Level Limit Switch nivector FTC 968, FTC 968 Z

Compact capacitance limit switch for powders and fine-grained solids

























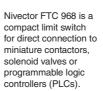
Application

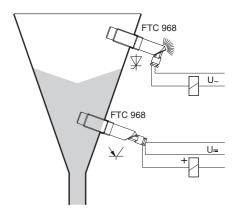
Nivector is a compact level limit switch for use in silos containing free-flowing powders or fine-grained solids (max. particle size 10 mm). Its construction and materials make it suitable for use with foodstuffs. The version Nivector FTC 968 **Z** is designed for use in dust-explosion hazardous areas.

Typical applications: plastic granules, detergent, grain, sugar, spices, semolina, animal feed.

Features and Benefits

- No calibration: quick and economical commissioning
- No mechanical moving parts: no wear, long operational life
- High immunity to electromagnetic interference and voltage peaks: reliable operation
- Switching status visible from outside the vessel: simple control
- Wettet parts of the build-in adapter "Protector": FDA listed material (according to 21 CFR 177.1660)
 - Level limit switch protection: function test also with filled silo possible.





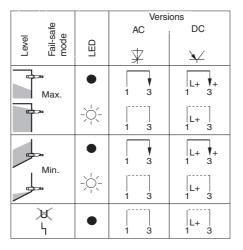


Operating Principle

The electronic switch and the LEDs operate according to the level and the fail-safe mode selected.

The electronic switch blocks:

- on reaching the limit,
- on a fault and
- on power failure



The face of the Nivector acts as a sensor. When medium comes into contact with it, the electronics change the switching status. The Nivector can be switched to either min. or max. fail-safe mode, ensuring quiesent current operation in all applications. A LED indicates its switching status.

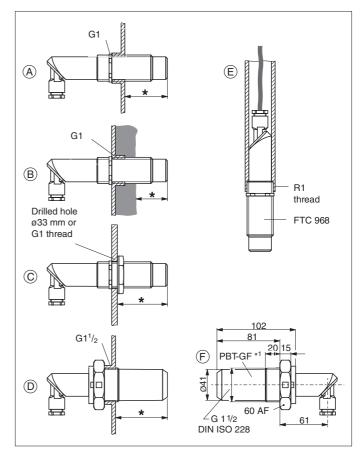
A screened electrode protects the sensor from interference from the vessel wall or from the effects of lateral material build-up.

Mounting

Nivector FTC 968 may be installed and positioned in any orienation in a bulk solids silo

★ min. 20 mm

- A Standard mounting with external G 1 thread adapter
- B Where build-up occurs on the silo wall with internal G 1 thread adapter
- C Without thread adapter but with drilled hole or threaded directly in the silo wall or a flange
- D With "Protector" *1 for G 1½ thread adapter; outflow protection sleeve for function testing when the silo is full.
 Protection of the limit switch against damage by particularly abrasive or coarse product.
- E In extension tube for mounting from above (not with FTC 968 **Z**)
- F Dimensions of the "Protector" *1 (accessory)
- *1 in conformity with FDA



Electrical Connection

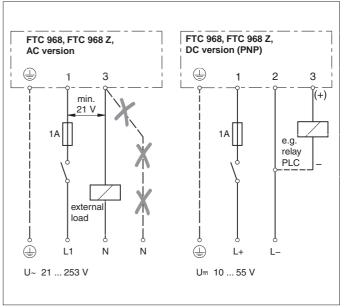
Two-wire AC version Always connect a load in series!

Take account of the voltage drop across the electronics when connected (max. 12 V), the quiescent current when blocked (max. 4 mA) as well as the voltage drop across the load at low voltages. This ensures that the voltage across the Nivector does not fall below the minimum value of 21 V.

Three-wire DC version Preferred for

programmable logic controllers (PLCs). Positive signal at the switching output of the electronics (PNP).

A ground connection is required only for the FTC 968 **Z**The Nivector FTC 968 has double isolation



Technical Data

General specifications

Manufacturer	Endress+Hauser GmbH+Co.		
Designation	Nivector FTC 968, FTC 968 Z		
Function	Level limit switch		

Application

Limit detection Maximum or minimum detection in silos filled with powders and fine-grained solids, especially with limited space for mounting

Function and system design

Measuring principle	Capacitance Evaluation of the different dielectric constants of air and the bulk solid; convertion of them into an electronic switching output signal
Modularity	Compact limit switch with the sensor part projecting into the silo
Signal processing	- Two-wire AC version: Load switching via thyristor directly into the power circuit; - Three-wire DC version: Load switching via transistor and separate connection

Input

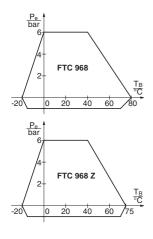
Measured variable	Level (limit, binary)
Measuring range (detection range)	Determined by mounting point in silo

Output

Output signal	Binary; output blocked when limit reached	
Signal on alarm	Output blocked	
Load (connectable) with AC version (load switching via thyristor directly into the power circuit)	Transient (40 ms) max. 1.5 A, max. 375 VA at 253 V or max. 31,5 VA at 21 V (not short-circuit resistant) continuous max. 87 VA at 253 V (max. 250 V with FTC 968 Z), max. 7.4 VA at 21 V min. 2.5 VA at 253 V (10 mA), min. 0.5 VA at 21 V (20 mA) Voltage drop max. 12 V Quiescent current max. 4 mA with blocked thyristor	
Load (connectable) for DC version (load switched via transistor and separate PNP connection)	Transient (50 ms) max. 0,5 A, max. 55 V (Resistant to cyclical overload and short-circuit); continuous max. 350 mA; max. 0.5 μF at 55 V, max. 1.0 μF at 24 V; Quiescent voltage < 3 V (with connected transistor); Quiescent current < 100 μA (with blocked transistor)	
Fail-safe mode	Minimum or maximum quiescent current, switchable	
Switching time	Approx. 0.2 s when covered or uncovered	

Operating conditions

Installation



Installation	Any orientation; end face min. 20 mm projecting into silo Silo wall thickness max. 35 mm or G 1 threaded adapter max. 50 mm in length
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Environment

Ambient temperature	−20 °C +60 °C
Limiting temperature range	−20 °C +60 °C
Storage temperature range	−25 °C +85 °C
Ingress protection	FTC 968 : IP 65 / IP 67 to EN 60529 FTC 968 Z: IP 65
Electromagnetic compatibility	Interference Emission to EN 61326, Electrical Equipment Class B Interference Immunity to EN 61326

Permissible values for operating pressure p_e in silo are dependent on the operating temperature T_B in the silo 1 bar = 14.5 psi $x^{\circ}C = (1.8x + 32)^{\circ}F$

Medium

Medium temperature	FTC 968: -20 °C +80 °C, see also Fig. left FTC 968 Z: -20 °C +75 °C, see also Fig. left
Limiting medium temperature	FTC 968: -40 °C +80 °C FTC 968 Z: -20 °C +75 °C
Medium pressure p _e	−1 bar +6 bar, see also Fig. left
Limiting medium pressure	10 bar at 20 °C (test pressure)
Particle size	Max. 10 mm
Relative dielectric constant ϵ_{r} of product	Min. 1.6

Mechanical construction

Design	Dimensions shown in dimensional sketches overleaf	
Weight	FTC 968: 0.14 kg, FTC 968 Z: 0.25 kg	
Material of wetted parts	FTC 968: Housing in blue PC, locking nuts in black PA FTC 968 Z: Housing in white ECTFE, threaded sleeve in nickel-plated brass, locking nuts in black PA	
Other materials	Connection area: in transparent PC	

Mechanical construction (continued)

Process connections	FTC 968:	G 1 A parallel thread with two nuts for mounting in a thread adapter or wall opening and R1 thread (DIN 2999) for mounting in extension tube parallel G 1 A thread with two nuts for mounting in a thread adapter or wall opening
Electrical connection	Screw terminals for max. 1.5 mm² wires in sleeves A 1.5 - 7 to DIN 46 228 Cable gland Pg 11 (any position), for cable diameters 6 8 mm	

User interface

Display in connection compartment	Red LED to indicate switching status, visible from outside	
Operating elements in connection compartment	Rotary switch to switch between minimum/maximum fail-safe modes Adjuster for sensitivity (factory set value at $\epsilon_r > 1.6$ with Protector, at $\epsilon_r > 2.0$ without Protector)	
AC version	Voltage at Terminals 1 and 3: 21 253 V, 50 / 60 Hz (max. 250 V with FTC 968 Z); Current consumption (stand-by) max. 4 mA	

Power supply

AC version	Voltage at Terminals 1 and 3: 21 253 V, 50 / 60 Hz (max. 250 V with FTC 968 Z); Current consumption (stand-by) max. 4 mA
DC version	10 55 V, ripple max. 1.7 V, 0 400 Hz; Current consumption max. 15 mA, reverse polarity protection

Certificates and approvals

BVS Nr. St Ex 6/87 B DMT 00 ATEX E 026	FTC 968 Z : Dust-Ex design approval (German Zone 10) ATEX: (
CE Mark	By attaching the CE Mark, Endress+Hauser confirms that the instrument fulfils all legal requirements of the relevant EC directives

Ordering

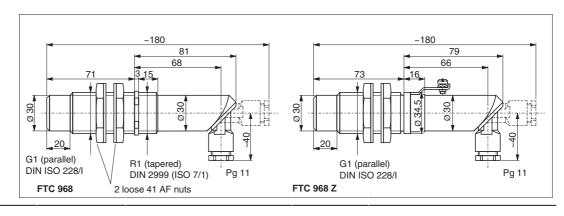
Instruments	FTC 968, AC version: FTC 968, DC version: FTC 968 Z, AC version: FTC 968 Z, DC version:	Order No. 918 098-0000 Order No. 918 098-0140 Order No. 918 098-1000 Order No. 918 098-1140
Accessories	Adapter and outflow protection sleeve "Protector" G 1½ A Wettet parts of the build-in adapter "Protector": FDA listed material (according to 21 CFR 177.1660)	Order No. 917 255-1000
Supplementary Documentation	Safety Instructions for FTC 968 Z (ATEX) General information on EMC	XA 078F/00/a3 TI 241F/00/en
Certificates	Design approval	ZE 168F/00/de

Dimensions

left: Nivector FTC 968 (plastic thread)

right:
Nivector FTC 968 **Z**for use in dust explosion
hazardous areas
(metal thread,
ground connection)

100 mm = 3.94 in



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