



Technical
Information
TI 268F/00/en

Operating Instructions
017184-1000

Capacitance Limit Detection *Electronic Insert EC 17 Z*

**Transmitter for capacitance probes
Suitable for use in explosion-hazardous areas
(European and North American certificates)**



Application

The EC 17 Z electronic insert is a transmitter for capacitance limit detection in conjunction with the limit switches Nivotester FTC 470 Z, 471 Z, 520 Z, 521 Z and with the Silometer FMC 671 Z, 676 Z or the Prolevel FMC 661 for limit function or for automatic calibration correction.

Features and Benefits

- Approval for use in explosion-hazardous areas (EEx ia, FM IS, CSA IS)
- Connection to the Nivotester, Silometer, or Prolevel over standard screened installation cable
- Applicable over a wide temperature range.

Endress + Hauser

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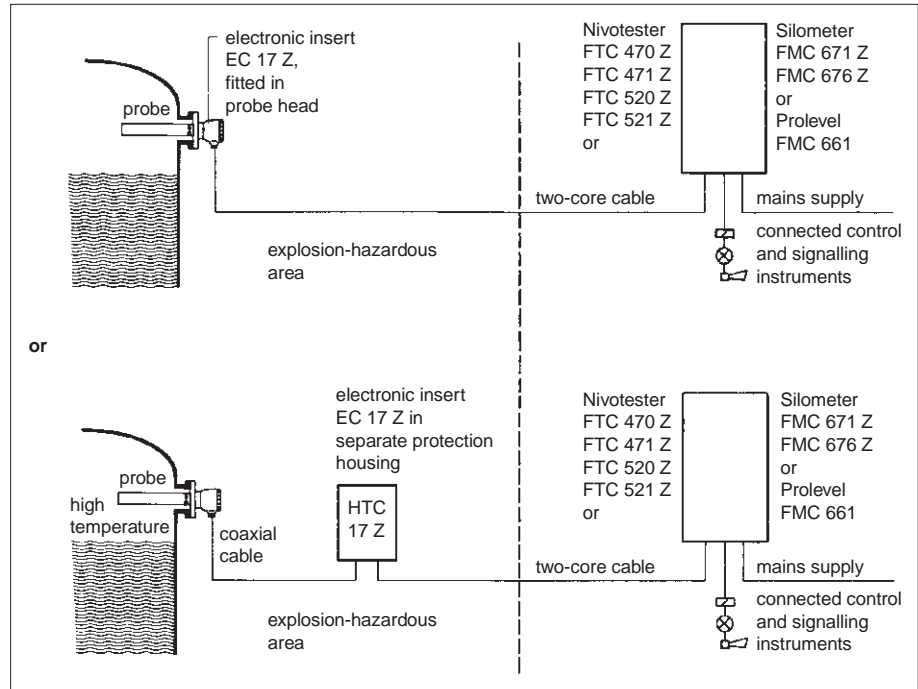
Measuring System

The complete measuring system comprises:

- one of the limit switches mentioned in Sect. "Application"
- a capacitance probe
- an electronic insert EC 17 Z, which is normally fitted in the probe head.

Where high temperatures affect the probe head, the electronic insert can be fitted in a separate protection housing, called the HTC 17 Z.

Measuring system for capacitance limit detection



Measuring Principle

The basis of this technique lies in the physical properties of a capacitor. The capacitance C of a capacitor is derived from the distance d of the electrodes, the surface area A of the electrodes and the dielectric constant ϵ of the intermediate dielectric:

$$C = \epsilon \frac{A}{d}$$

The capacitor used in level measurement generally takes the form of the vessel itself and a probe that extends into the vessel. The vessel wall and the probe form the two electrodes. If the vessel is made from non-conductive material, then a counter electrode must be fitted (e. g. an earth tube, second probe or metal plate). This can also be the second rod of a double rod probe.

The distance between the electrodes and surface area remain constant. The

only variable is the depth of material being measured, which represents the dielectric between the two electrodes. Air and vacuum have a relative dielectric constant $\epsilon_r = 1$, for liquids and solids $\epsilon_r > 1$ is valid.

The capacitance of the capacitor therefore depends on how much material lies between the probe and the vessel wall, i. e., whether the probe is covered with or free from material. The capacitor is part of an oscillating circuit, whose other components are located in the EC 17 Z electronic insert. With a free probe the capacitance is lower and the oscillator has a higher frequency than with a covered probe. The electronic insert converts the oscillator frequency into a pulse frequency signal, which is sent to the Nivotester, Silometer, or Prolevel superimposed on the basic current over a two-core cable.

Installation and Electrical Connection

Normally the white electronic insert EC 17 Z is fitted in the probe head and screwed tight.

Before fitting, connect the earth connection between terminal 6 and the probe head housing.

It is important to select the correct bridge to terminals 3 to 5:

Bridge 4-5 is standard for connecting to Nivotester FTC 470 Z, 471 Z, 520 Z, 521 Z, Silometer FMC 671 Z, FMC 676 Z, and Prolevel FMC 661.

Bridge 3-4 should be connected if the probe projects into conductive material that forms a build-up.

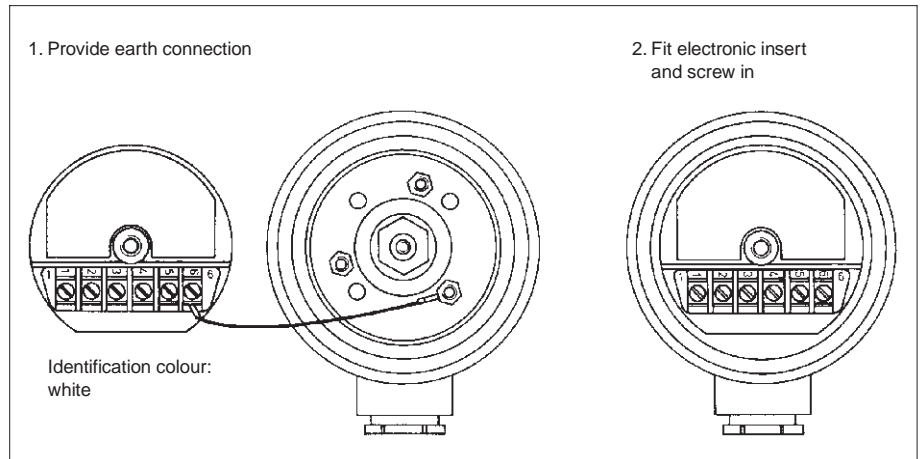
Use a two-wire screened installation cable for wiring up the Nivotester, Silometer or Prolevel.

Ground the screen at both ends; if this is not possible, ground the screen to the sensor housing at one end.

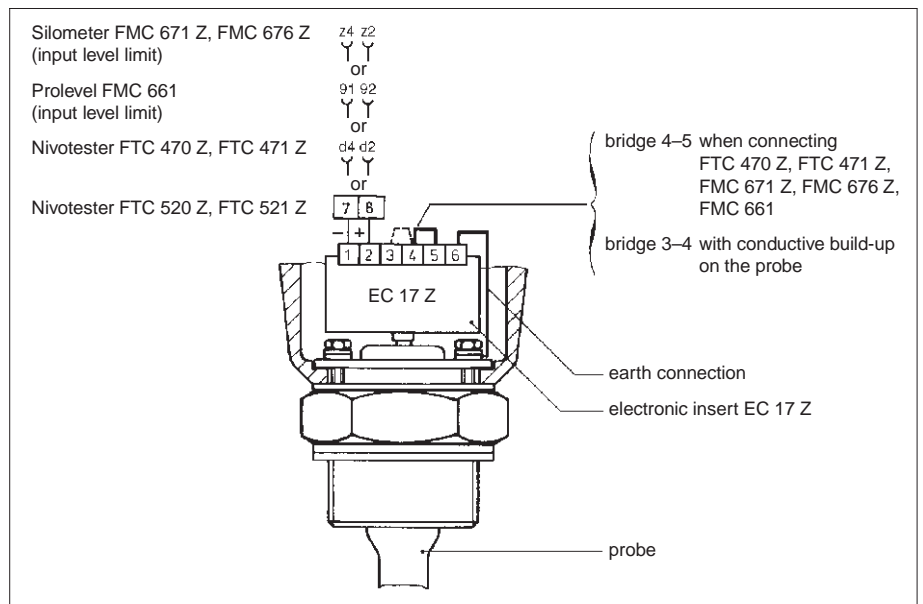
Comply with explosion protection regulations.

Screw the housing lid and the cable entries tight to prevent the ingress of moisture into the probe head housing. For the greatest possible accuracy, recalibrate after replacing the electronic insert.

Connection to probe head

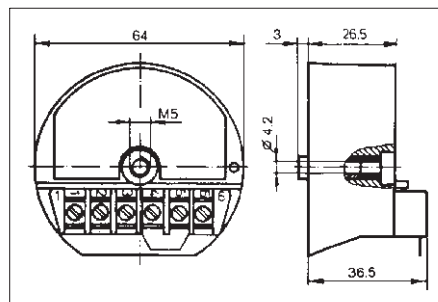


Connection to the Nivotester, Silometer, or Prolevel



Dimensions

Dimensions of the electronic insert EC 17 Z



Technical Data

Electronic insert EC 17 Z

Housing	plastic, potted electronics
Identification colour	white
Protection type to DIN 40050	electronics IP 55, terminals IP 00
Weight	approx. 120 g
Permissible ambient temperature	-25 °C...+100 °C
Certificates	PTB (Germany), FM (USA), CSA (Canada), shipbuilding approvals by ABS, BV, DNV, and GL
Explosion protection type	Europe: EEx ia IIC T6 (Zone 0 for rod or rope) North America: IS / Cl. I, II, III / Group A-G
Supply voltage	approx. 10.5 V...12.2 V
Basic current	approx. 4 mA...10 mA
Operating frequency	approx. 300 kHz
Signal transmission	pulse-frequency-modulation (PFM)
Pulse current	approx. 10 mA...18 mA
Pulse width	approx. 200 µs
Transmission frequency	185 Hz...116 Hz, equivalent to 20 pF...350 pF for initial capacitance (bridge 4-5)
Electromagnetic Compatibility	Interference Emission to EN 61326, Electrical Equipment Class B Interference Immunity to EN 61326

Electronic insert in separate housing HTC 17 Z

Housing	cast aluminium
Protection type to DIN 40050	IP 55
Connection to probe	2 m coaxial cable, temperature resistant to +200 °C, in a flexible protection tubing of galvanised steel
Capacitance of the coaxial cable	approx. 50 pF/m
Permissible ambient temperature	max. +100 °C

Supplementary Documentation

- Nivotester FTC 470 Z / 471 Z
Technical Information TI 088F/00/en
- Nivotester FTC 520 Z / 521 Z
Technical Information TI 081F/00/en
- Silometer FMC 671 Z / 676 Z
Technical Information TI 064F/00/en
- Prolevel FMC 661
Technical Information TI 232F/00/en
- Separate housing for electronic insert
Technical Information TI 228F/00/en

Certificates

- Certificate of conformity
PTB No. Ex-93.C.2061 X
ZE 095F/00/a3

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