

Conductive Limit Detection

nivotester FTW 470 Z, FTW 570 Z

**Limit detection and two-point control
in tanks containing liquids**
Suitable for use in hazardous area Zone 0



Two-channel limit switch
Nivotester FTW 470 Z
or FTW 570 Z. Two
galvanically isolated
limit switches on one
RACKSYST plug-in card

Features and Benefits

- Two-channel limit switch for minimum and maximum limit detection and overspill protection
- Two-point control within a level range
- Monitoring the conductivity of liquids
- Installation of probes in all electrically conductive liquids in hazardous area Zone 0 and as an overspill protection (Germany WHG, VbF)
- No electrolytic action between the probes and the product.

Application

The probe and the electrically conductive vessel wall or a ground probe act as two electrodes. As soon as electrically conductive material touches the probe, a weak alternating current is generated. It actuates the relay in the Nivotester via an amplification circuit. A red LED indicates the switching status of the relay.

Fail-Safe Mode

For overspill protection in **maximum** fail-safe mode, the relay de-energises

- when the maximum probe is covered
- on short-circuit faults
- on cable breakage
(with separate electronics for cable monitoring in the probe only).
- on power failure

For **minimum** fail-safe mode the relay de-energises

- when the minimum probe is uncovered
- on power failure

For **two-point control** the Nivotester switches with a hysteresis determined by length of the min. and max. probes.

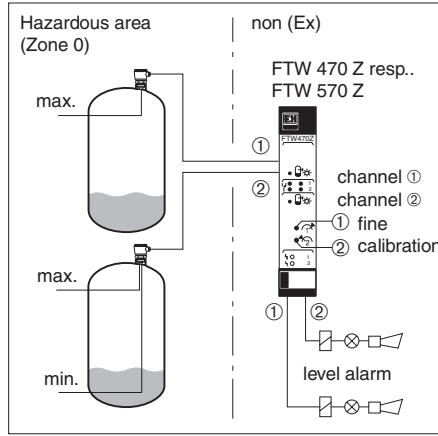
Indication

LEDs on the front panel of the Nivotester indicate for each limit switch:

- Probe covered or uncovered
- Relay energised or de-energised
- Fault alarm on cable breakage

Measuring System

Nivotester FTW 470 Z resp. FTW 570 Z for two independent limit detections or for two independent two-point controls



FTW 470 Z:

With a calibration range of 1 kΩ...50 kΩ. For standard applications with little build-up.

FTW 570 Z:

With a calibration range of 100 Ω...50 kΩ. For side-mounted probe or substantial build-up on the probe insulation.

Two probes are recommended for limit detection with turbulent liquid surface (two-point detection).

Electrical Connection

The Nivotester FTW 470 Z or FTW 570 Z must be installed outside the hazardous area. The appropriate connector to DIN 41 612, Form F, is partly pinned. Creep and air gaps conform to regulations concerning hazardous areas. It is already fitted with coding pins to ensure that only the Nivotester FTW 470 Z or FTW 570 Z can be inserted.

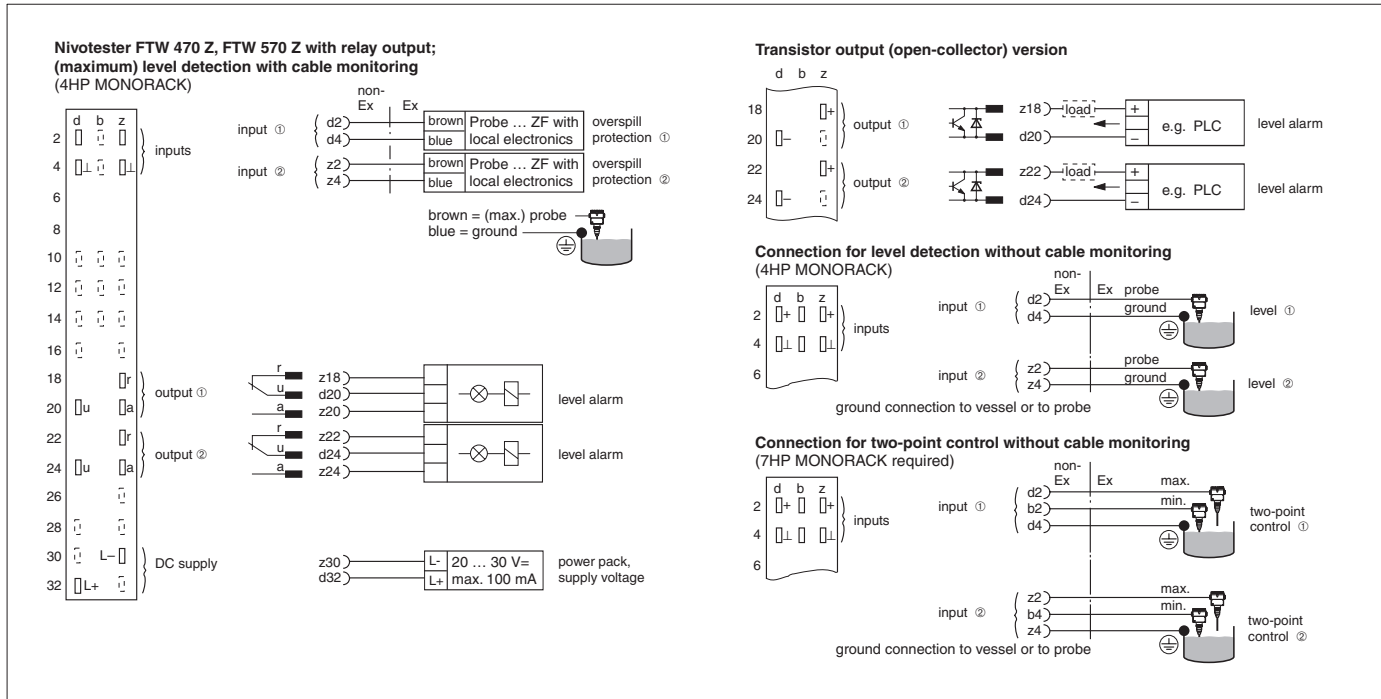
Probe

Standard screened installation cable can be used for the signal input cables connecting the probes. Two-point control requires three wires, limit detection two. Ground the screening at both ends. If this is not possible, then at the probe end only. Always observe the specifications on the certificate!

Maximum values for cable resistance R_L , cable capacitance C_L and cable length L , depend on the calibration value R_M :

$R_M < 500 \Omega$, R_L max. 12 Ω /core
 $R_M > 500 \Omega$, R_L max. 25 Ω /core
 $R_M < 25 \text{ k}\Omega$, C_L max. 50 nF,
 L max. 500 m with cable monitoring
 $R_M > 25 \text{ k}\Omega$, C_L max. 20 nF,
 L max. 200 m with cable monitoring

See PTB certification (certificate of conformity) for capacitance values concerning hazardous areas.



Technical Data

General Specifications

Manufacturer	Endress+Hauser
Designation	Nivotester FTW 470 Z, FTW 570 Z
Function	Level limit switch for electrically conductive liquids
Scope of delivery	Nivotester FTW 470 Z, FTW 570 Z

Input

Signal inputs	Two channels, intrinsically safe [EEx ia] IIC, galvanically isolated from each other and from the voltage supply
Measuring signal	Alternating current, approx. 70 μ A ... 1 mA, Frequency: approx. 50 Hz; Voltage: approx. 0.1 V ... 3.5 V
Calibration range	FTW 470 Z: approx. 1 k Ω ... 50 k Ω (standard type) FTW 570 Z: approx. 100 Ω ... 50 k Ω (in event of build-up on the probe insulation)
Calibration elements	Switches for 2 or 3 ranges on the card, potentiometers for fine calibration on front panel
Probe connection	2-core screened cable for level detection 3-core screened cable for two-point control

Output

Relay	
Output	1 relay with potential-free changeover contact per switch
Switching capacity	AC: max. 2.5 A, max. 250 V, max. 300 VA at $\cos \varphi > 0.7$, DC: max. 2.5 A, max. 100 V, max. 90 W
Switching delay	< 1 s
Function display	3 LEDs per switch on front panel
Fault indication (cable break)	1 LED per switch on front panel
Switching hysteresis	Approx. 4 % of calibrated resistance or determined by difference in length between max. and min. probes
Quiescent current – fail-safe mode	Selectable for min. or max.
Temperature coefficient of switch sensitivity	0.05 %/K typical

Transistor	
Output	One open collector output per level switch, galvanically isolated by optocoupler
Switching capacity	Max. 35 V, max. 100 mA, max. 1 W, max. 0.5 H, max 0.5 A (10 ms)
Blocking operation	Residual current max. 50 μ A, residual voltage max. 1.3 V (at 50 mA)

Power supply

DC voltage	20 V ... 30 V
Superimposed AC voltage	Max. 2 V _{pp} (within tolerance)
DC current	approx. 90 mA, max. 100 mA
Connection	Pinned connection conforming to DIN 41 612, part 3, Form F (30 pole) Format encoding pins in strip: for relay output at terminals 1 and 19 for transistor output at terminals 1 und 20

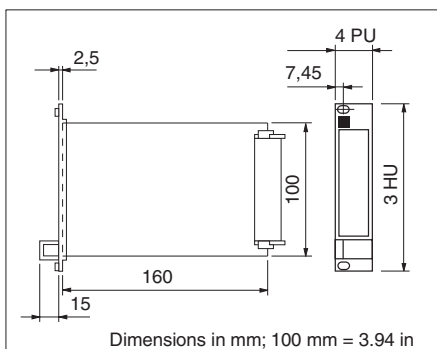
Operating conditions

Temperature ratings	Storage: -20 °C ... +85 °C (0 ... 185 °F) Operation: 0 °C ... +70 °C (30 ... 160 °F)
Ingress protection	Plug-in card: IP 00, DIN 40 050 Front panel: IP 20, DIN 40 050 Field housing: IP 65, DIN 40 050
Electromagnetic compatibility	Interference Emission to EN 61326; Electrical Equipment Class B Interference Immunity to EN 61326 For general references to electromagnetic compatibility see TI 241 F/00/en

Mechanical construction

Housing	RACKSYST plug-in card, conforming to DIN 41 494 (Eurocard format) black synthetic with blue field inlay, handle and label area, Weight: approx. 0.18 kg
Mounting	In 19" assembly rack, field housing or MONORACK housing

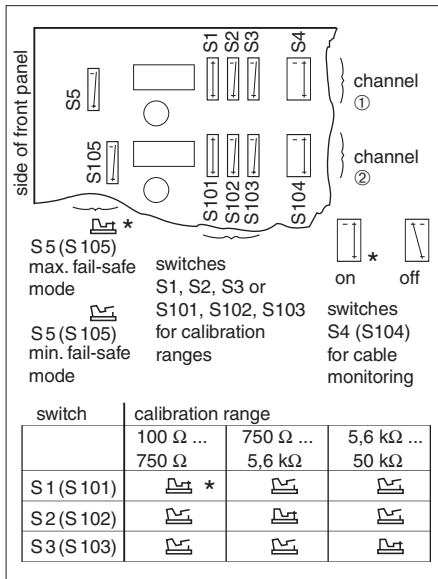
Product Structure



Nivotester FTW 470 Z, FTW 570 Z	
Certificate, Approval	
A	ATEX II (1) GD [EEx ia] IIC, WHG (Germany)
X	ATEX II (1) GD [EEx ia] IIC, GL
Y	Special version
Version	
0	RACKSYST plug-in card, 4 PU
9	Special version
Power supply	
E	Power supply 20...30 V DC
Y	Special version
Switch output	
0	Output: potential-free SPDT contacts
3	Output: 1 open collector
9	Special version
FTW ... Z -	Product designation

Operating Instructions

Set the switches



Set the switches on the circuit board, separately for the two channels.

1. Select minimum or maximum fail-safe mode with switch S 5 or S 105.
2. Switch cable monitoring system on or off with switch S 4 or S 104. The switch must be turned off if the probe does not have integrated electronics. The Nivotester will continue to indicate a fault if this is not set correctly.
3. Select correct calibration range. Switch position is determined by application. This is demonstrated by the following examples. Select another range if the Nivotester does not switch with fine calibration adjustment. It is essential with calibration that the Nivotester can clearly distinguish between 2 resistivity values:

Fig. 1: Set the switches.
Switches S 1 / S 101 are not available on the FTW 470 Z

* preset at factory.

the lower value when the probe is covered, or the higher value when the probe is uncovered but the insulation is still wet. Recommendations for switch positions:

- Max. level detection (overspill protection) in high conductivity materials, the probe may be mounted horizontally or vertically:
FTW 570 Z: S 1 (S 101) closed, other switches open.
FTW 470 Z: S 2 (S 102) closed, S 3 (S 103) open.
- For level detection in materials with low conductivity, the probe should be mounted vertically:
S 3 (S 103) closed, other switches open.
- Monitoring the conductivity of a liquid for changes in concentration:
identify switch position during calibration.

Calibration

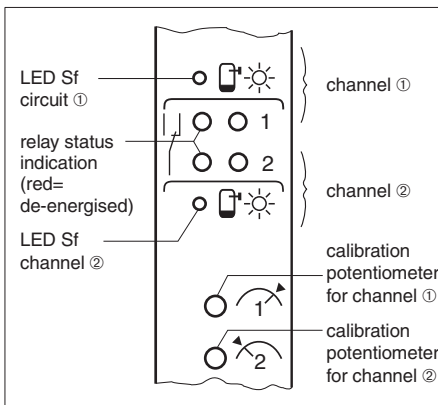


Fig. 2: Calibration.
After calibration the small green LED Sf lights up to show that the probe is not covered by material (Sf = Sensor free).

Calibration for the two channels must be separate. The adjustments for fine calibration are 20-turn potentiometers. A mechanical "stop" does not exist.

1. Calibration for level detection and two-point control:
 - Fill vessel to the required switch point (probe covered).
 - Turn the calibration potentiometer a maximum of 20 turns counterclockwise.
 - If the LED Sf goes out, then no further adjustment is necessary.
 - If the LED Sf is still lit, then turn the calibration potentiometer clockwise until the LED Sf goes out.
 - Turn the calibration potentiometer a further 1 to 3 turns clockwise (less if substantial build-up on the probe insulation is expected; more if large conductivity changes are expected).
 - If no calibration is possible, then select the next calibration range using the switch on the circuit board.

2. Calibration for monitoring concentration changes in liquids:

2.1 Calibration when material has reached the upper conductivity limit (lowest resistance):

- Select max. fail-safe mode.
- **Slowly** turn the calibration potentiometer clockwise until the LED Sf goes out.

or

2.2 Calibration when material has reached the lower conductivity limit (highest resistance):

- Select min. fail-safe mode.
- **Slowly** turn the calibration potentiometer counterclockwise until the LED Sf lights up.

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