



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services



Solutions

## Technical Information

# Capacitance Level Switch Nivector FTC968

Compact level switch for powders, granules and pellet solids



FTC968



FTC968 with protector/mounting well

### Applications

The Nivector is an economical, compact level limit switch that is ideal for applications where control of powders, granular or pelletized solids is needed. Constructed of durable impact and abrasion resistant polycarbonate, the FTC968 is suitable for industries including chemical, food and pharmaceutical.

- Compact, single unit may be used for many applications
- Ideal for powders, granules and pellet solids, with particle sizes up to 0.4" (10 mm)
- Typical process materials include plastic granules, detergent, grain, sugar, spices, animal feed

### Your benefits

- Requires no calibration, factory adjusted for standard applications
- Field-selectable failsafe mode, maximum or minimum
- Maintenance free design, no moving parts to wear, break or fail
- Extremely sensitive, detects materials with dielectric constants as low as 1.5
- Switching status visible from outside the vessel, simple control
- High immunity to electromagnetic interference and voltage peaks results in reliable operation
- Wetted parts of the protector/mounting well are FDA listed (according to 21 CFR 177.1660)

## Function and system design

### Operating principle

The FTC968 contains both plates of a capacitor whose value changes as the dielectric constant of its surroundings change. When material contacts the sensor head, the capacitance increases and the FTC968 switches (the internal SCR or output transistor switches state depending on version selected). The Nivector can be switched to either minimum or maximum fail-safe mode, ensuring quiescent current operation in all applications. A red LED indicates its switching status.

















An external load (user-supplied) is installed in series with one of the field wiring connections. This load is normally a control relay or indication lamp. When the Nivector switches, the load device is switched ON or OFF depending on whether maximum or minimum failsafe is selected. When the load is switched OFF, a minute amount of current still passes through the unit (and external load in the AC version) to maintain power to the sensing head.

The FTC968 is factory adjusted for standard applications and does not normally require calibration. Although standardly shipped in the MAX failsafe mode, the FTC can be reconfigured for MIN failsafe by rotating the MIN/MAX selector switch. Sensitivity adjustment is not normally required. If sensing through a plastic container wall, mounting well or sight glass, user may adjust the sensitivity by rotating the adjustment potentiometer (clockwise to increase). Adjustment pot is located behind the removable cable entry.

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

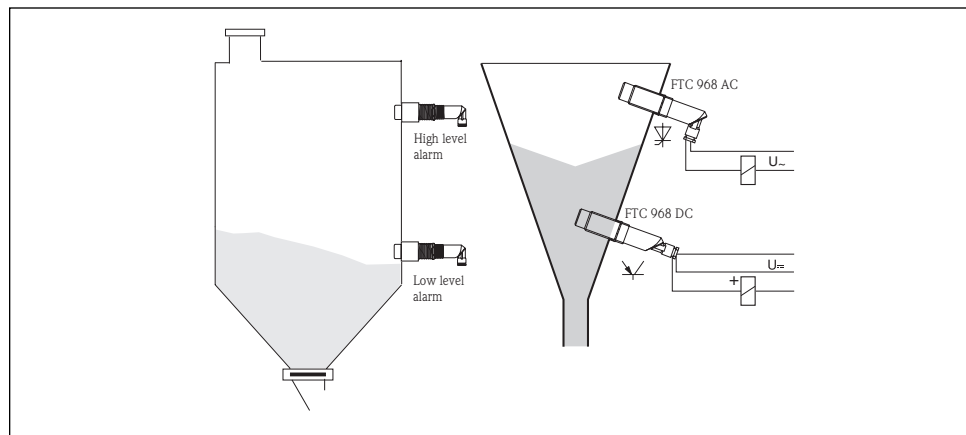
The electronic switch blocks:

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

Level	Fail-safe mode	LED	Versions	
			AC	DC
	Max.			
	Min.			
				
				

### Applications

For total control of filling and emptying operations, two FTC968 units are installed. For low level indication, one unit is set for minimum failsafe; for high level indication, the second FTC968 is set for maximum failsafe.



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## Input

Measured variable	Level (limit, binary)
Measured range	Determined by mounting point in process vessel

## Output

Output signal	Binary, output blocked when limit reached
Signal on alarm	Output blocked
Fail-safe mode	Minimum or maximum quiescent current, switchable
Switching time	Approximately 0.2 s when covered or uncovered

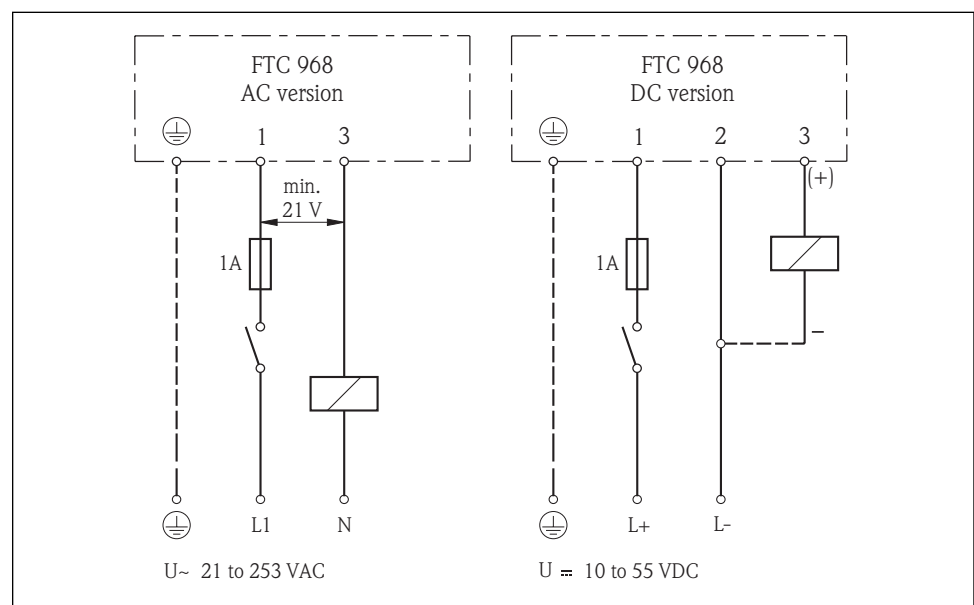
## Power supply

**Electrical connection** Two-wire AC - always connect a load in series! Take into account 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 FTC968 does not fall below 21 V.

Three-wire DC - preferred for programmable logic controllers. Positive signal at the switching output of the electronics (PNP).

### CAUTION!

To avoid damage to the electronics, do not connect and apply power until an external load is connected.



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## Supply voltage

AC version – 21 to 253 VAC, 50/60Hz, 2-wire connection through user-supplied load.

- Load (connectable) with AC version (load switching via thyristor directly into 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 protected).
- Continuous maximum 87 VA at 253 V, maximum 7.4 VA at 21 V. Minimum 2.5 VA at 253 V (10 mA), minimum 0.5 VA at 21 V (20 mA).
- Voltage drop maximum 12 V.
- Quiescent current maximum 4 mA with blocked thyristor.

DC version – 10 to 55 VDC, 3-wire connection through user-supplied load.

- Load (connectable) with DC version (load switching 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  $\mu$ F at 55 V, max. 1.0  $\mu$ F at 24 V
- Quiescent voltage < 3 V (with connected transistor)
- Quiescent current < 100  $\mu$ A (with blocked transistor)

## Installation guidelines

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### Installation instructions

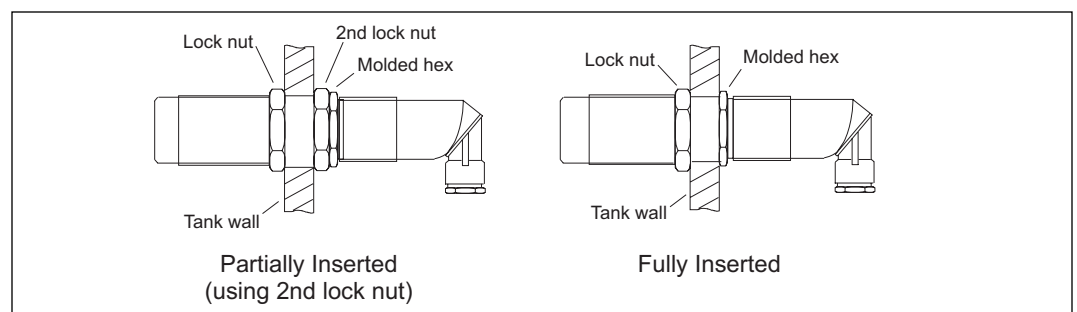
The FTC968 can be installed in a tank in any position from vertical to horizontal. When mounted horizontal, the cable entry should be rotated downwards to keep dust or moisture from entering the electronics.

The sensing tip should extend a minimum of 0.8" (20 mm) into the vessel to ensure full contact with the process medium (exception, when mounting against sight glass or in mounting well). Maximum wall thickness of vessel, 1.4" (35 mm).

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### Through wall mounting

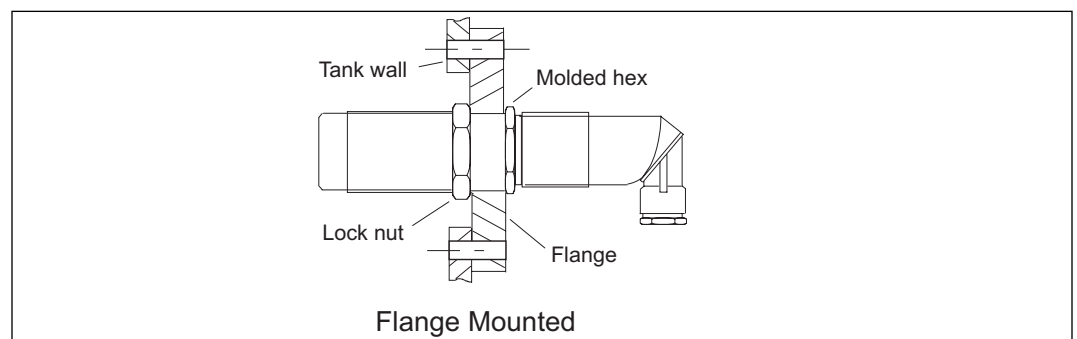
Mounting hole (1-5/16" maximum) is drilled through vessel wall. For best results, insert unit until molded hex is flush against outside wall. An additional lock nut is provided should it not be possible to mount the unit fully inserted.



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### Flange mounting

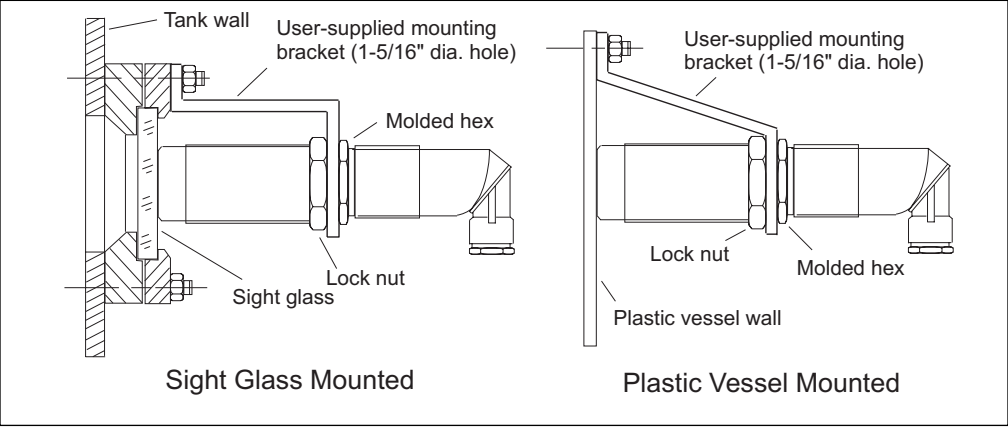
If an opening is available at the desired mounting location and is too large to securely mount the FTC968, a flange (user-supplied) may be used. Mount the nivector to the flange by the same methods as through wall mounting and mount the flange to the vessel.



**Sight glass/plastic vessel mounting**

In applications where a sight glass is used, the FTC may be installed using a mounting bracket (user-supplied). The unit should be mounted flush against the glass to insure positive switching. The sensitivity may be increased or decreased to improve the unit's ability to detect material through the sight glass.

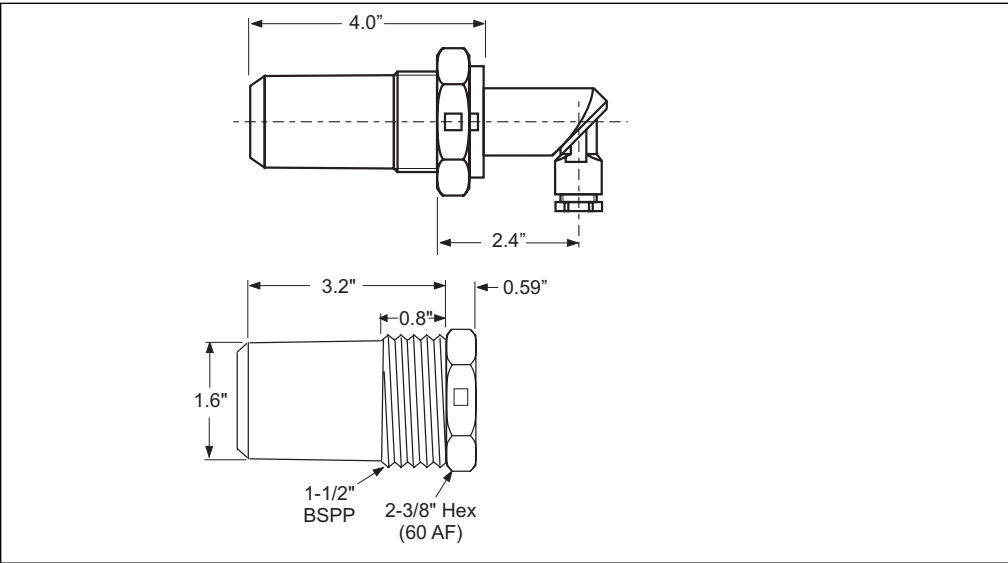
In applications where the vessel material is plastic, a mounting bracket may be used instead of drilling through the vessel wall. As described in sight glass mounting, ensure the sensor tip is flush against the vessel wall.



**Mounting well**

An optional plastic (PBTP) mounting well is available which allows the FTC968 to be withdrawn from the vessel without spilling contents. External mounting threads (1-1/2" BSPP) can be mounted directly into the vessel wall. Maximum vessel pressure, 90 psig. Materials are FDA listed according to 21 CFR 177.1660.

Order No: 917255-1000

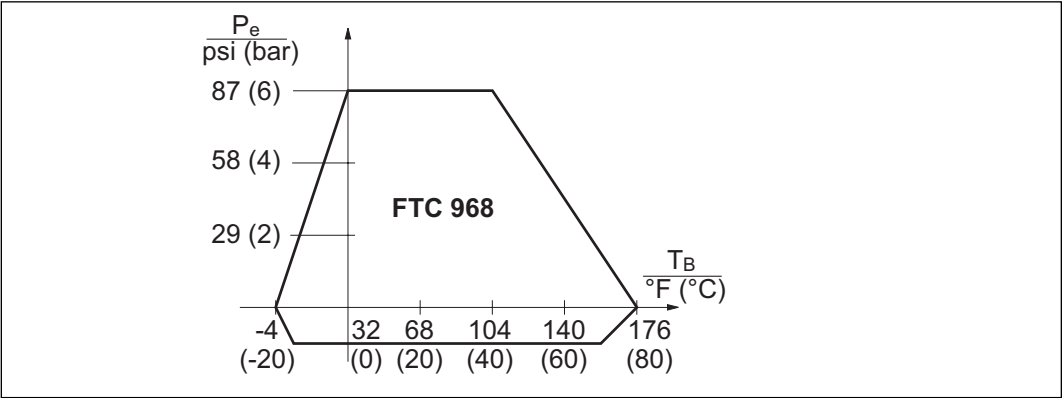


# Environment

Ambient temperature range	-4 to +140°F (-20 to +60°C)
Limiting temperature range	-4 to +140°F (-20 to +60°C)
Storage temperature	-13 to +185°F (-25 to +85°C)
Ingress protection	NEMA 4 (IP 65 / IP 67)
Electromagnetic compatibility	Interference emission to EN61326, Electrical Equipment Class B Interference immunity to EN61326

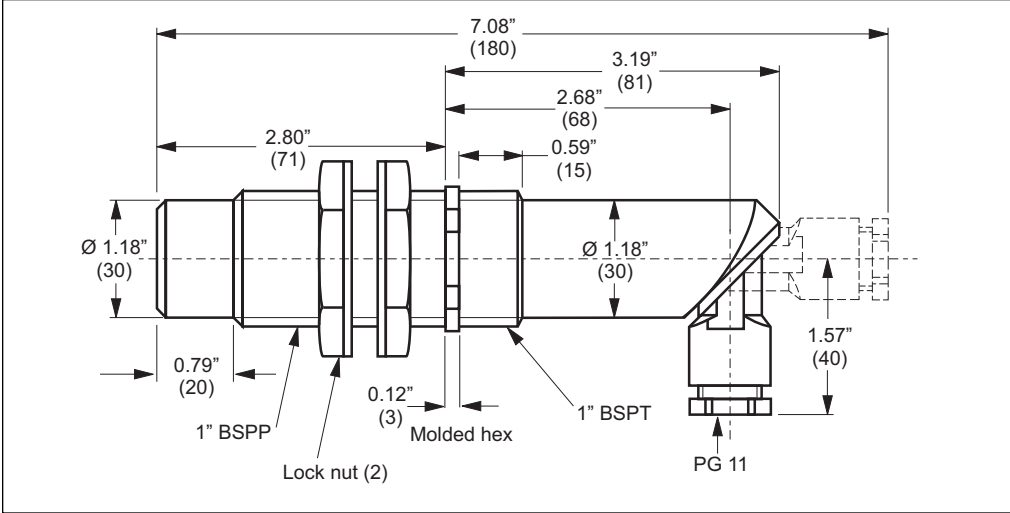
# Process

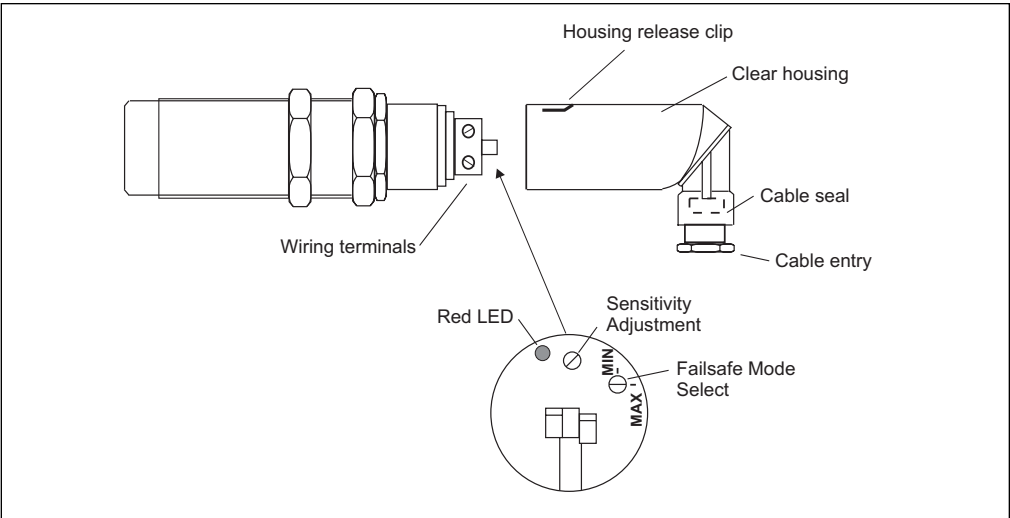
Medium temperature	-4 to +176°F (-20 to +80°C), refer to figure below
Limiting medium temperature	-40 to +176°F (-40 to +80°C)
Limiting medium pressure	-14.5 to +87 psi (-1 to +6 bar), refer to figure below
Particle size	Maximum 0.4” (10 mm)
Relative dielectric constant of medium	Minimum 1.6



Permissible values for operating pressure  $P_e$  in vessel are dependent on the operating temperature  $T_B$ .

# Mechanical construction

Design, dimensions	Dimensions are in inches (mm)
 <p>The drawing shows a side view of the device with the following dimensions and labels:</p> <ul style="list-style-type: none"><li>Overall length: 7.08" (180)</li><li>Distance from left end to first lock nut: 2.80" (71)</li><li>Distance between lock nuts: 0.79" (20)</li><li>Distance from second lock nut to molded hex: 0.12" (3)</li><li>Distance from molded hex to cable entry: 3.19" (81)</li><li>Distance from cable entry to PG 11: 2.68" (68)</li><li>Distance from PG 11 to right end: 0.59" (15)</li><li>Left end diameter: Ø 1.18" (30)</li><li>Right end diameter: Ø 1.18" (30)</li><li>Height at PG 11: 1.57" (40)</li><li>Labels: 1" BSPP, Lock nut (2), Molded hex, 1" BSPT, PG 11</li></ul>	
Weight	0.3 lbs (0.14 kg)
Wetted materials	Housing, blue polycarbonate; locking nuts, black PA
Process connection	G 1A (BSPP) parallel thread with two lock nuts for mounting in threaded adapter or vessel wall opening
Wiring connection	Screw terminals, maximum 16 AWG (1.5 mm <sup>2</sup> ) Cable entry, Pg 11, for wire cable diameters 0.23 to 0.31" (6 to 8 mm)
Operating elements	Red LED to indicate switching status, visible from outside clear terminal connection housing. Failsafe mode select and sensitivity adjustment located on terminal connection board.



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## Certificates and approvals

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### CE Mark

By attaching the CE Mark, Endress+Hauser confirms that the instrument fulfils all legal requirements of the relevant EC directives.

## Ordering information

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### FTC968

AC version: Order no. **918098-0000**

DC version: Order no. **918098-0140**

### Documentation

Operating instructions:

KA072F/00/a6

General information on EMC:

TI241F/00/en

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