Technical
Information
TI 161F/00/en

Operating Instructions
017189-1000

Capacitance Level Measurement
Probes 11500 Z, 11500 ZM

Ceramic, fully insulated rod probes for high temperatures and pressures

Versions
Four basic versions, each with its own variations, cover all applications:
- 11500 Z with threaded boss
- 11500 Z with flange
- 11500 ZM with ground tube and threaded boss
- 11500 ZM with ground tube and flange

The versions with ground tubes are especially designed for electrically non-conductive liquids with low dielectric constants.

Application
Continuous level measurement and limit detection in liquids.

The probes are designed for use in tanks with
- very high pressures (up to 500 bar) and
- very high temperatures (up to 400°C).

They are also approved for use in explosion-hazardous area Zone 0.

Endress+Hauser
The Power of Know How

Measuring System

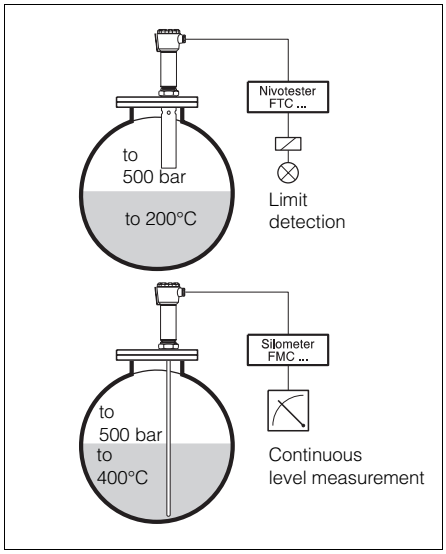
A complete measuring system consists of the probe, electronic insert and the level transmitter FMC…
or level limit switch FTC…

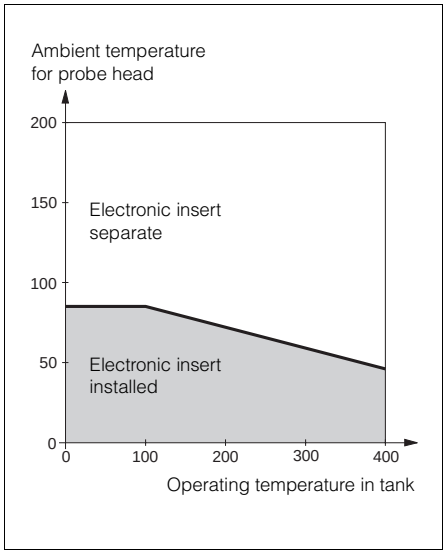
At low ambient temperatures the electronic insert can be mounted in the probe head housing. Separate mounting is required at high temperatures.

Overspill protection
The probe can be used for overspill protection with flammable liquids conforming to VbF.

For approved combination of instruments, see section on "Certificates".

When to install an electronic insert

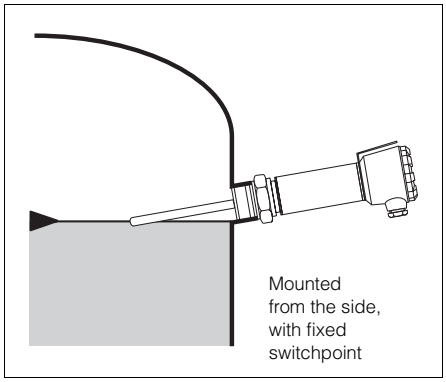


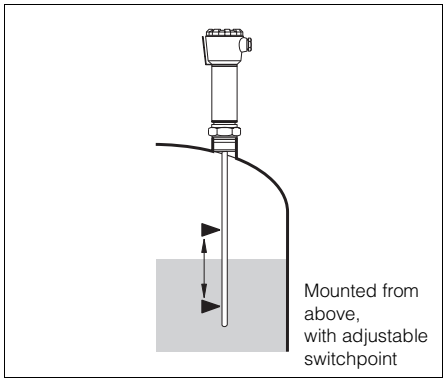


Mounting for Limit Detection

Mounting from the side
- When the probe is mounted from the side, the Nivotester always accurately switches at the limit point specified by where the sensor is installed.
- For recommended probe lengths please refer to Page 7.
- For applications with organic materials, a probe with ground tube is recommended in order to produce large capacitance changes with small dielectric constants.
- If the probe is mounted from the side, then it should be tilted slightly downwards so that the liquid can flow off more easily (and out of the ground tube, if used) and prevent build-up. The ground tube is not suitable for viscous products or those causing build-ups.
- Only short probes (max. 500 mm) may be mounted from the side if no ground tube is used.

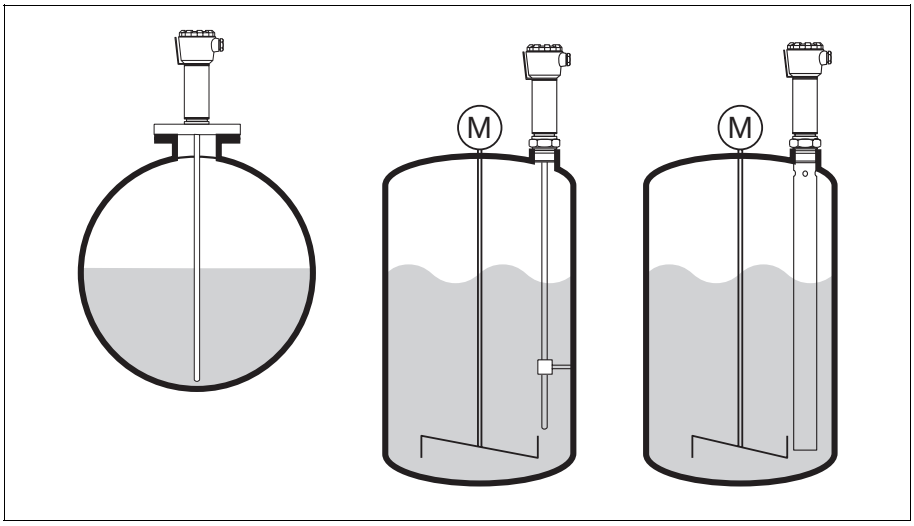
Mounting from above
- If the probe is mounted from above, then the switchpoint may be varied by adjusting the setting on the Nivotester.
- Note: A probe with a ground tube is recommended for use with organic materials.
- This kind of probe is also recommended for applications with strong turbulence.
- Please refer to Page 7 for minimum lengths when mounting from above. As the capacitance can be adjusted within a very wide range, it is useful to select a probe which is somewhat longer than required.





Mounting for Continuous Measurement

- Mount the probe vertically in the tank from above.
- The probe without the ground tube 11500 Z is for use with electrically conductive liquids.
- If turbulence is present, then a side bracket (insulated if possible) is to be used if the probe is longer than approx. 500 mm.
- The 11500 ZM probe with ground tube is more suitable for turbulent liquids which do not cause build-up.
- Use the 11500 ZM probe with ground tube for organic substances and other electrically non-conductive liquids.



Left:
Storage tank without turbulence

Centre:
Process tank with turbulence and build-up. The probe 11500 Z with bracket should be used

Right:
Process tank with turbulence but without build-up. The probe 11500 ZM should be used

Several Measuring Points

For capacitive level limit detection or continuous level measurement, probes without ground tubes should not be too close to each other if mounted in a metal tank or in neighboring plastic tanks.

This is to ensure that no mutual interference can occur.
Please contact Endress+Hauser if they are mounted at intervals of less than 500 mm.

Transport Unpacking Mounting

Transport
The probe can be transported without the risk of breaking because:

The probe consists of a ceramic tube surrounding a metal unit.
The ceramic tube is resistant to many chemicals and withstands extremely high temperatures and pressures.
Bending or hitting the probe, however, can result in breaking the ceramic and therefore damaging the insulation.

Unpacking
Compare the code on the nameplate of the probe with the order number on Page 6 to ensure that the correct probe has been delivered.

Remove the packing on-site just before mounting.

A different method of packing is used for each version:

Probe **with ground tube** 11500 ZM
The ground tube is an integral part of the measuring system and is not to be unscrewed!
The ground tube is filled with a plastic granulate (Noryl, PPO).

- Open the plug at the lower end of the ground tube and allow the granulate to run out. Do not hit the ground tube!
- Remove the adhesive tape from the vents situated at the top of the ground tube.
- Blow or rinse out the ground tube if the probe has to totally clean before mounting.

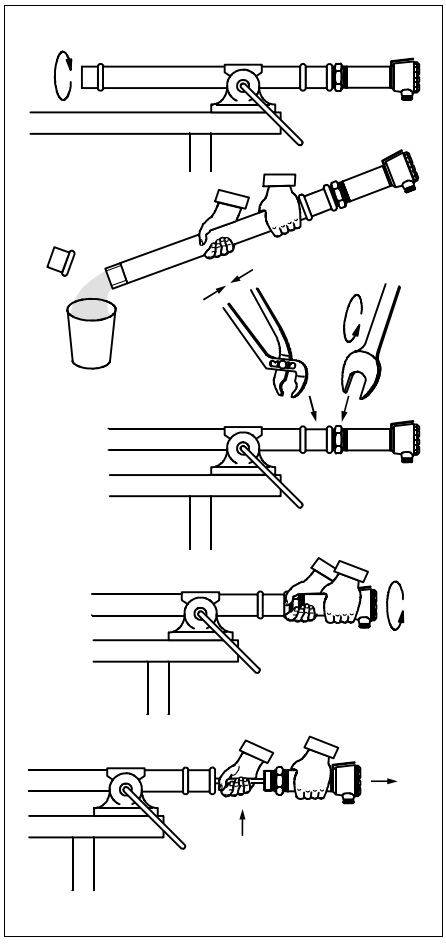
Probe **without ground tube** 11500 Z
The probe rod is protected by a metal tube which is filled with a plastic granulate (Noryl, PPO).
- Loosen the screw cap (55 AF) at the bottom of the protective pipe
- Unscrew the cap only at the place of mounting and allow the plastic granulate to run out from the protective pipe.
  Do not hit the protective pipe!

Probes **with a threaded boss**
- Hold the slip-on nut with a pipe wrench and begin to turn the probe with a 60 AF open-ended spanner at the hex nut.
- Note that the length of the thread of the boss is approx. 30 mm. Remove the probe from the protective pipe by carefully turning it by hand as you come to the end of the thread.

Probes **with a flange ≥ DN50**
At the bottom on the flange is a short threaded pin (approx. 5 mm) onto which the protective pipe is screwed.
- Carefully unscrew the probe and flange from the protective pipe by hand.

Probes **with a flange < DN50**
A counter flange is welded onto the protective tube.
- Remove the mounting screws from the flange and counter flange and make sure that the two flanges do not move in relation to one another until you have carefully removed the probe from the protective pipe.

Avoid hitting or putting any strain on the ceramic rods when removing the probe from the protective pipe.



Carefully remove the packing!
The diagrams show the probe 11500 Z with threaded boss, but without the ground tube

Mounting
- Ensure that the ceramic rods are in good order (no cracks or chipping) and check the probe length.
- The probe rod must not be shortened otherwise the insulation will be damaged and its resistance to chemical corrosion will be lost.
- Mount the probe immediately after unpacking.
- Please note instructions given in the certificates.
- Use a suitable seal for the application
- Avoid hitting or putting any strain on the probe (especially with the probe 11500 Z) when sliding it through the threaded sleeve or the collar with counterflange or when screwing it tight.

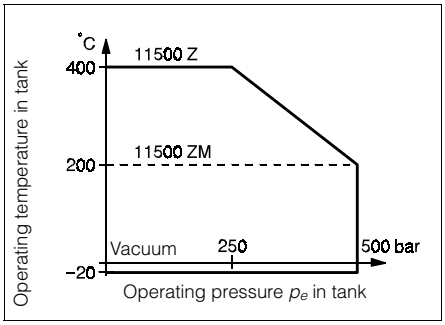
Short-term storage
If the probe has to be stored, then lay it vertically with the probe head downwards and secure to prevent it falling over.
The probe should be repacked if it is to be stored or transported for any long period of time!

Connection

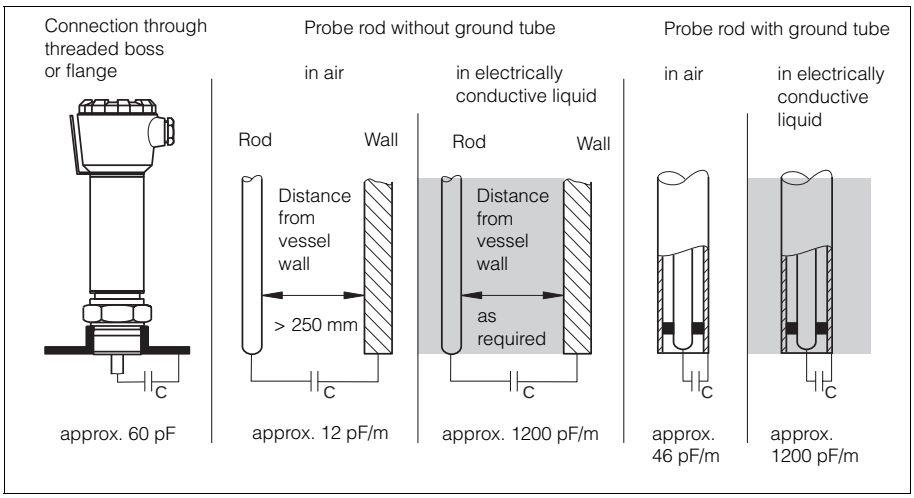
Please refer to the Technical Information about the electronic insert EC… for the electrical connections when installing the electronic insert in the probe head.
No moisture must enter the probe head housing during storage of the probe, connection of the electronic insert or during operation.
The housing cover and the cable gland must be screwed tight.

Technical Data

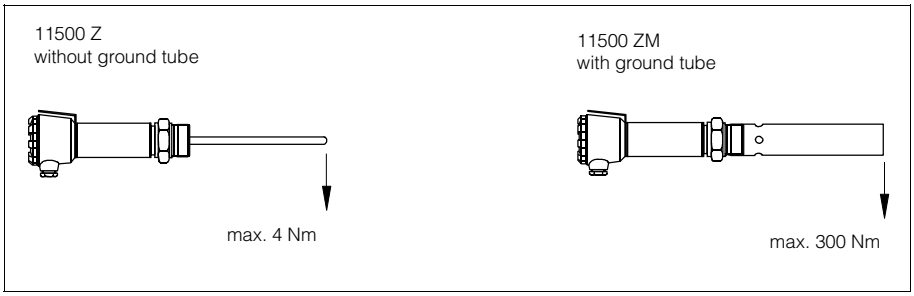
Operating data
- Relationship between maximum operating pressure and temperature: refer to diagram on the right.
- Resistance to temperature shock: 150°C/min
- For use in steam: depending on the resistance of Al_2O_3 (99.7%)



Capacitance of the probe



Lateral load on the probe at 20°C and static loading



Probe lengths
Minimum: 100 mm
Maximum: 2000 mm

Probe length tolerances:

Probe length	Tolerance
to 1 m	+ 0 mm, – 5 mm
to 2 m	+ 0 mm, –10 mm

Materials:
- Full rod insulation: approx. 2 mm ceramic Al_2O_3
- Ground tube: stainless steel 1.4301 or 1.4571 (11500 ZM)
- Spacer: PTFE (11500 ZM), temperature resistant up to 200°C
- Threaded boss G $1^1/_2$: 1.4571
- Flange: steel, primed, or stainless steel 1.4571
- Pipe between process connection and housing: stainless steel 1.4571

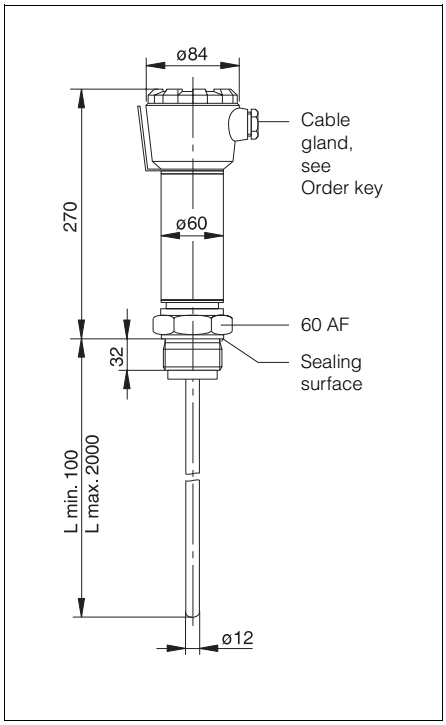
Process connections:
- Thread G $1^1/_2$ A DIN/ISO 228 Sealing conf. to DIN 3852 Z, Page 2, Form D, large sealing ring conf. to DIN 7603, Form D (recommended material: soft iron)
- DIN flange: DIN 2501, Page 1
- ANSI flange: ANSI B 16.5
- High pressure flange: on request

- Cable glands:
  Standard PG in nickel-plated brass with NBR sealing for cable diameter 7…10 mm, Protection: IP 55
  Ambient temperature up to 100°C

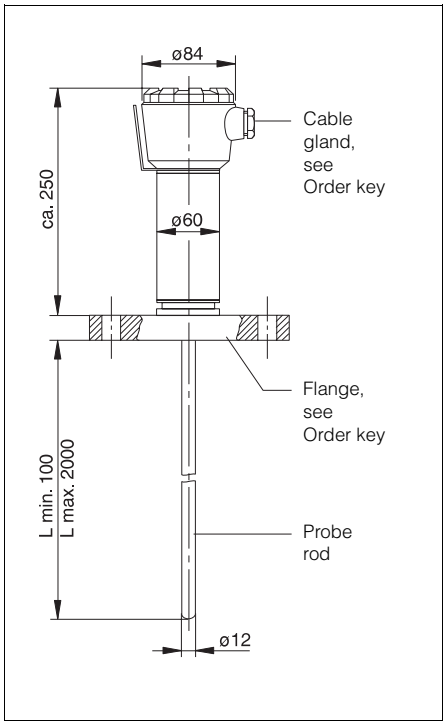
  Water-tight PG in polyamide with neoprene CR sealing for cable diameter 5…12 mm.
  Protection: IP 66
  Ambient temperature max. 80°C

Subject to modification

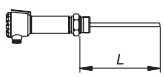
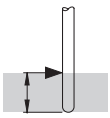
Dimensions and Probe Length



Probe 11500 Z with threaded boss G $1^1/_2$

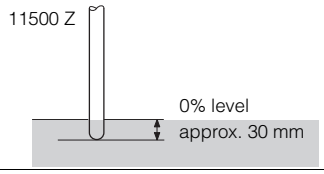


Probe 11500 Z with flange

Material characteristics, relative dielectric constant ε_r	Limit detection, mounting from the side Recommended total length *L* 	Limit detection, mounting from above The lengths given here in this table incorporate the additional minimum lengths from the sealing surface of the flange or threaded boss right up to the limit point required. 
electrically conductive	100 mm	50 mm
ε_r > 10 e.g. alcohols	150 mm	100 mm
ε_r approx. 4…10	200 mm	200 mm
ε_r approx. 3…4		400 mm
ε_r approx. 2…4 e.g. oils	400 mm	

Please contact us if the dielectric constant of the material is not known.

Continuous level measurement



To ensure that values at the start of the measuring range are also linear, the probe rod should be approx. 30 mm longer than the distance from the sealing surface of the process connection to the 0% level.

How to Order

Rod probe 11500 Z

Certificates
- R For non-hazardous areas
- 1 ATEX II 1/2 G, EEx ia IIB T6
- 2 ATEX II 1/2 G, EEx ia IIB T6, WHG
- A ATEX II 1/2 G, EEx ia IIC T6
  Note safety instruction (XA) for electrostatic charging!
- P ATEX II 1/2 G, EEx ia IIC T6
  Note safety instruction (XA) for electrostatic charging!
- 8 For connection to EEx ia
- Y Special version

For use with (lable text)
- F FMC 470 Z with EC 47 Z / 37 Z
- G FMC 671 Z with EC 47 Z / 37 Z
- R FMC 671 Z with EC 17 Z
- H FMC 672 Z with EC 47 Z / 37 Z
- K FMC 676 Z with EC 47 Z / 37 Z
- S FMC 676 Z with EC 17 Z
- L FMC 677 Z with EC 47 Z / 37 Z
- C FTC 470 Z / 471 Z with EC 17 Z
- X unspecified instrument
- Y Special version

Process connection and material
- G2 G 1 $^1/_2$" BSP thread / SS316Ti
- H2 1 $^1/_2$" NPT thread / SS316Ti
- K1 DN50 PN16 B (FF) / steel
- K2 DN50 PN16 B (FF) / SS316Ti
- M1 DN80 PN16 B (FF) / steel
- M2 DN80 PN16 B (FF) / SS316Ti
- P1 DN100 PN16 B (FF) / steel
- P2 DN100 PN16 B (FF) / SS316Ti
- Q1 ANSI 2" 150 lbs RF / steel
- Q2 ANSI 2" 150 lbs RF / SS316Ti
- R1 ANSI 4" 150 lbs RF / steel
- R2 ANSI 4" 150 lbs RF / SS316Ti
- Y9 Special version

Rod material
The price is based on units of 100 mm
- A Rod material: Ceramic insulation
- Y Special version

Probe Length L, 100-2000 mm
- 1 mm L total length
- Y Special version

Housing and cable gland
- C Aluminium IP66 / $^1/_2$" NPT
- D Aluminium IP66 / G $^1/_2$"
- E Aluminium IP66 / M20
- F Aluminium IP66 / HNA24 gland
- T Coated alum. IP66 / $^1/_2$" NPT
- U Coated alum. IP66 / G $^1/_2$"
- V Coated alum. IP66 / M20
- W Coated alum. IP66 / HNA24 gland
- Y Special version

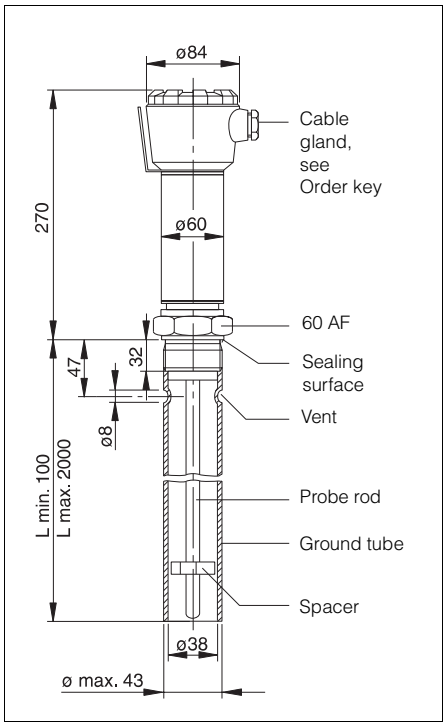
Electronic insert
- A Electronic insert not installed
- C with EC 17 Z 2-wire PFM
- G with EC 37 Z 2-wire PFM 33 kHz
- H with EC 47 Z 2-wire PFM 1 MHz
- Y Special version

11500 Z								

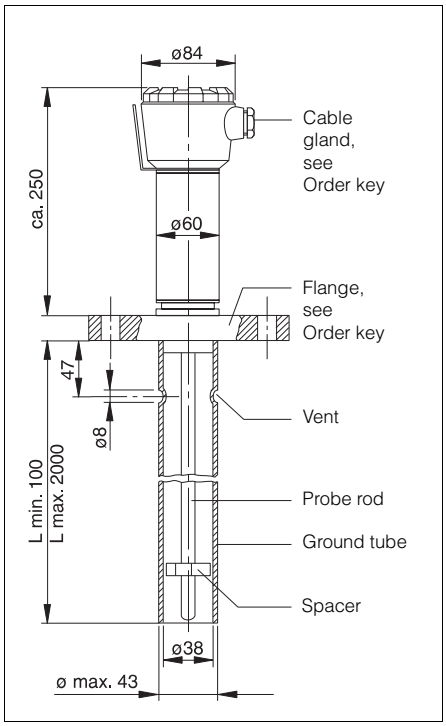
Order code

Please state length of probe in mm
See also section “Probe Length”

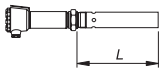
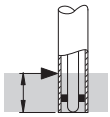
Dimensions and Probe Length



Probe 11500 ZM with ground tube and threaded boss G 1½

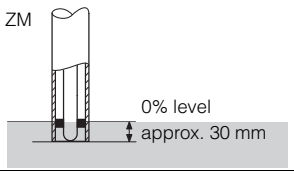


Probe 11500 ZM with ground tube and flange

Material characteristics, relative dielectric constant ε_r	Limit detection, mounting from the side Recommended total length *L* 	Limit detection, mounting from above The lengths given here in this table incorporate the additional minimum lengths from the sealing surface of the flange or threaded boss right up to the limit point required. 
electrically conductive	(approx. 100 mm)	50 mm
ε_r > 10 e.g. alcohols	100 mm	50 mm
ε_r approx. 4…10	100 mm	100 mm
ε_r approx. 3…4		200 mm
ε_r approx. 2…4	200 mm	
ε_r approx. 2 e.g. oils, benzine		250 mm
ε_r approx. 1,5…2 e.g. propane	300 mm	300 mm

Please contact us if the dielectric constant of the material is not known.

Continuous level measurement



To ensure that values at the start of the measuring range are also linear, the probe rod should be approx. 30 mm longer than the distance from the sealing surface of the process connection to the 0% level.

How to Order

Rod probe 11500 ZM

Certificates

A ATEX II 1/2 G, EEx ia IIC T6
Note safety instruction (XA) for electrostatic charging!
P ATEX II 1/2 G, EEx ia IIC T6
Note safety instruction (XA) for electrostatic charging!
8 For connection to EEx ia
1 ATEX II 1/2 G, EEx ia IIB T6
2 ATEX II 1/2 G, EEx ia IIB T6, WHG
Y Special version

For use with (lable text)

F FMC 470 Z with EC 47 Z / 37 Z
G FMC 671 Z with EC 47 Z / 37 Z
R FMC 671 Z with EC 17 Z
H FMC 672 Z with EC 47 Z / 37 Z
K FMC 676 Z with EC 47 Z / 37 Z
S FMC 676 Z with EC 17 Z
L FMC 677 Z with EC 47 Z / 37 Z
C FTC 470 Z / 471 Z with EC 17 Z
X unspecified instrument
Y Special version

Process connection and material

G1 G 1 $^{1}/_{2}$" BSP thread / steel
G2 G 1 $^{1}/_{2}$" BSP thread / SS316Ti
K1 DN50 PN16 B (FF) / steel
K2 DN50 PN16 B (FF) / SS316Ti
M1 DN80 PN16 B (FF) / steel
M2 DN80 PN16 B (FF) / SS316Ti
P1 DN100 PN16 B (FF) / steel
P2 DN100 PN16 B (FF) / SS316Ti
Q1 ANSI 2" 150 lbs RF / steel
Q2 ANSI 2" 150 lbs RF / SS316Ti
R1 ANSI 4" 150 lbs RF / steel
R2 ANSI 4" 150 lbs RF / SS316Ti
Y9 Special version

Rod material and ground tube

The price is based on units of 100 mm
C Rod ceramic insul., SS304 ground tube
D Rod ceramic insul., SS316Ti ground tube
Y Special version

Probe Length L, 100-2000 mm

1 mm L total length
Y Special version

Housing and cable gland

C Aluminium IP66 / 1/2" NPT
D Aluminium IP66 / G $^{1/2"}$
E Aluminium IP66 / M20
F Aluminium IP66 / HNA24 gland
T Coated alum. IP66 / 1/2" NPT
U Coated alum. IP66 / G 1/2"
V Coated alum. IP66 / M20
W Coated alum. IP66 / HNA24 gland
Y Special version

Electronic insert

A Electronic insert not installed
C with EC 17 Z 2-wire PFM
G with EC 37 Z 2-wire PFM 33 kHz
H with EC 47 Z 2-wire PFM 1 MHz
Y Special version

11500 ZM								

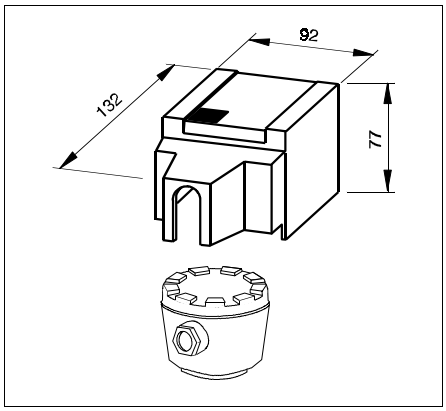
Order code

Please state length of probe in mm
See also section “Probe Length”

Accessories

Protective cover
for aluminium housing
Material: polyamide
Maximum ambient temperature: 100°C

The protective cover
should be used when mounting in the open. This protects the probe with aluminium housing from excessive temperatures and condensation caused by large temperature variations.



Supplementary Documentation

- ☐ Electronic Insert EC 17 Z
  Technical Information TI 268F/00/en
- ☐ Nivotester FTC 470 Z, FTC 471 Z
  Level limit switch
  Technical Information TI 088F/00/en
- ☐ Electronic Insert EC 37 Z, EC 47 Z
  Technical Information TI 271F/00/en
- ☐ Silometer FMC 470 Z
  Level measuring instrument
  Technical Information TI 018/00/en
- ☐ Contacter HTA 470 Z
  Limit signal transmitter
  Technical Information PI 011/00/en

Further instruments for limit detection and continuous level measurement on request.

Certificates

- ☐ Certificate of conformity
  PTB No. Ex-82/2071 X
  with VbF approval
  01/PTB No. Ex-82/2071 X-F
  for limit detection with
  EC 17 Z and FTC 470 Z / 471 Z
  ZE 003F/00/de (in German)
- ☐ Certificate of conformity
  PTB No. Ex-80/2143 X
  for continuous level measurement
  with electronic insert
  EC 37 Z / EC 47 Z
  and with VbF approval
  01/PTB III B/E - 29813 B-F
  for limit detection with
  FMC 470 Z and HTA 470 Z
  ZE 018F/00/de (in German)

Order Details

- ☐ Order code
- ☐ Probe length
- ☐ Special version as required
- ☐ Accessories
  (e.g. protective cover)

Endress+Hauser
GmbH+Co.
Instruments International
P.O. Box 22 22
D-79574 Weil am Rhein
Germany

Tel. (0 76 21) 9 75-02
Tx 7 73 926
Fax (0 76 21) 9 75 345
http://www.endress.com
info@ii.endress.com

Endress+Hauser

The Power of Know How

01.99/MTM

TI 161F/00/en/03.02
017189-1000
SL/CV4.2

017189- 1000