

Capacitance Limit Detection *Electronic Insert EC 27 Z*

**Transmitter for capacitance probes
Suitable for use in explosion-hazardous areas
(Zone 0)**



Application

The EC 27 Z electronic insert is a transmitter for capacitance limit detection in conjunction with the safety limit switch Nivotester FTC 625.

Features and Benefits

- Total self-monitoring of complete measuring system with an active check pulse, consequently maximum measurement and function reliability to prevent damage to plant and eliminate downtime
- Approval for use in explosion-hazardous areas (Zone 0 for rod or rope)
- Connection to the Nivotester over standard installation cable
- Applicable over a wide temperature range.

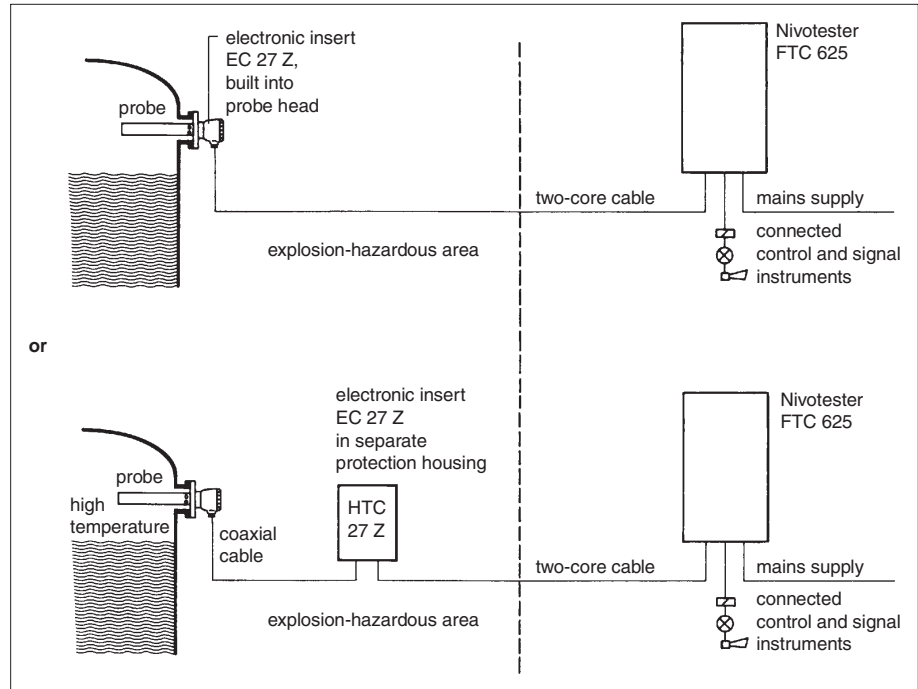
Measuring System

The complete measuring system comprises:

- a limit switch Nivotester FTC 625
- a capacitance probe
- an electronic insert EC 27 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 27 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 27 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 superimposed on the basic current over a two-core cable.

Installation and Electrical Connection

Connect the probe in accordance with the following figures. This will ensure optimum self-monitoring of the measuring system.

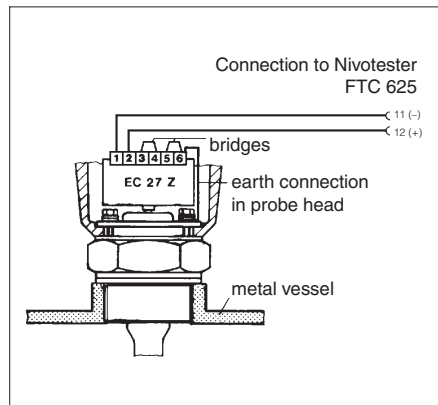
If the electronic insert is used in the protection housing, then the cable to the probe should be as short as possible because the capacitance of the coaxial cable is approx. 50 pF/m.

If the equipment is connected to monitor the probe, then ensure that the metal vessel or the counter electrode has a galvanic connection with the boss of the probe.

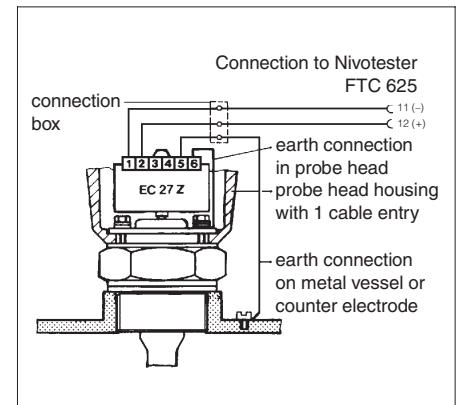
In place of the small round probe head housing with one cable entry, a large

square probe head housing with two cable entries may also be fitted. In this case a separate connection box is no longer necessary.

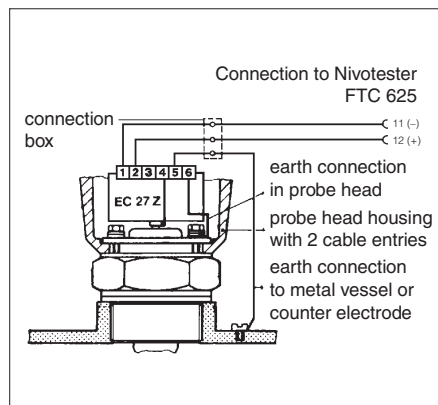
Standard two-core installation cable or two cores of a multi-core cable can be used for connecting the Nivotester, provided nothing else is specified for explosion-hazardous area operation. Screw the housing lid and the cable entries tight to prevent the ingress of moisture into the probe head housing. For the greatest possible accuracy, recalibrate after replacing the electronic insert.



Any sensor with monitoring of the electronic insert and the cable to the Nivotester



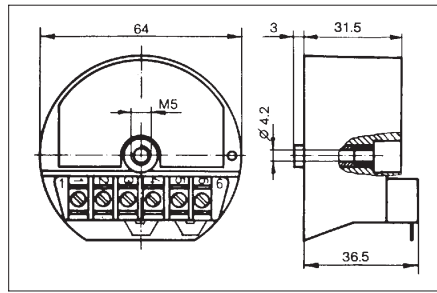
Any sensor with monitoring of the electronic insert, the cable to the Nivotester and the earth connection to the metal vessel or the counter electrode



Any fully insulated sensor with monitoring of the electronic insert, the cable to the Nivotester, the probe insulation and the earth connection to the metal vessel or the counter electrode

Dimensions

Dimensions of the
electronic insert EC 27 Z



Technical Data

Housing	plastic, potted electronics
Identification colour	bright green
Protection type to DIN 40050	electronics IP 55, terminals IP 00
Weight	140 g
Permissible ambient temperature	-20 °C...+85 °C
Storage temperature	-40 °C...+85 °C
Explosion protection type	[EEx ia] IIC T4...T6 (Zone 0 for rod or rope)
Measuring frequency	120 kHz...380 kHz, depending on probe capacitance
Measuring voltage	< 7 V
Supply voltage	10 V...12.5 V, protected against reverse polarity
Supply current	max. 17 mA
Output signal	pulse-shaped, superimposed on the supply current
Pulse frequency	approx. 180 Hz...60 Hz, equivalent to approx. 20 pF...1600 pF

Supplementary Documentation

- Nivotester FTC 470 Z / 471 Z / 625
Technical Information TI 088F/00/en
- Electronic insert in protection
housing HTC 27 Z
Technical Information E 09.82.01
- Separate housing for electronic insert
Technical Information TI 228F/00/en

Certificates

- Certificate of conformity
PTB 98 ATEX 2215 X
CE II 1/2 G, II 2 G
XA 024F/00/a3
- Certificate of conformity
PTB 98 ATEX 2215 X
CE II 1/2 G, II 2 G
XA 080F/00/a3

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