

# Capacitance Limit Detection *nivotester FTC 520 Z, FTC 521 Z*

## Capacitance fail-safe level limit switch for liquids and bulk solids



The Nivotester  
FTC 520 Z or FTC 521 Z  
in Minipac assembly  
housing for snap-in  
mounting on a 35 mm  
standard DIN rail

### Features and Benefits

- The intrinsically safe signal circuit allows use with probes also in explosion-hazardous areas
- The Nivotester FTC in compact Minipac row housing
- Ideal for control panel mounting
- Side by side mounting on a 35 mm standard DIN rail
- Easy to wire thanks to pluggable terminal blocks at the front of the row housing
- Switches and calibration potentiometers are situated behind the flip-up front panel and are easily accessible but protected from unauthorised use

### Application

The Nivotester FTC 520 Z, FTC 521 Z is a level limit switch for capacitance limit detection in tanks containing liquids and in silos containing solids.

**Nivotester FTC 520 Z**  
for immediate signalling.

**Nivotester FTC 521 Z**  
with adjustable switching delay.

Endress + Hauser

The Power of Know How



# Measuring System

## Complete Measuring System

The complete measuring system comprises:

- a Nivotester FTC 520 Z or FTC 521 Z
- a capacitance probe matching the application
- an electronic insert EC 17 Z or EC 16 Z, normally mounted in the housing of the probe
- signal and control instruments.

The Nivotester FTC 521 Z with adjustable switching delay is best suited for level limit detection of liquids with turbulent surfaces.

## Measurement and Signal Transmission

The probe and vessel together constitute a capacitor whose capacitance changes with the level of the product.

The electronic insert EC 17 Z or EC 16 Z converts capacitance into current pulses that are superimposed on the supply current on the two-core cabling. This interference-free pulse-frequency-modulation signal is evaluated by the Nivotester FTC 520 Z or FTC 521 Z, and the output relay is actuated.

The wide variety of capacitance probes ensures that the correct probe can be matched with the application.

## Fail-Safe Mode

The fail-safe mode (quiescent current mode) can be selected with a link across connecting terminals.

- Minimum fail-safe mode:  
The relay de-energises when the level falls below the switchpoint (red LED lights), a fault is detected or the power fails.
- Maximum fail-safe mode:  
The relay de-energises when the level rises above the switchpoint (red LED lights), a fault is detected or the power fails.

## Fault Indication

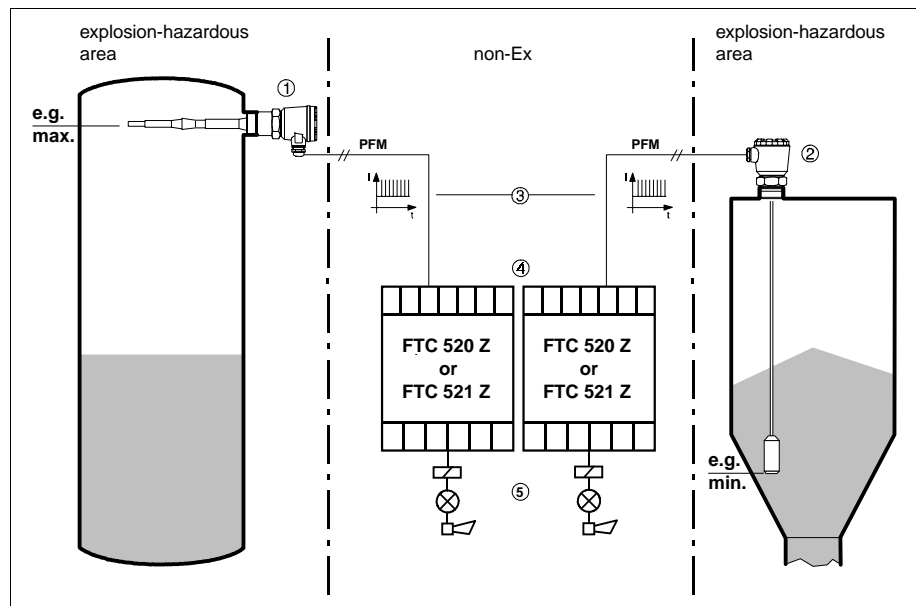
A fault is indicated when the PFM signal fails in the two-core cabling, e. g. short-circuiting, breakage, fault in the electronic insert.

The LEDs on the front panel of the Nivotester FTC indicate:

- standby
- relay de-energised
- fault.

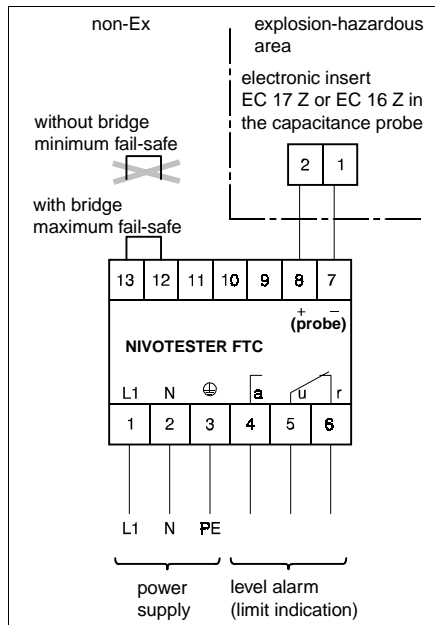
Measuring system for capacitance limit detection in liquids tanks and bulk solids silos

- ① e. g. rod probe with active build-up compensation and electronic insert EC 16 Z
- ② e. g. rope probe with electronic insert EC 17 Z
- ③ interference-free PFM signal transmission over intrinsically safe two-core cable
- ④ Nivotester FTC 520 Z or FTC 521 Z
- ⑤ signalling and control instruments



## Electrical Connection

Electrical connections to the probe, power, signalling and control instruments



### Terminal Block

Cables to the power supply and output relay contacts are connected to the terminal block at the bottom of the instrument, and the intrinsically safe cables from the sensors are connected to the terminal block at the top of the instrument. This ensures a minimum distance is maintained between intrinsically safe and non-intrinsically safe circuits.

### Probe Connection

Connection is via two-core screened installation cable with a maximum resistance of 25  $\Omega$ /core. Regulations governing explosion-hazardous areas must be observed when laying cables.

## Technical Data

### Construction

Housing: row housing (Minipac construction) in plastic  
 Mounting: on standard DIN rail to EN 50022-35x7.5 or EN 50022-35x15  
 Protection type to DIN 40050: housing IP 40, terminals IP 20

### Permissible Ambient Temperatures

Single mounting:  
 -20 °C...+60 °C (0...140 °F)  
 Side by side row mounting:  
 -20 °C...+50 °C (0...120 °F)  
 In protective housing (2 instruments):  
 -20 °C...+40 °C (0...100 °F)  
 Storage temperature:  
 -25 °C...+85 °C (-10 °F...+180 °F)

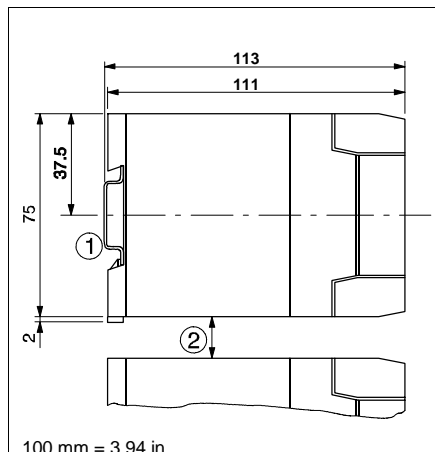
### Input Signals

Signal transmission: PFM  
 Pulse width: approx. 200  $\mu$ s  
 Transmission frequency:  
 185 Hz...116 Hz, equivalent to 20 pF...350 pF probe capacitance  
 Pulse current: approx. 12 mA superimposed on the supply current

### Electromagnetic compatibility

Interference Emission to EN 61326; Electrical Equipment Class B.  
 Interference Immunity to EN 61326.  
 For hints on installation, see TI 241F.

Dimensions in mm of the Nivotester FTC 520 Z, FTC 521 Z in Minipac form  
 Housing width: 50 mm  
 ① Mounting with standard rail 35x7.5 or 35x15  
 ② Ensure that a minimum distance is kept between the top and bottom rows of instruments:  
 For use with probes in explosion-hazardous area min. 50 mm  
 For use with probes in non-hazardous area min. 25 mm



### Output Signals

Relay output: 1 relay with potential-free change-over contact  
 Switch rating: max. 4 A, max. 250 V AC, max. 500 VA at  $\cos \varphi \geq 0.7$   
 Quiescent current fail-safe mode: selectable for minimum or maximum  
 Switching delay with FTC 521 Z: adjustable approx. 0.5 s...30 s  
 Function indication: 3 LEDs on the front panel for operation, fault, level alarm

### Electrical Connection

Terminals: removable terminal blocks, non-interchangeable, 6-pole, 7-pole  
 Max. terminal diameter:  
 1  $\times$  0.5 mm<sup>2</sup> to 1  $\times$  2.5 mm<sup>2</sup> or  
 2  $\times$  0.5 mm<sup>2</sup> to 2  $\times$  1.5 mm<sup>2</sup>  
 Power supply AC:  
 127 V, 115 V, 110 V,  
 48 V, 42 V, 24 V,  
 all with +15%, -10%, 50/60 Hz  
 230 V, +10%, -15%, 50/60 Hz  
 100 V,  $\pm$ 10%, 50/60 Hz  
 Power consumption: max. 3.5 W (4.4 VA)  
 Sensors: probes with electronic inserts EC 17 Z, EC 16 Z  
 Cable to probe: 2-core, max. 25  $\Omega$ /core

### Power Supply to the Transmitter (EC 17 Z, EC 16 Z)

Explosion protection type: [Ex ia] IIC  
 Voltage: 10.5 V...12.2 V  
 Operating current: max. 12 mA  
 Short circuit current: max. 60 mA  
 Short circuit time: unlimited

### Certificates

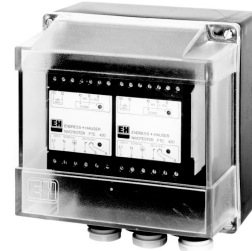
Nivotester FTC 520 Z, FTC 521 Z  
 EC-Type-examination certificate  
 TÜV 01 ATEX 1682

# Supplementary Documentation

- System Components Minipac Technical Information TI 009F/00/en
- Electronic Insert EC 17 Z Technical Information TI 268F/00/en
- Technical Informations on capacitance probes for limit detection
- Electronic Insert EC 16 Z Technical Information TI 170F/00/en

# Ordering Information

- Product designation (see product structure below)
- Probe version, probe length
- Electronic insert EC 17 Z or EC 16 Z
- Accessories



Plastic protective housing for Minipac instruments. Protection type IP 55.

**FTC 520 Z Nivotester**  
**FTC 521 Z Nivotester with switching delay**

**Certificates**

- A ATEX II (1) GD [EEx ia] IIC
- Y Special version

**Version**

- 0 MINIPAC housing, with terminal block
- 1 MINIPAC housing, for flat plug
- 2 Weather proof MINIPAC, with terminal block
- 3 Weather proof MINIPAC, for flat plug
- 9 Special version

**Power supply**

- A Power supply 230 V, AC
- B Power supply 110 V, AC
- C Power supply 48 V, AC
- D Power supply 24 V, AC
- F Power supply 115 V, AC
- G Power supply 127 V, AC
- K Power supply 42 V, AC
- L Power supply 100 V, AC
- Y Special version

**Switch output**

- 0 1 relay, volt free SPDT
- 9 Special version

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Product designation

Product structure

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