

Level Limit Switch *nivotester FTL 320*

**With an intrinsically safe signal circuit
for connection to sensors
Liquiphant, Nivopuls, Soliphant**



Features and Benefits

- Intrinsically safe signal circuits [EEx ia] for problem-free use of sensors in explosion hazardous areas
- High functional safety with:
 - interference-immune PFM signal transmission
 - cable monitoring right up to the sensor
 - monitoring for corrosion at the vibrating fork of the Liquiphant sensor
- Compact Minipac housing for simple row mounting on a standard rail in the control cabinet
- Simple wiring using plug-in terminal blocks

Applications

- Limit detection of fluids and bulk solids in tanks and silos; suitable for applications in explosion hazardous areas Zone 0 and Zone 10
- Liquid detection in pipes for dry run protection of pumps
- Overspill protection of tanks containing flammable or non-flammable water-polluting liquids

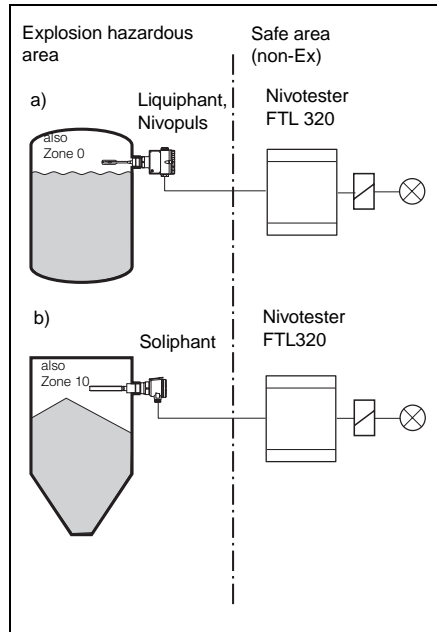
Endress + Hauser

The Power of Know How



Measuring System

- a)
Limit detection in a tank containing liquid with one Liquiphant FDL 30, FDL 31, FDL 35, FDL 36, DL 17 Z or Nivopuls FDU 10 C, FDU 10 S sensor
- b)
Limit detection in a silo containing bulk solids with one Soliphant DM 90 Z, DM 91 Z, DM 92 Z, FTM 30 S, FTM 31 S, FTM 32 S sensor



The measuring system consists of:

- the Liquiphant, Nivopuls or Soliphant sensor
- the Nivotester FTL 320
- control or signalling systems

Operating Principle

The Nivotester FTL 320 is a limit switch for single measuring points.

Signal Transmission

The intrinsically safe input of the Nivotester FTL 320 limit switch is electrically isolated from both the power supply and the output. The Nivotester supplies DC power to the Liquiphant, Nivopuls or Soliphant sensor via a two-wire cable and receives a frequency indicating whether the sensor is covered (approx. 50 Hz) or free (approx. 150 Hz). The sensor signal is a pulsed current of approx. 10 mA with width approx. 200 μs which is superimposed on the power supply.

Signal Evaluation

The Nivotester evaluates the frequency and activates the relay of the level alarm output. The switching mode of the relay is indicated by a light emitting diode (LED) on the front panel of the Nivotester.

Fail-Safe Mode

By correct selection of the fail-safe, the relay always operates in a quiescent current mode. **Minimum fail-safe:** The relay de-energises when the level falls below the switchpoint (sensor uncovered), when a fault occurs or when the power fails. **Maximum fail-safe:** The relay de-energises when the level rises above the switchpoint (sensor covered), when a fault occurs or when the power fails.

Function Monitoring

The Nivotester has a function monitoring system to increase operational safety. A fault is indicated by an LED and the relay also de-energises. A fault is indicated if the Nivotester no longer receives an input signal, e.g. on short-circuiting or breakage of the sensor signal cable, corrosion of the Liquiphant fork, defective sensor electronics or input circuit of the Nivotester. Function monitoring can be checked at the terminals of the signal cable.

Level		
Signal transmission	↑ approx. 150 Hz PFM signal base current	↑ approx. 50 Hz PFM signal base current
Maximum fail-safe mode with jumper	 4 5 6 ● green ● red	 4 5 6 ● green ● red
Minimum fail-safe mode no jumper	 4 5 6 ● green ● red	 4 5 6 ● green ● red
Fault	 4 5 6 ● green ● red ● red	 4 5 6 ● green ● red ● red

Limit detection as a function of level and fail-safe mode.

Design and Installation



Above:
Row mounting
on standard rail



Below:
Two Nivotesters in one
protective housing

The Nivotester FTL 320 limit switch must be installed in a control cabinet outside the explosion hazardous area. The Minipac transmitters are designed for single or row mounting on a standard EN 50022-35x7.5 or EN 50022-35x15 symmetrical rail. Note the permissible ambient temperatures and the minimum distance allowed between rows of instruments (see Technical Data).

A protective housing (IP 55) is available for two Nivotester transmitters mounted in the open. Please refer to the section »Supplementary Documentation«.

Electrical Connection

For easy wiring, the removable terminal blocks are separated according to whether they are intrinsically safe connections (upper) or non-intrinsically safe connections (lower). Diameter max. 1 x 2.5 mm² or 2 x 1.5 mm².

Connecting the Sensor

(to the upper terminal block.)
The two-core connection cable between the Nivotester FTL 320 and the Liquiphant, Nivopuls or Soliphant sensor can be common, unscreened installation cable or two cores of a multicore cable. Cable resistance max. 25 Ω per core.

The cable should be screened if it is to be laid in areas with strong electromagnetic interference, e.g. caused by machines or walkie-talkies. Connect the screening to the ground connection in the sensor only. Do not connect it to the Nivotester.

Explosion Hazardous Areas:

Please observe all local regulations on explosion protection concerning the type and installation of intrinsically safe signal cabling. Please refer to the certificate of conformity for maximum permissible values of capacitance and inductance.

Connecting the Signal and Control Systems

(to the lower terminal block.)
Note relay function with regard to level and fail-safe mode. If an instrument with a high inductance is connected (e.g. contactor, magnetic valve, etc.), then a spark arrester must be provided to protect the relay contact.

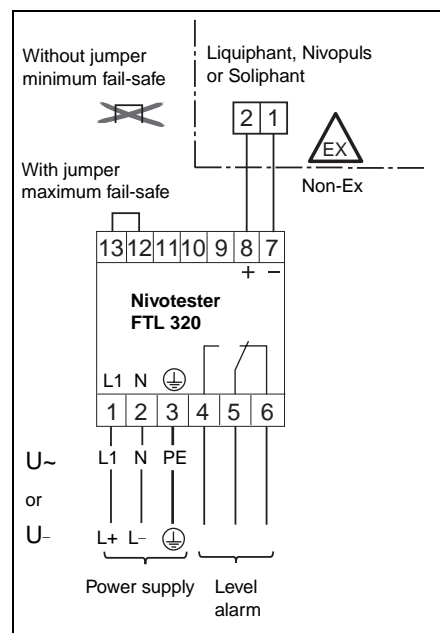
Connecting the Power Supply

(to the lower terminal block.)
See Product Structure on Page 5. A fine-wire fuse is not required as there is a fuse in the power supply circuit. The DC version of the Nivotester has protection against reverse polarity.

Connecting the limit switch
Nivotester FTL 320

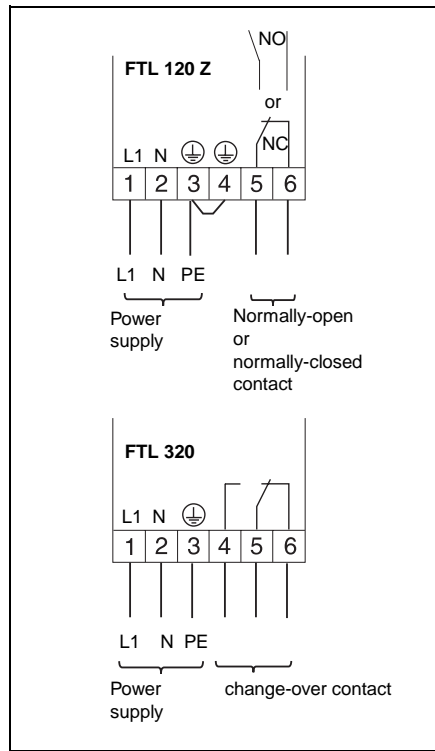
Terminal 3 must be connected to the protection ground PE or to the potential compensating cable

Select the **fail-safe mode** by inserting or removing the jumper at terminals 12 and 13.



Replacing the Instrument

The wiring of the lower terminal block must be modified.



Replacing the Previous FTL 120 Z Version with the Latest Nivotester FTL 320

Please note:

The signal cable connection, fail-safe mode and the power supply connection are identical on both instruments.

The jumper between terminals 3 and 4 must be removed.

The relay contact between terminals 5 and 6 on the FTL 120 Z can be connected as an NO or an NC contact. With the FTL 320, this part of the change-over contact performs as a normally closed contact. (Quiescent current fail-safe mode: this contact is closed in cases of level alarm and fault.) Change the wiring if necessary!

Please also note the information given in the approval certificates.

Technical Data

Construction

- Housing: row housing (Minipac) in plastic
- Mounting: on standard rail to EN 50022-35x7.5 or EN 50022-35x15
- Protection to DIN 40050: Housing IP 40, terminals IP 20
- Weight: 320 g

Operating Data

- Permissible ambient temperatures
 - single mounting:*
 - Nominal operating range: 0 ... +60°C
 - Limits of operating range: -20°C ... +60°C (0 ... 140°F)
 - with row mounting without side spacing:*
 - Nominal operating range: 0 ... +50°C
 - Limits of operating range: -20°C ... +50°C (0 ... 120°F)
 - mounted in protective housing (2 units):*
 - Nominal operating range: 0 ... +40°C
 - Limit of operating range: -20°C ... +40°C (0 ... 100°F)
 - Storage: -25°C ... +85°C
- Climatic operating class to DIN 40040: K U E
 - Temperature range: 0 ... +70 °C (30 ... 160°F)
 - relative air humidity:
 - annual mean max. 75 %
 - for 30 days continuously in the year max. 95 %
 - for other days occasionally 85 %
 - infrequent and light dew

Power supply

AC version:

- Voltage ranges see Product Structure
- Power consumption max. 3 W

DC version:

- Voltage range: 20 ... 30 V
- Permissible residual ripple within tolerance: $U_{pp} = 2$ V
- Current consumption: max. 56 mA
- Power consumption : max. 1.7 W

Integrated fine-wire fuse (with protection against reverse polarity)

Signal Input

- Input FTL 320: electrically isolated from power supply and output
- Spark protection: intrinsically safe [EEx ia] IIC
- Sensors:
 - Liquiphant DL 17 Z, FDL 30, FDL 31, FDL 35, FDL 36,
 - Nivopuls FDU 10 C, FDU 10 S,
 - Soliphant DM 90 Z, DM 91 Z, DM 92 Z,
 - FTM 30 S, FTM 31 S, FTM 32 S
- Power supply to sensor: supplied by the Nivotester FTL 320
- Connecting cable: two-core, screening not required,
- Cable resistance: max. 25 Ω per core
- Signal transmission: Pulse Frequency Modulation (PFM)

See approval certificates for further specifications.

CE Mark

The Nivotester FTL 320 fulfils the legal requirements of the EC guidelines. By issuing the CE mark, Endress + Hauser confirm that the device has been successfully tested.

Electromagnetic compatibility: Immunity to EN 50 082-2 and industrial standard NUMUR, at a field strength of 10 V/m. Emission to EN 50 081-1.

For general information on electromagnetic compatibility (test methods, installation hints) see TI 241F/00/e.

Output

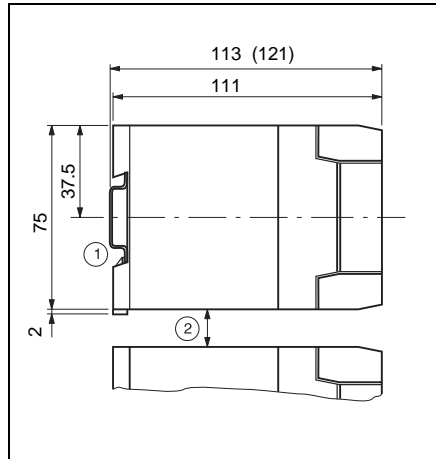
- Relay output: one potential-free change-over contact for level alarm
- Quiescent current fail-safe mode: Minimum/maximum fail-safe mode, selectable by jumper on the terminal block
- Switching delay: approx. 0.5 s

- Switching capacity of relay contacts:
 - U~ max. 250 V
 - I~ max. 6 A
 - P~ max. 1500 VA at $\cos \varphi = 1$
 - P~ max. 750 VA at $\cos \varphi \geq 0.7$
 - U- max. 250 V
 - I- max. 6 A
 - P- max. 200 W
- Operating life: min. 10^5 switchings with max. contact load
- Function indicators: three LEDs for operation, level alarm and fault

Dimensions

Dimensions in mm of the Nivotester FTL 320 in Minipac format.
Housing width: 50 mm.

100 mm = 3.94 in
 1 in = 25.4 mm

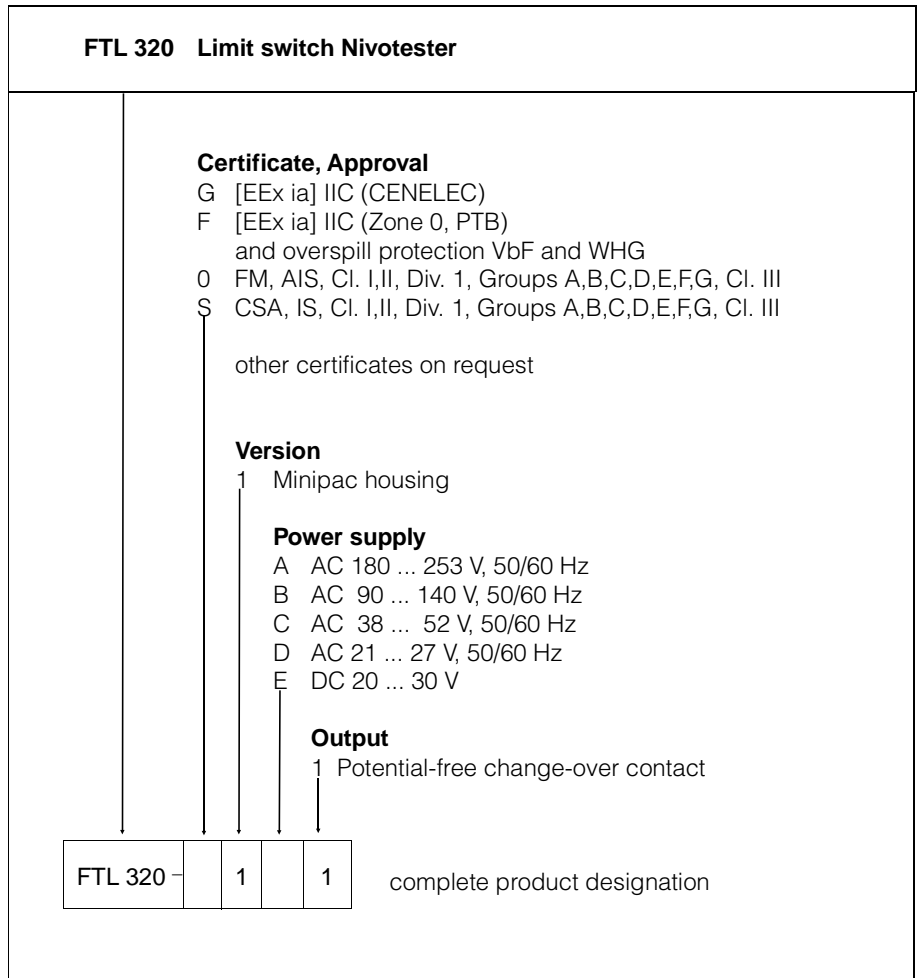


Mounting

See diagram on left.

- ① Row mounting on standard rail 35 mm x 7.5 mm (or 35x15)
- ② Minimum spacing between next row of instruments above and below: min. 50 mm (2 in) when sensor used in explosion-hazardous area, min. 25 mm (1 in) when used otherwise.

Product Structure



How to Order

Nivotester FTL 320

Product designation as per Product Structure, other versions defined as required

Accessories

Refer to the particular technical documentation for ordering accessories.

Mounting accessories

as required:

- protective housing
- standard rail

Sensors:

- Liquiphant for liquids
- Nivopuls for Liquids
- Soliphant for bulk solids

Supplementary Documentation

Sensors

- Liquiphant II
FDL 30, FDL 31, FDL 35, FDL 36
Sensors for limit detection in liquids
TI 185F/00/en
- Nivopuls FDU 10 C
Sensor for limit detection in liquids
TI 248F/00/en
- Nivopuls FDU 10 S
Sensor for limit detection in liquids
TI 275F/00/en
- Soliphant
FTM 30 S, FTM 31 S, FTM 32 S
Sensors for
limit detection in bulk solids
TI 249F/00/en

Mounting

- Mounting accessories for Minipac instruments
(protective housing, standard rail)
TI 009F/00/en

Certificates

- Certificate of Conformity
PTB No. 94.C.2025 X
Certificate ZE 107F/00/d,e,f/06.94

Other Certificates on request

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

Tel. (0 76 21) 975-02
Tx 773926
Fax (0 76 21) 975-345
<http://www.endress.com>
info@ii.endress.com

Endress+Hauser

The Power of Know How

