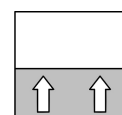




## Operating manual

**NC56**

Capacitive filling level probe



## Masthead

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Subject to technical amendments.



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## Version history

Rev. ST4-A 09/20	Version 1: First issue
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# 1 Safety instructions

## 1.1 General

This operating manual contains basic instructions for the installation, operation and maintenance of the device that must be followed without fail. It must be read by the installer, the operator and the responsible specialist personnel before installing and commissioning the device.

This operating manual is an integral part of the product and therefore needs to be kept close to the instrument in a place that is accessible at all times to the responsible personnel.

The following sections, in particular instructions about the assembly, commissioning and maintenance, contain important information, non-observance of which could pose a threat to humans, animals, the environment and property.

The instrument described in these operating instructions is designed and manufactured in line with the state of the art and good engineering practice.

## 1.2 Personnel Qualification

The instrument may only be installed and commissioned by specialized personnel familiar with the installation, commissioning and operation of this product.

Specialized personnel are persons who can assess the work they have been assigned and recognize potential dangers by virtue of their specialized training, their skills and experience and their knowledge of the pertinent standards.

## 1.3 Risks due to Non-Observance of Safety Instructions

Non-observance of these safety instructions, the intended use of the device or the limit values given in the technical specifications can be hazardous or cause harm to persons, the environment or the plant itself.

The supplier of the equipment will not be liable for damage claims if this should happen.

## 1.4 Safety Instructions for the Operating Company and the Operator

The safety instructions governing correct operation of the instrument must be observed. The operating company must make them available to the installation, maintenance, inspection and operating personnel.

Dangers arising from electrical components, energy discharged by the medium, escaping medium and incorrect installation of the device must be eliminated. See the information in the applicable national and international regulations.

Please observe the information about certification and approvals in the Technical Data section.

## 1.5 Unauthorised Modification

Modifications of or other technical alterations to the instrument by the customer are not permitted. This also applies to replacement parts. Only the manufacturer is authorised to make any modifications or changes.

## 1.6 Inadmissible Modes of Operation

The operational safety of this instrument can only be guaranteed if it is used as intended. The instrument model must be suitable for the medium used in the system. The limit values given in the technical data may not be exceeded.

The manufacturer is not liable for damage resulting from improper or incorrect use.

## 1.7 Safe working practices for maintenance and installation work

The safety instructions given in this operating manual, any nationally applicable regulations on accident prevention and any of the operating company's internal work, operating and safety guidelines must be observed.

The operating company is responsible for ensuring that all required maintenance, inspection and installation work is carried out by qualified specialized personnel.

## 1.8 Pictogram explanation



### **DANGER**

#### **Type and source of danger**

This indicates a **direct** dangerous situation that could lead to death or **serious injury** (highest danger level).

1. Avoid danger by observing the valid safety regulations.



### **WARNING**

#### **Type and source of danger**

This indicates a **potentially** dangerous situation that could lead to death or **serious injury** (medium danger level).

1. Avoid danger by observing the valid safety regulations.



### **CAUTION**

#### **Type and source of danger**

This indicates a **potentially** dangerous situation that could lead to slight or serious injury, damage or **environmental pollution** (low danger level).

1. Avoid danger by observing the valid safety regulations.



### **NOTICE**

#### **Note / advice**

This indicates useful information of advice for efficient and smooth operation.

## 2 Product and functional description

### 2.1 Delivery scope

- Capacitive filling level probe NC56 as per specification (see order code)
- Operating manual

### 2.2 Intended use

The capacitive filling level probe NC56 serves to measure tank filling levels in tanks containing fresh water, waste water, faeces, diesel fuel, chemicals and extinguishing foam. Filling level heights of between 400 and 2000 mm can be measured. The probe can be used regardless of the tank material (metal, plastic or concrete).

Please contact the manufacturer before using this device with dirty or aggressive media because the device needs to be adapted in terms of the parts that come into contact with the media.

The device is to be exclusively used for the applications agreed between the manufacturer and the user.

### 2.3 Device versions

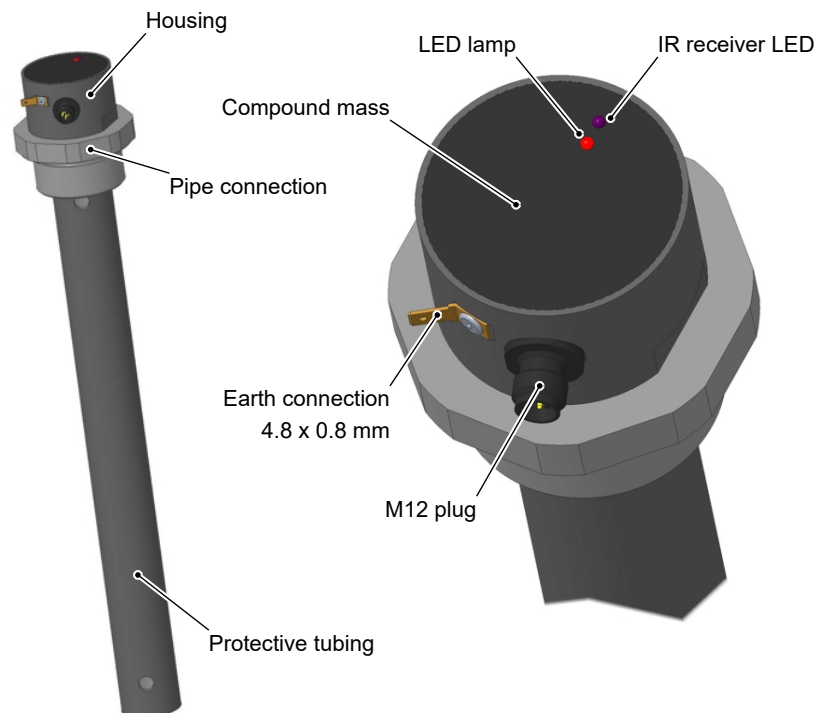


Fig. 1: Product summary

Depending on the medium, the NC56 can be supplied in various versions.

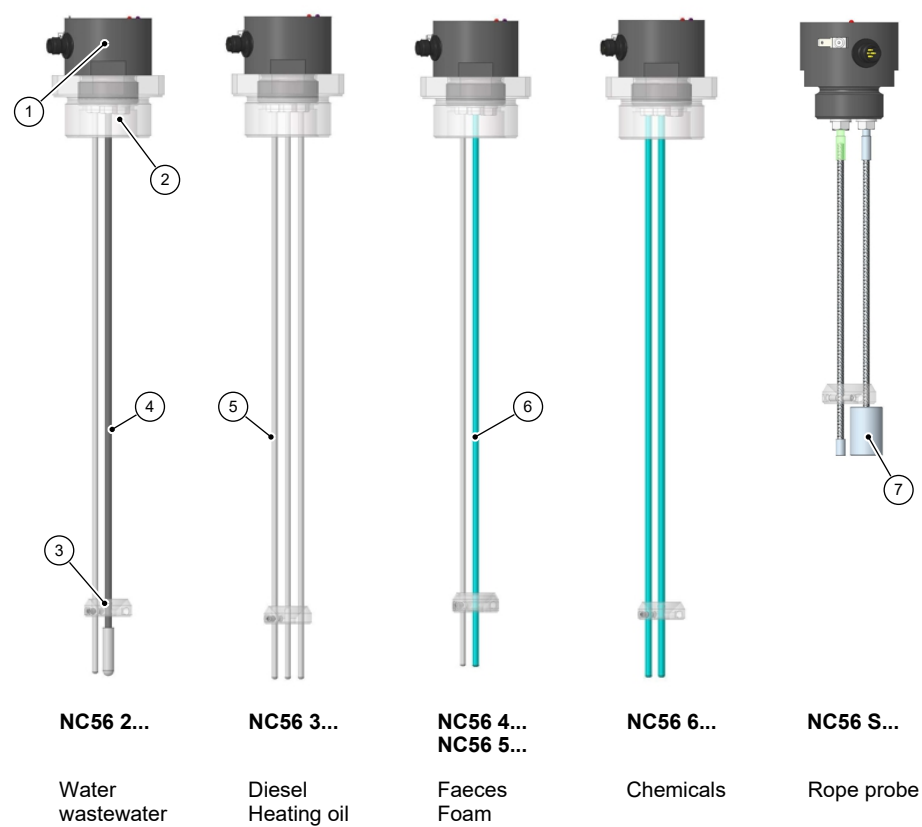


Fig. 2: Device versions

1	Probe housing	2	Pipe adapter
3	Spacer	4	Shrink-fit tubing insulation
5	Stainless steel	6	ECTFE insulation
7	Weight		

2.3.1 Type plate

The presented type plates serve to show an example of the information shown. The data shown is purely fictive, but does correspond to the actual conditions. For more information, please see the order code at the end of these instructions.

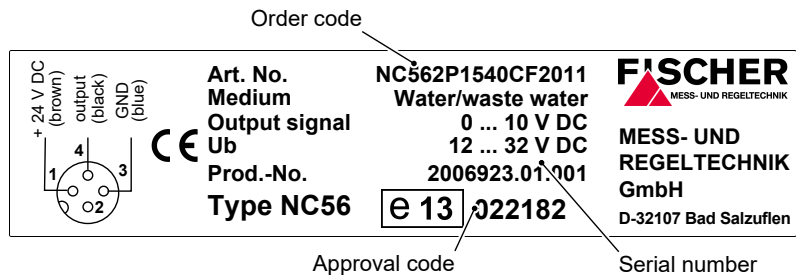
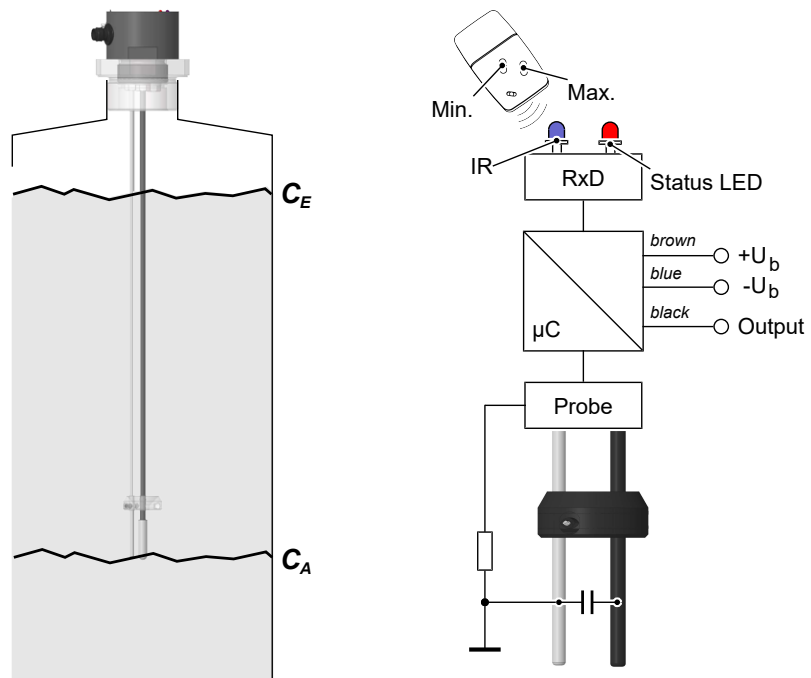


Fig. 3: Type plate

## 2.4 Function diagram



$C_A$  : Start capacity (probe free)  
 $C_E$  : End capacity (probe covered)

Fig. 4: Function diagram

## 2.5 Design and mode of operation

An AC voltage signal is exerted onto two metal rods held at a defined distance to each other. This means that the metal rods become a capacitor when dipped into fluids. The capacitive values of this capacitor are primarily determined via the filling level height and the resulting change in the dielectrics.

Electronics integrated into the device convert these capacity changes into linear uniform electrical signals. A comparison is conducted with an infrared remote control.



## 3 Assembly

### 3.1 General



#### ⚠ CAUTION

##### Risks connected to medium or system

The builder or operator of the tank system must implement suitable protective measures for installation and maintenance work.

### 3.2 Process connection

- By authorized and qualified specialized personnel only.
- Assembly only with the delivered process connection.
- Note the maximum permissible operating pressure of 10 bar.
- Check that the device is compatible with the medium being measured.

As standard, the device is intended for assembly in a size 1¼ mounting flange. If a protection tube is used, a pipe connection suitable for a size 2 mounting flange is used. The NC56 is suited only for vertical installation and, if possible, should be mounted at the highest point of the tank.

**NOTICE!** See also the information about the calibration in the section "Start-up".

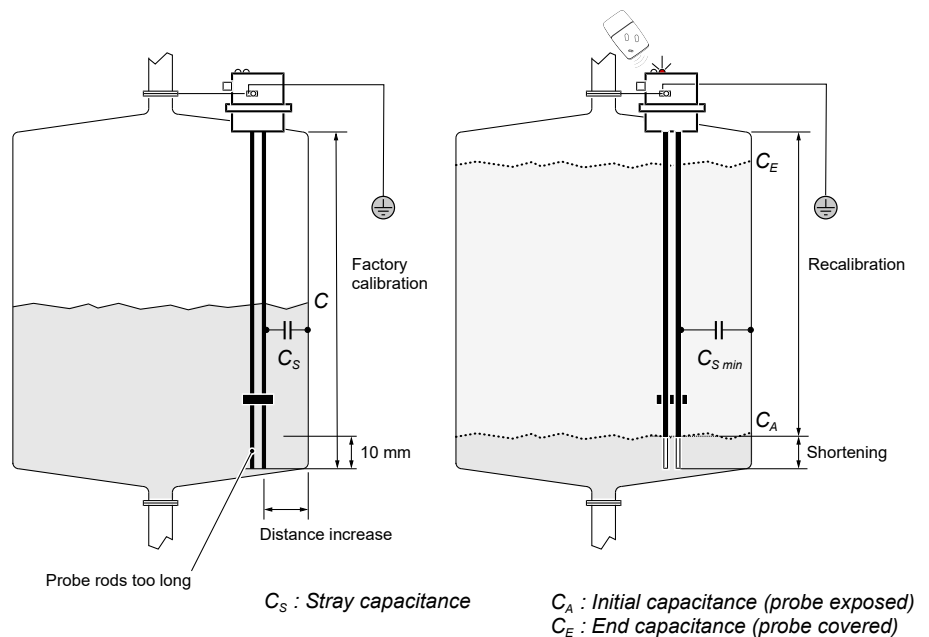


Fig. 5: Assembly of the NC56

A distance of at least 10 mm between the tank bottom and probe rods must be observed. If the probe was not ordered in the precise length required, the rods can be shortened by the user.

In the case of non-conductive fluids and very short electrodes, the impact of the stray capacitance of the environment will increase. For this reason, the probe should be installed in the middle of the tank if possible. The further the metal walls or metal frame from the electrodes, the lower the effect of this stray capacitance.

Pulsating impacts on the tank system can cause functional impairments on the device.

### 3.2.1 Shortening the probe rods



#### ⚠ CAUTION

##### Damage to coating

Insulated electrodes can become unusable as a result of rough impacts and shocks (e.g. hitting the floor).

If you need to shorten the electrodes, proceed as follows:

- Unscrew the clamping screw by 2 turns.
- Pull the probe rods out.
- Shorten the probe rods to the desired length on the head end.
- Remove 21 mm of the insulation (shrink-fit tubing) on the head end. It is best to remove the ECTFE coating with a belt sander.
- Insert the electrodes to the noticeable stop point. Tighten the clamping screws until the screw head lies flat on the surface.

**NOTICE! If the rods are shortened, the probe must be recalibrated during the start-up process.**

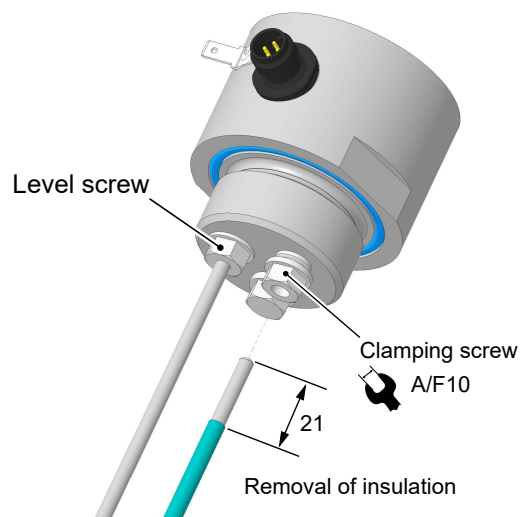


Fig. 6: Shortening the probe rod

Model	Length of probe rod
Without protection tube	Installation length + 25 mm
With protection tube	Installation length + 37 mm

### 3.3 Electrical connections

- By authorized and qualified specialized personnel only.
- When connecting the unit, the national and international electro-technical regulations must be observed.
- Disconnect the system from the mains, before electrically connecting the device.
- Install the consumer-adapted fuses.
- Do not connect the connector if strained.

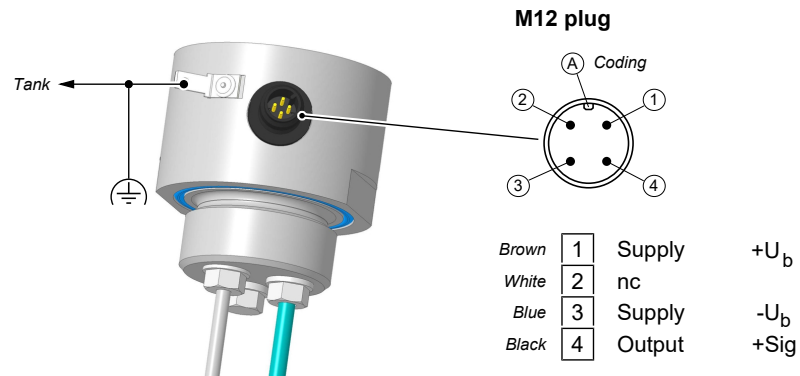


Fig. 7: Electrical connections

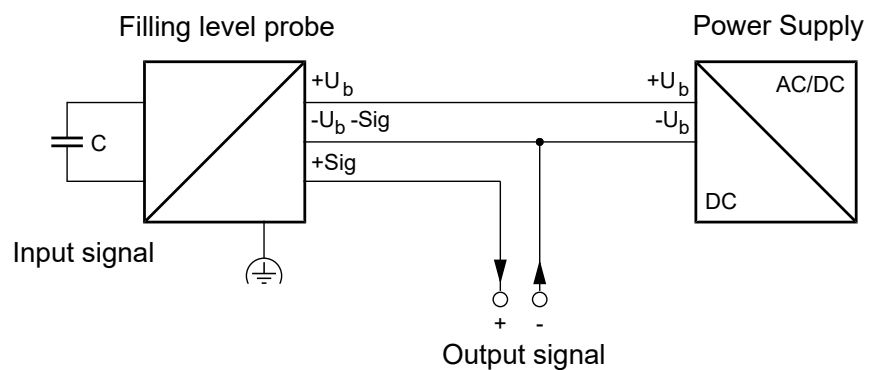


Fig. 8: 3W connection

The permitted operating voltage and the load impedance for the signal output are stated in the technical data. The internal signal ground is connected to the supply ground. This means that the output signal is free of interference levels on the power supply lines.

To avoid measurement errors due to conducted interference, we recommend that you realize potential equalization between the probe and the tank by connecting both together to a clean earth ground, particularly in the case of conductive liquids.

In the case of plastic tanks, only the ground connection of the probe must be connected with a clean earth ground.

## 4 Start-up

### 4.1 General

All electrical lines must have been installed properly before the start-up takes place. All connections must be arranged so that there are no mechanical forces acting on the device.

- Check that the defined safety measures for tank systems have been observed.
- Check that the mechanical installation is correct in accordance with the applicable erection regulations for tank systems.
- Make sure that the device is protected from the effects of frost.
- Switch the supply voltage on. A small light diode flashes regularly and briefly as a function control.
- This completes the start-up.

**NOTICE! The probe was calibrated to the ordered installation dimension. An on-site calibration is therefore unnecessary.**

If for some reason a recalibration does become necessary, proceed as described below.

### 4.2 Calibration

For the calibration, you need an infrared remote control of type EU04 (see accessories).

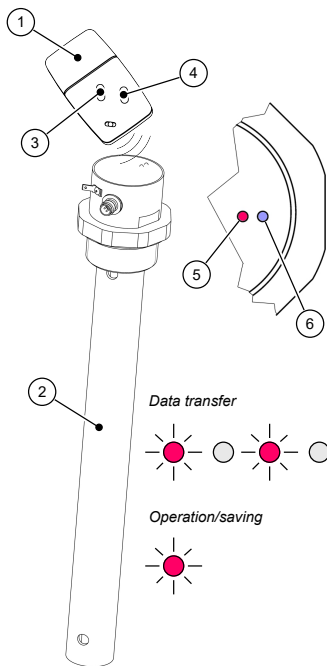


Fig. 9: Calibration

1	Remove control EU04	2	Filling level probe
3	MIN button	4	MAX button
5	Status LED	6	Infrared receiver LED

The calibration takes place in two stages:

#### 1. Minimum filling level

##### ▷ Zero point calibration

1. Reduce the level in the tank to the lowest filling level.
  2. Press and hold the " **MIN** " button.
    - ➔ The status LED flashes quickly. After 2 to 3 seconds, the LED lights up permanently. This is how the device indicates that the zero point has been stored.
  3. Now release the button.
- The zero point has been calibrated.

#### 2. Maximum filling level

##### ▷ Calibration of the measurement range (end value)

1. Fill the tank to the highest filling level.
  2. Press and hold the " **MAX** " button on the infrared remote control.
    - ➔ The status LED flashes quickly. After 2 to 3 seconds, the LED lights up permanently. This is how the device indicates that the end value has been stored.
  3. Now release the button.
- The end value has been calibrated.
- The calibration process is complete.

### Useful information about the calibration

If the filling levels change, the calibration can be repeated at any time. If just one of the two filling levels changes, it is sufficient to recalibrate only the corresponding value.

If you wish, you can use only part of the electrode length as the measuring distance. However, the shorter the measuring distance, the lower the precision. The best results are achieved if the electrodes are only just wetted for the zero point calibration and are almost but not quite fully submerged for the end point calibration.

The output signal of the probe depends linearly on the wetting level of the electrodes. The filling level is proportional to the filling volume in a cylindrical tank.

**NOTICE! This simple ratio no longer applies in the case of complex tank forms. Depending on the tank geometry, the filling level and tank content can differ significantly.**

In the case of non-conductive fluids and very short electrodes, the impact of the stray capacitance of the environment will increase. For this reason, the probe should be installed in the middle of the tank if possible. The further the metal walls or metal frame from the electrodes, the lower the effect of this stray capacitance.

If several filling level probes lie close together, all probes can be calibrated at the same time with an infrared remote control. However, if you want to avoid this, it is generally sufficient to specifically target the probe to be calibrated. Nevertheless, the safest way to proceed is to deactivate all of the other probes for the duration of the calibration.

## 5 Servicing

### 5.1 Maintenance

The instrument is maintenance-free. We recommend the following regular inspection to guarantee reliable operation and a long service life:

- Check the function in combination with downstream components.
- Check the leak-tightness of the pressure connection lines.
- Check the electrical connections.

The exact test cycles need to be adapted to the operating and environmental conditions. In combination with other devices, the operating instructions for the other devices also need to be observed.

### 5.2 Transport

The measuring device must be protected against impacts. It should be transported in the original packaging or a suitable transport container.

### 5.3 Service

All defective or faulty devices should be sent directly to our repair department. Please coordinate all shipments with our sales department.



#### **WARNING**

##### **Process media residues**

Process media residues in and on dismantled devices can be a hazard to people, animals and the environment. Take adequate preventive measures. If required, the devices must be cleaned thoroughly.

Return the device in the original packaging or a suitable transport container.

### 5.4 Disposal

Please help to protect the environment by always disposing of the work pieces and packaging materials in compliance with the valid national waste and recycling guidelines or reuse them.

## 6 Technical data

### 6.1 General

General information		
Type designation	NC56	
Measurement principle	Continuous measurement of the capacity change between two/three probe rods, depending on the filling probe of a fluid.	
Operating pressure	Max. 10 bar	
Number of electrodes	2 (3 for diesel)	
Thread connection	G 1¼" (for protective tubing version G2")	
Protection class	IP67 as per DIN EN 60529	
Reference conditions (acc. to IEC 61298-1)		
Temperature	+15 to +25 °C	
Relative humidity	45 ... 75 %	
Air pressure	86 to 106 kPa	860 to 1060 mbar
Installation position	vertical	

### 6.2 Input variables

Measuring range	The measuring range lies between 400 mm and 2000 mm, depending on the ordered probe length.  Other lengths available on request.
Input signal	Probe rods covered: high capacity Probe rods free: low capacity

### 6.3 Output variables

	Current output	Voltage output
Output signal	0 to 20 mA	0 ... 10 V
	4 to 20 mA	2 ... 10 V
		0 ... 5V
		1 ... 5V
Load impedance	$(U_b - 9V)/20 \text{ mA}$	> 5 kΩ

### 6.4 Measuring accuracy

Measurement deviation	< 1 % FS
Temperature coefficient of the zero-point	< 0.5 % FS/10 K
Temperature coefficient of the measuring range	< 0.1 % FS/10 K

FS: Full Scale (measuring range)

### 6.5 Auxiliary energy

	Current output	Voltage output
Nominal voltage	24 V DC	24 V DC
Permitted op. voltage	9 to 32 V DC	12 to 32 V DC
Current draw (without signal)	30 mA	30 mA

## 6.6 Operating conditions

Ambient temperature range	-20 °C ... +70 °C
Storage temperature range	-40 °C ... +80 °C
Medium temperature range	Max. 80°C
IP protection class	IP67
EMC	EN 61326-1:2013 EN 61326-2-3:2013
RoHS	EN IEC 63000:2018
e-approval	72/245/EEC
Approval number	95/54/EC E13*72/245/95/54*2182*00

## 6.7 Construction design

Electrical connection	M12 connector 4-pin, male
Installation position	vertical

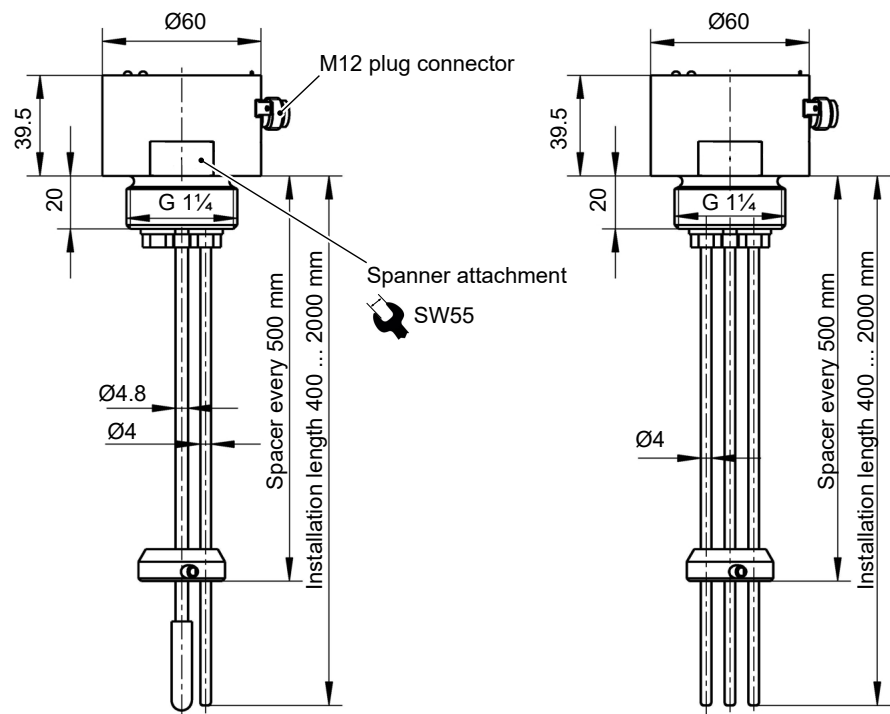
### 6.7.1 Materials

Materials of the parts that come into contact with the medium	
Probe rod (bare)	Stainless steel 1.4404
with shrink-fit tubing	Polyolefin
with coating	ECTFE

Materials of the parts that come into contact with the surroundings	
Housing	POM-C (Polyoxymethylene (copolymer))
Compound mass	Polyurethane
Spacer	POM-C (Polyoxymethylene (copolymer))
M12 plug	Polyamide
Earthing connection	Brass, tin-coated

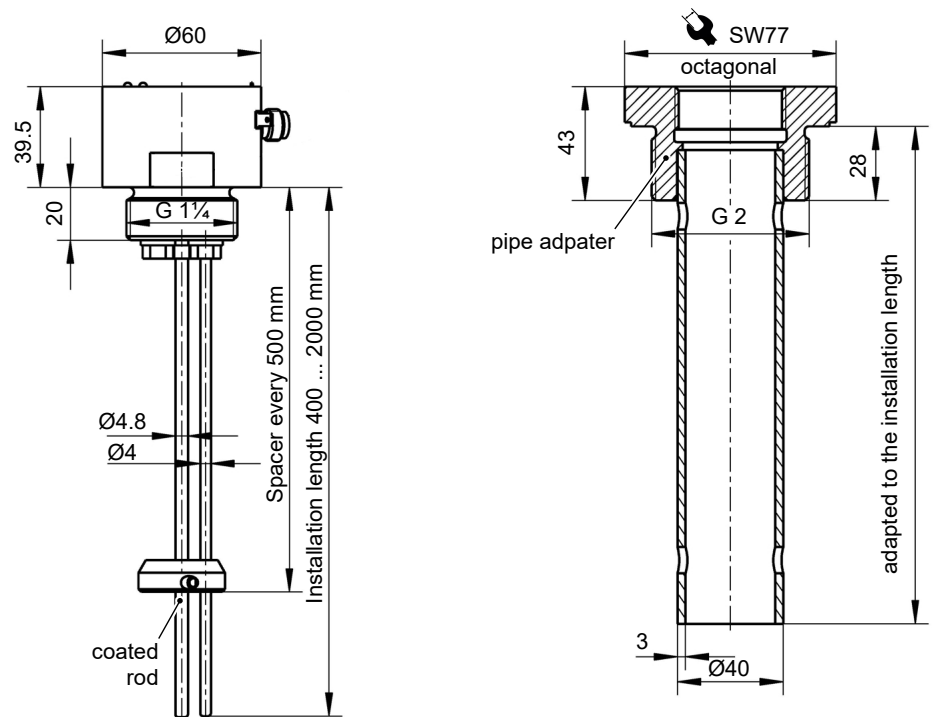


### 6.7.2 Dimension drawings



**Probe with shrink-fit tubing**

**Probe with 3 rods  
(uncoated)**

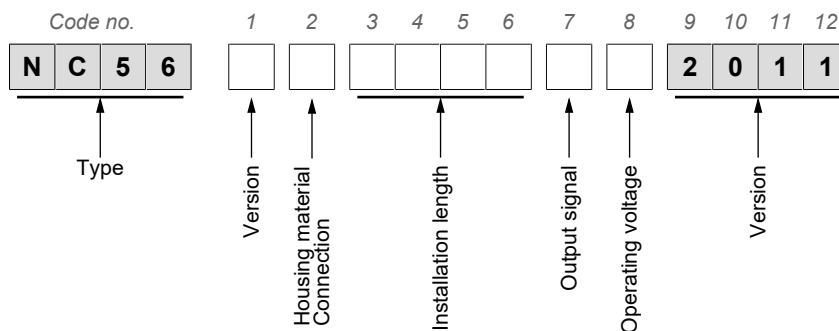


**Probe with  
coated rod**

**Protective tubing**

Fig. 10: Dimension drawing

## 7 Order codes



### Design:

[1]	(Code no.)	Rod 1	Rod 2	Rod 3
2	Water waste water	Shrink-fit tubing	Bare (1.4404)	---
3	Diesel	Bare (1.4404)	Bare (1.4404)	Bare (1.4404)
4	Faeces	ECTFE coating	Bare (1.4404)	---
5	Extinguishing foam agent	ECTFE coating	Bare (1.4404)	---
S	Cable probe	Steel cable (1.4404)	Steel cable (1.4404)	---
6	Chemicals	ECTFE coating	ECTFE coating	---

### Casing material/connection:

[2]	(Code no.)
0	Plastic casing with size 1¼ for outside use incl. size 2 protection tube
P	For outside use incl. size 2 protection tube
G	For outside use and bores for suction vehicles (only for model 4 - Faeces)

### Installation length (from sealing surface):

[3-6]	(Code no.)
0400	400 mm
	to
2000	2000 mm
	<i>The probe rods are produced in steps of 50 mm.</i>

### Output signal:

[7]	(Code no.)
A	0 to 20 mA
P	4 to 20 mA
C	0 to 10 V
Z	2 to 10 V
U	0 to 5 V
D	1 to 5 V

**Operating voltage:**

<b>[8] (Code no.)</b>	
<b>E</b>	9 to 32 V (for current output)
<b>F</b>	12 to 32 V (for voltage output)

**Version:**

<b>[9-12] (Code no.)</b>	
<b>2011</b>	Version

**7.1 Accessories**

<b>Order no.</b>	<b>Designation</b>	<b>No. of poles</b>	<b>Length</b>
06401993	Connection cable with M12 connector	4 poles	2 m
06401994	Connection cable with M12 connector	4 poles	5 m
06401563	Connection cable with M12 connector	4 poles	7 m
06401572	Connection cable with M12 connector	4 poles	10 m

**Infrared remote control**

<b>Order no.</b>	<b>Designation</b>
EU04	Infrared remote control

## 8 Attachment



(Translation) **CE**

### EU Declaration of Conformity

For the product described as follows

**Product designation**                      **Capacitive level probe**  
**Type designation**                        **NC56**

it is hereby declared that it corresponds with the basic requirements specified in the following designated directives:

2014/30/EU

EMC Directive

2011/65/EU

RoHS Directive

The products were tested in compliance with the following standards.

#### **Electromagnetic compatibility (EMC)**

**DIN EN 61326-1:2013-07**  
**EN 61326-1:2013**

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

**DIN EN 61326-2-3:2013-07**  
**EN 61326-2-3:2013**

Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-3: Particular requirements - Test configuration, operational conditions and performance criteria for transducers with integrated or remote signal conditioning

#### **RoHS Directive (RoHS 2)**

**DIN EN IEC 63000:2019-05**  
**EN IEC 63000:2018**

Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Also they were subjected to the conformity assessment procedure „Internal production control“.

Sole responsibility for the issue of this declaration of conformity in relation to fulfilment of the fundamental requirements and the production of the technical documents is with the manufacturer.

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**Documentation representative**              Mr. Torsten Malischewski  
 B.Sc.  
 Development department

**The devices bear the following marking:**



**Bad Salzufflen**  
**21. Sept. 2020**

G. Gödde  
 Managing director

09010427 • CE\_EN\_NC56 • Rev. ST4-A • 09/20



1 / 1

Fig. 11: CE\_DE\_NC56

## Notes







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