Technical
Information
TI 170F/00/en

Operating Instructions
017190-1000

Capacitance Limit Detection
Electronic Insert EC 16 Z

Transmitter for Multicap DC... probes with active build-up compensation

Application
The electronic insert EC 16 Z is a transmitter mounted in the housing (type E) of Multicap probes which have active build-up compensation and are used for limit detection in liquids tending to cause strong (electrically conductive) build-ups.
Approved for use with probes in explosion-hazardous areas and for using the entire measuring system as an overspill protection system.

Features and Benefits
- constant and accurate switchpoint with active build-up compensation, even with strong build-up on the probe, and without the need for cleaning or calibration correction
- compact design for mounting in the probe
- no on-site adjustment, calibration can be carried out in the control room
- reliable, interference-immune signal using PFM transmission
- high electromagnetic compatibility (EMC)
- high immunity to radio interference (RFI)

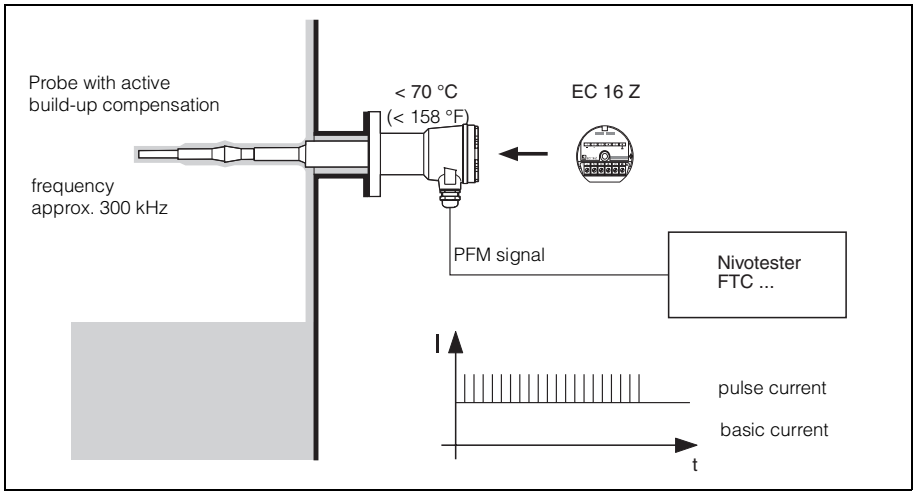
Endress+Hauser
Nothing beats know-how

Measuring System

The complete measuring system consists of:
- the Multicap DC… probe with active build-up compensation in the vessel
- the electronic insert EC 16 Z in the probe housing *
- level limit switch Nivotester FTC in the control room.

* for ambient temperatures above 70 °C (158 °F) or strong radioactive radiation the electronic insert is used in a separate housing HTC 16 Z

The following level limit switches may be connected:
- Nivotester FTC 470 Z, FTC 471 Z
- Nivotester FTC 520 Z, FTC 521 Z
- The limit input of the Silometer FMC 671 Z, FMC 676 Z or of the Prolevel FMC 661.



Measuring system

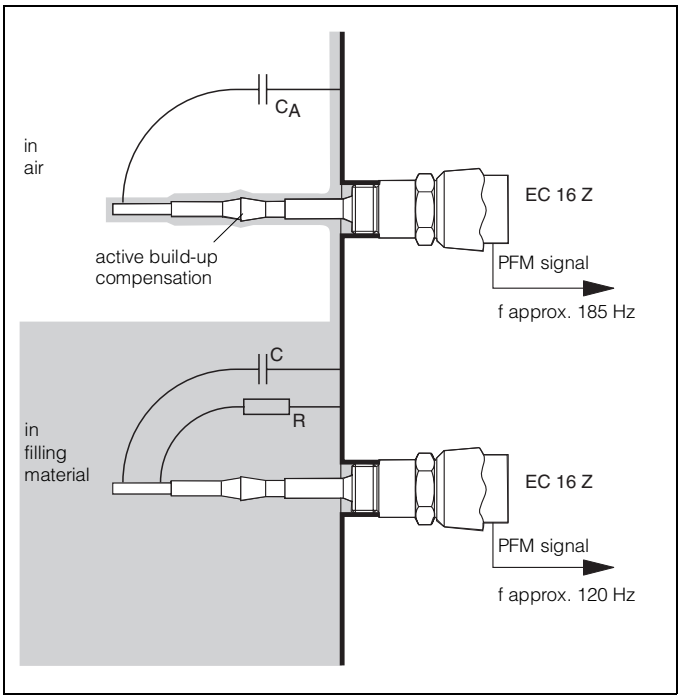
Operating Principle

The probe and vessel wall or counter electrode form a capacitor with a defined capacitance when the probe is in air.
As soon as material covers the probe a parallel circuit is formed consisting of a much larger capacitance and the resistance of the material – the impedance.

This ensures that even with poor conductors any changes in dielectric constant and, therefore, in the capacitance no longer affect the switchpoint.

The Nivotester provides the electronic insert with a low-level intrinsically safe power supply.
The impedance is measured at a high frequency:
The change in impedance between the probe and vessel wall changes the frequency of the oscillator in the electronic insert. When the probe is free, or when the capacitance is low, the oscillator vibrates with a higher frequency than when the probe is covered.
The electronic insert EC 16 Z converts the oscillator frequency into a pulse frequency current which is superimposed on the power supply of the electronic insert.

A Multicap DC… probe, with active build-up compensation and electronic insert EC 16 Z, identifies build-up on the probe and compensates for it to ensure that the switchpoint is always accurately set.



Principle of limit detection with Multicap probes

Certified Applications

All specifications given in certificates and other regulations must be observed as well as all instructions given in this Technical Information.

Planning and Mounting Instructions

The Technical Information on the probe to be used has a graph showing ambient and operating temperatures at which the EC 16 Z electronic insert may be used in the probe housing.
To mount the electronic insert in the probe housing:

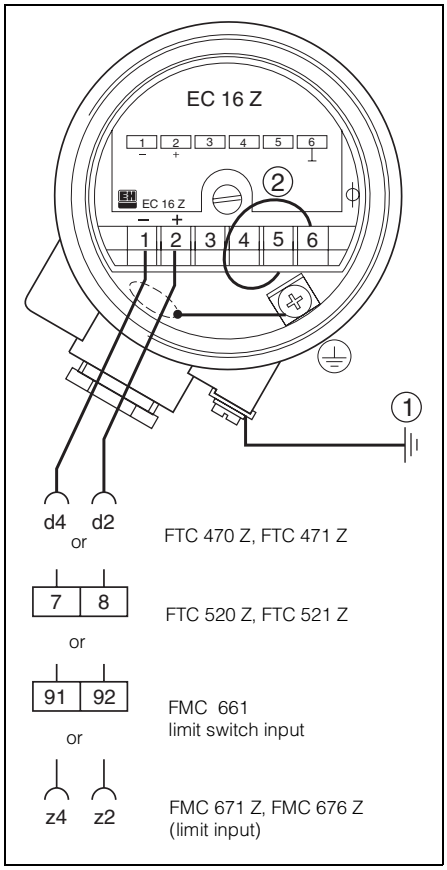
- Plug in the electronic insert
- Tighten the central screw and ensure that the cable gland remains free
- Make sure no water enters the housing during installation.

Electrical Connection

Connecting the electronic insert to the Nivotester

① If the probe is mounted in a vessel with non-conductive walls, then connect the external ground connection on the probe to the counter electrode by means of a short cable.
The ground connection of the plastic housing is connected to the process connection of the probe.
If the probe has a hard rubber threaded boss or if the process connection is insulated from the vessel because of sealing material then a short ground connection should be made between the probe housing and the vessel wall.

② Ground connection from the process connection to Terminal 6 inside the housing.



Screened, unscreened or general purpose multi-core cabling can be used for connecting the Nivotester and probe. Only two cores are required with a max. cable resistance of 25 Ω per core.
If there is the possibility of electromagnetic interference, e.g. from machines or walkie-talkies, then screened cable should be used.
Connect the screening to the ground connection in the probe housing only. Do not connect to the Nivotester.

Using the probe in explosion-hazardous areas:
All regulations covering explosion protection must be observed when laying and connecting intrinsically safe cabling.
Please refer to the certificate of conformity for the Nivotester connected concerning maximum values for capacitance and inductance.

After connecting, ensure that the cover and cable gland of the probe are screwed up tight.

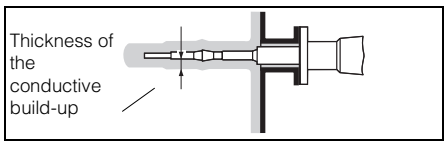
Calibration

When commissioning, calibration is carried out from the Nivotester in the control room.

Recalibration need only be carried out if the electronic insert or a probe with other dimensions is replaced.

Active Build-Up Compensation

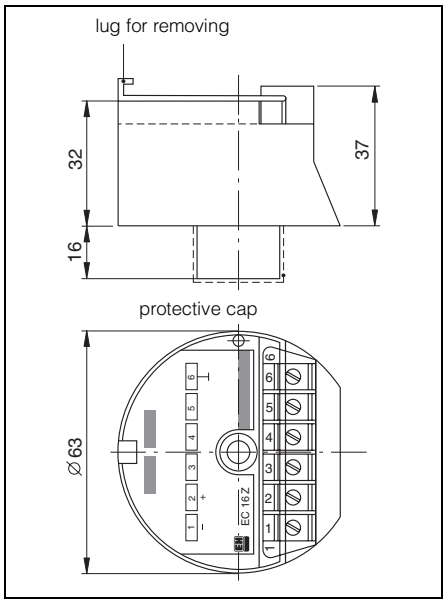
The effect of build-up compensation depends on the thickness of the coating, its conductivity and the switchpoint set on the Nivotester.



Permitted thickness for build-up compensation

		permissible thickness in mm without calibration correction	
Conductivity of the build-up	**Typical material in vessel**	**with normal calibration on the Nivotester, Δ C 5 pF, e.g. for the detection of solvents**	**with insensitive calibration on the Nivotester, Δ C 30 pF, e.g. for detection of conductive materials**
0.2 mS/cm (0,5 mS/1")	water moist bulk solids	approx. 25 mm (1")	> 25 mm (1")
1 mS/cm	wastewater	approx. 7 mm (0.27")	> 25 mm (1")
3 mS/cm	aqueous solutions alcohols	approx. 2 mm (0.08")	approx.17 mm (0.67")
10 mS/cm		approx. 1 mm (0.04")	approx. 7.5 mm (0.3")
100 mS/cm (250 mS/1")	highly concentrated acids, electrolytes	approx. 0.2 mm (0.008")	approx. 2 mm (0.08")

Technical Data



- Housing: plastic, potted electronics
  Colour coding: yellow
  Protection to DIN 40050: electronics IP 55, terminals IP 20
  Weight: approx. 130 g
- Permissible ambient temperature:
  Nominal range of use: 0…+70 °C (32…158 °F)
  Range limits: –20 °C…+85° C (–4…+185 °F)
  Storage temperature: –40…+85 °C (–40…+185 °F)
- Switchpoint drift within the temperature range –20…+70 °C: 2.5 pF
- Operating frequency: approx. 300 kHz
- Capacitance change for empty indication (uncovered probe) 20…350 pF
- Supply voltage from Nivotester: 10.5…12.2 V, protected against reverse polarity
- Basic current: max. 13 mA
- Pulse current for signal transmission: 6 mA, superposed on basic current
  Pulse width: approx. 200 µs
  Transmission frequency: approx. 185…120 Hz, low…high impedance
- Protection against electrostatic discharge: up to 15 kV
- RFI immunity up to 10 V/m (with screened cabling)
- Order number 919220-0000

Electronic insert
EC 16 Z

Dimensions in mm
1" = 25.4 mm

Supplementary Documentation

- ☐ Electronic insert in separate housing HTC 16 Z
  Technical Information TI 171F/00/e
- ☐ Nivotester FTC 470 Z, FTC 471 Z
  Technical Information TI 088/00/en
- ☐ Nivotester FTC 520 Z, FTC 521 Z
  Technical Information TI 081/00/en
- ☐ Silometer FMC 671 Z, FMC 676 Z
  Technical Information TI 064/00/en

Certificates

- ☐ Certificate of conformity (CENELEC)
  Certificate ZE 094F/00/d, e, f
- ☐ Certificate of conformity for application with Multicap probes in explosion-hazardous area,
  Certificate ZE 103F/00/d, e, f
- ☐ DIBt approval certificate conforming to VAWS, §19 WHG (Germany)
  Certificate ZE 098F/00/de
  (in German)

Endress+Hauser
GmbH+Co.
Instruments International
P.O. Box 2222
D-79574 Weil am Rhein
Germany

Tel. (07621) 975-02
Tx 773926
Fax (07621) 975345
http://www.endress.com

Endress+Hauser
Nothing beats know-how

10.97/MTM

TI 170F/00/en/12.96
017190-1000
EHF/CV4.2