra Low Voltage (PELV) or Safety Extra Low Voltage (SELV).
- If the power supply unit has an earth connection (PE, GND), earth the power supply unit via this connection.
- Verify that the product is protected with suitable overvoltage protection if the product is operated outdoors and if the installation location of the product is more than 20 m away from the connection point of the product, for example, in an outdoor control cabinet or in a building.

**Failure to follow these instructions will result in death or serious injury.**

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## **DANGER**

### **OPERATION IN HAZARDOUS AREA**

- Only use an intrinsically safe, stabilised and galvanically isolated power supply for products approved for use in hazardous area (EFT-20 \_EX and EFT-20 MEX)
- Verify that all products intended for use in hazardous areas (EFT-20 \_EX, EFT-20 \_MEX) are sufficiently earthed.

**Failure to follow these instructions will result in death or serious injury.**

---

## **NOTICE**

### **ELECTROSTATIC DISCHARGE**

- Always earth yourself before touching electronic components.
- Do not touch the product to plug it in; use the anti-electrostatic film to plug the product into the slot.

**Failure to follow these instructions can result in equipment damage.**

---

1. Connect the wires as follows:

- +U = BN (brown) or pin 1 of the connector
- 0 V = BU (blue) or pin 3 of the connector
- $U_{out}$  = BK (black) or pin 4 of the connector

The wiring diagrams are shown in the illustrations.

If there is strong electromagnetic interference in the environment or a line length > 30 m is used, use a shielded cable (at least 2 x 0.75 mm<sup>2</sup>).

The products with electrical connections A, B or D (see "Type code") have a permanently wired cable.

The product with plug M12 x 1, 4-pin (type C) is connected with a connector (not included). Recommended wire cross section: at least 0.5 mm<sup>2</sup>.

In the case of the versions EX and MEX, the cable length must be selected taking into account the maximum permissible values (in particular the inductance and capacitance) of the external intrinsically safe circuit of the power supply.

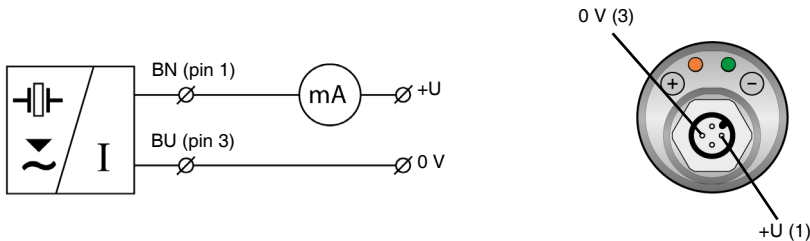


Figure 6: Electrical connection (4-20 mA, 2-wire system)

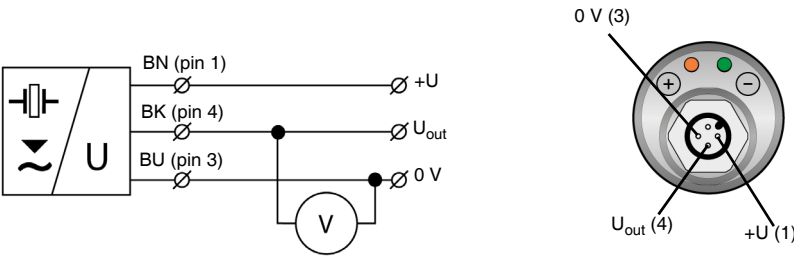


Figure 7: Electrical connection (0–10 V, 3-wire system)

If the power supply unit has an earth connection (PE, GND), earth the power supply unit via this connection.

## 6 Commissioning

### 6.1 State and error signalling (LED)

The product is adjusted after installation by placing the test magnet (magnetic pen) against the circle symbols  $\ominus$  and  $\oplus$ . When you make settings, this is signalled by the orange LED.



1. Connect the product to supply voltage.
2. Check the output value (current or voltage) with a measuring device or a downstream device.

Colour	Function
Green	<b><u>Indication of the measuring function</u></b> <b>Flashes:</b> correction unction of the level measurement <b>Off:</b> incorrect installation or malfunction. When you make settings, the green LED is off. <b>The green and orange LEDs flash alternately:</b> incorrectly set limit values
Orange	<b><u>Indication of the settings</u></b> <b>Slow flashing:</b> Setting 4 mA (for current output) or 0 V (for voltage output) <b>Fast flashing:</b> Setting 4 mA (for current output) or 0 V (for voltage output) <b>Solid on:</b> Confirm the limit value with the test magnet. <b>3 short flashes:</b> Confirmation of the setting. Both LEDs light up while the test magnet is applied.



## 6.2 Setting at minimum and maximum fill level (direct)

If you want to use this method of setting the measuring range, you must first bring the level in the tank to the minimum level (0 %) and then to the maximum level (100 %).

### Setting 4 mA (for current output) or 0 V (for voltage output)

1. Empty the tank to the minimum level (0 %). To achieve the linearity, The lower end of the electrode must still be submerged in the medium.
2. Hold the magnet to the circle symbol for five seconds .
  - After three seconds, the orange LED starts to flash slowly. The test magnet must remain on the circle symbol. After two additional seconds, the value 4 mA (0 V) is set.
3. Remove the test magnet from the circle symbol.
4. Wait until the orange LED is solid on.
5. Briefly hold the test magnet to the circle symbol  to confirm the setting.
6. Remove the test magnet when both LEDs are on.
  - The set limit value is signalled by the orange LED flashing briefly three times.

### Setting 20 mA (for current output) or 10 V (for voltage output)


1. Fill the container to the maximum level.
2. Hold the magnet to the circle symbol for five seconds .
  - After three seconds, the orange LED starts to flash slowly. The test magnet must remain on the circle symbol. After two additional seconds, the value 20 mA (10 V) is set.
3. Remove the test magnet from the circle symbol.
4. Wait until the orange LED is solid on.
5. Briefly hold the test magnet to the circle symbol  to confirm the setting.
6. Remove the test magnet when both LEDs are on.
  - The set limit value is signalled by the orange LED flashing briefly three times.



If both LEDs flash alternately, the product does not detect the two selected levels (incorrectly set limit values). Repeat the setting procedure.

### 6.3 Setting for any two fill levels (indirect)

This method is used if the container cannot be emptied to the minimum level or filled to the maximum level. After you have set any two auxiliary fill levels, for which you know the percentage of the minimum and maximum levels is known, the product automatically calculates the full measuring range 4 ... 20 mA or 0 ... 10 V.

#### Setting the lower limit value


1. Empty the container to a level close to the minimum level to be measured.
2. Hold the magnet to the circle symbol for three seconds .
  - After three seconds, the orange LED starts to flash slowly.
3. Remove the test magnet from the circle symbol.

When the orange LED flashes slowly, the output value can be set in steps by holding the test magnet to the  and  circle symbols. Check the output value (current or voltage) with a measuring device or a downstream device.


The value to be set for the output is calculated based on the following formula:



- for current output:  $I_{out} = 4 + (0.16 \times \text{current level height in \%}) \text{ [mA]}$
- for voltage output:  $U_{out} = 0.1 \times \text{current level height in \% [V]}$

If the test magnet is held permanently against the circle symbol, the step speed increases continuously.

4. Remove the test magnet from the circle symbol if the lower limit value is reached.
5. Wait until the orange LED is solid on.
6. Briefly hold the test magnet to the circle symbol  to confirm the setting.
7. When both LEDs are on, the test magnet can be removed.
  - The set limit value is signalled by the orange LED flashing briefly three times.

## Setting the upper limit value – indirect


1. Fill the container to a level close to the maximum level to be measured.
2. Hold the magnet to the circle symbol for approx. three seconds .
  - After three seconds, the orange LED starts to flash rapidly.
3. Remove the test magnet from the circle symbol.

When the orange LED flashes rapidly, the output value can be set in steps by holding the test magnet to the  and  circle symbols. Check the output value (current or voltage) with a measuring device or a downstream device.

The output value to be set is calculated based on the following formula:

- for current output:  $I_{\text{out}} = 4 + (0.16 \times \text{current level height in \%}) \text{ [mA]}$
- for voltage output:  $U_{\text{out}} = 0.1 \times \text{current level height in \% [V]}$

If the test magnet is held permanently against the circle symbol, the step speed increases continuously.

4. Remove the test magnet from the circle symbol if the upper limit value is reached.
5. Wait until the orange LED is solid on.
6. Briefly hold the test magnet to the circle symbol  to confirm the setting.
7. When both LEDs are on, the test magnet can be removed.
  - The set limit value is signalled by the orange LED flashing briefly three times.
8. If both LEDs start to flash alternately, the product cannot distinguish between the selected levels. It is necessary to either reduce the level to set the lower limit value or increase the level to set the upper limit value.

## 7 Type code

**1 Capacitance level indicator**

56550 CapFox® EFT 20

**2 Probe type / max. measuring range / application / base price incl. 1 m electrode**

- 20 Mono probe rigid with FEP insulation EFT 20 MS, max. 2,000 mm, for non-conductive media
- 21 Mono probe rigid with FEP insulation, EFT 20 MS, max. 2,000 mm, for conductive media
- 22 Mono probe rigid with PFA insulation, EFT 20 MS, max. 2,000 mm, for conductive media and food
- 40 Coax probe without insulation, EFT 20 KX, max. 1,000 mm, for non-conductive liquids
- 41 Coax probe with FEP-insulated measuring electrode, EFT 20 KX, max. 1,000 mm, for non-conductive liquids
- 60 Mono probe flexible, with weight Ø 22 mm, EFT 20 MF, max. 6,000 mm, for bulk solids

**3 Temperature range**

- ST Standard for max. flange temperature  $t_f$  85 °C (Ex version 75 °C)
- HT High temperature version for max. flange temperature  $t_f$  200 °C

**4 Probe length (L) Extra charge for each 100 mm probe length for lengths > 1,000 mm**

- 2000 Length in mm e.g. 2,000 mm
  - Rigid mono probe without insulation for EFT 20 MS
  - Rigid mono probe with FEP insulation for EFT 20 MS
  - Rigid mono probe with PFA insulation for EFT 20 MS
  - Flexible mono probe without insulation for EFT 20 MF

**5 Process connection**

- 1 G1B
- 2 G1/4B
- 3 1/4 NPT
- 4 Tri-Clamp DIN 32676, Ø 34 mm
- 5 Tri-Clamp DIN 32676, Ø 50.5 mm

**6 Electrical connection**

- A Short stainless steel cable gland
- B Plastic cable gland M12 x 1.5
- C Connector M12 x 1, 4-pin
- D Dust-tight cable gland (Ex)

**7 Output signal**

- 01 4–20 mA / 2-wire / DC 9–34 V
- 02 0–10 V / 3-wire / DC 12–34 V
- EX 4–20 mA (ia) / 2-wire / DC 9–28 V (gas and dust Ex)  
 $U_i = 30$  V DC;  $I_i = 132$  mA;  $P_i = 0.99$  W;  $C_i = 35$  nF;  $L_i = 10$  mH
- MEX 4–20 mA (ia) / 2-wire / DC 9–28 V (mining applications)  
 $U_i = 30$  V DC;  $I_i = 132$  mA;  $P_i = 0.99$  W;  $C_i = 35$  nF;  $L_i = 10$  mH

Ordering code

56550

21

ST

1000

1

A

01



## 8 Protection, safety and explosion protection

The product is equipped with protection against error voltage on the electrode, reverse polarity, short-term overvoltage and current limitation at the output.

EMC is ensured in accordance with the standards EN 55011 / B, EN 61326-1, EN 61000-4-2 to -6 and -8.

The variants EFT 20 ... EX (MEX) are in compliance with the standards EN IEC 60079-0:2018, EN 60079-11:2012, EN 50303:2000.

The use of the variants EFT 20 ... EX (MEX) in hazardous areas has been tested by FTZÚ – AO (Physical-Technical Testing Institute – notified body) 210 Ostrava – Radvanice: FTZÚ 24 ATEX 0009X (certificate number).

### 8.1 Special conditions for safe use of the version EFT 20 ... EX (MEX)

Products approved for use in hazardous areas atmospheres may only be connected to equipment in non-hazardous areas via intrinsically safe circuits. Connected equipment must either be galvanically isolated or a Zener barrier must be used as an associated apparatus between the product and the connected equipment. If you use a Zener barrier, you must carry out potential bonding between the earthing point of the product and the earthing point of the Zener barrier.

The version EFT 20 ... EX may be placed in zone 0 or zone 20. In the case of version EFT 20 ... EXHT, only the electrode component may be installed in zone 0 and zone 20. The housing with the electronics is approved for operation in zone 1 or zone 21.

Ambient temperature:  $T_{amb} = -40\text{ °C} \dots 75\text{ °C}$ .

The temperature class and maximum surface temperature depend on the temperature of the process medium. The maximum temperature of the electrodes corresponds to the temperature of the substance to be measured.

## Version EFT 20 ... EX

Temperature class for EPL Ga:

- T2 ... for maximum temperature of the process medium  $T_m = 270\text{ °C}$ .
- T3 ... for maximum temperature of the process medium  $T_m = 180\text{ °C}$ .
- T4 ... for maximum temperature of the process medium  $T_m = 115\text{ °C}$ .

Maximum surface temperature for EPL Da:

The maximum temperature range of the process media extends from  $-40\text{ °C}$  ...  $300\text{ °C}$ .

The maximum surface temperature is calculated as  $T_{200} = T_m + 45\text{ °C}$ .

## Version EFT 20 ... EXHT

Temperature class for EPL Ga/Gb:

- T2 ... for maximum temperature of the process medium  $T_m = 270\text{ °C}$ .
- T3 ... for maximum temperature of the process medium  $T_m = 180\text{ °C}$ .
- T4 ... for maximum temperature of the process medium  $T_m = 115\text{ °C}$ .

Maximum surface temperature for EPL Da/Db:

Temperature of the process medium from  $-40\text{ °C}$  ...  $300\text{ °C}$ .

The maximum surface temperature of the EPL Da part of the product can be calculated as  $T_{200} = T_m + 45\text{ °C}$ .

The maximum surface temperature of the EPL Db part of the product is calculated as  $T = T_m + 15\text{ °C}$ .

## Version EFT 20 ... MEX (HT)

The maximum temperature of the process media is  $135\text{ °C}$ .

In the case of version EFT 20 ... MEX, verify that the temperature of any surface on which layers of carbon dust can form does not exceed  $150\text{ °C}$ .

## 9 Operation

The product does not require any handling during operation.

## 10 Maintenance

Maintenance on the product may only be performed by a specialised company.

## 11 Decommissioning, disposal

Do not dispose of the product together with household waste.

Dispose of the product in compliance with all applicable directives, standards and safety regulations.

Dispose of the product at an associated waste collection point or return it to the manufacturer's or distributor's collection point.



1. Disconnect the product from the supply voltage.
2. Dismount the product (see chapter "Mounting", reverse sequence of steps).
3. Dispose of the product.

## 12 Returning the device

Get in touch with us before returning your product ([service@afriso.de](mailto:service@afriso.de)).

## 13 Warranty

See our terms and conditions at [www.afriso.com](http://www.afriso.com) or your purchase contract for information on warranty.

## 14 Spare parts and accessories

# NOTICE

### UNSUITABLE PARTS

- Only use genuine spare parts and accessories provided by the manufacturer.

**Failure to follow these instructions can result in equipment damage.**

## 15 Appendix

Approval documents and the EU declaration of conformity can be found in the German operating instructions.