Technical Information

Nivector FTC968, FTC968Z

Capacitance point level switch for powdery and fine-grained bulk solids

Application

The Nivector is a very compact point level switch for minimum or maximum detection in silos containing free-flowing, powdery or fine-grained bulk solids (max. particle size 10 mm or 0.39 in).

Its construction and the materials used make the Nivector particularly suitable for installation in cramped conditions and for use with foodstuffs.

The Nivector FTC968Z can be used in dust-explosion hazardous areas, zone 20.

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

Your benefits

• No calibration: quick and economical commissioning
• No mechanical moving parts: no wear, long service life
• High degree of immunity to electromagnetic interference and voltage peaks: reliable operation
• Switching status visible from outside the vessel: simple control
• Point level switch protected by "Protector": function test possible even when silo is filled
# Table of contents

**Function and system design** .......................................................... 3  
- Measuring principle ................................................................. 3  
- Measuring system ................................................................. 3  
- Modularity ................................................................. 3  
- Signal processing ................................................................. 3  

**Input** .............................................................................. 4  
- Measured variable ................................................................. 4  
- Measuring range (detection range) ......................................... 4  

**Output** .............................................................................. 4  
- Output signal ........................................................................ 4  
- Signal on alarm ..................................................................... 4  
- Load ....................................................................................... 4  
- Fail-safe mode ....................................................................... 4  
- Switching time ....................................................................... 4  

**Power supply** ..................................................................... 5  
- Electrical connection .............................................................. 5  
- AC version ............................................................................. 5  
- DC version ............................................................................. 5  

**Installation** ........................................................................ 6  
- Installation .............................................................................. 6  
- Orientation ................................................................................ 6  

**Environment** ....................................................................... 7  
- Ambient temperature .............................................................. 7  
- Limiting temperature range ...................................................... 7  
- Storage temperature .............................................................. 7  
- Degree of protection .............................................................. 7  
- Electromagnetic compatibility .................................................. 7  

**Process** ................................................................................ 7  
- Medium temperature .............................................................. 7  
- Medium temperature limits ...................................................... 7  
- Medium pressure pe .............................................................. 7  
- Medium pressure limits .......................................................... 7  
- Medium particle size .............................................................. 7  
- Relative dielectric constant \( \varepsilon_r \) of product ..................... 7  

**Mechanical construction** ...................................................... 8  
- Design, dimensions (in mm) ....................................................... 8  
- Weight ................................................................................... 8  
- Material ................................................................................ 8  
- Process connections ............................................................... 8  

**Operability** .......................................................................... 8  
- Display elements ................................................................... 8  
- Operating elements ............................................................... 8  

**Certificates and approvals** .................................................... 9  
- CE Mark ............................................................................... 9  
- Ex approval ............................................................................ 9  

**Ordering information** .............................................................. 9  
- FTC968 ............................................................................... 9  
- FTC968Z ............................................................................... 9  

**Accessories** ......................................................................... 9  
- "Protector" built-in adapter and outflow protection ................. 9  

**Documentation** ..................................................................... 9  
- Safety Instructions (FTC968Z) ................................................... 9  
- General information on EMC .................................................... 9  
- Certificates ............................................................................ 9
Function and system design

Measuring principle

The face of the Nivector acts as a sensor with regard to the environment and analyzes the different dielectric values of air and bulk solids. If the bulk solids come into contact with the face, the electronics change the switching status. The Nivector can be switched to either min. or max. fail-safe mode, ensuring quiescent current operation in all applications. The switching status is indicated by an LED. A screened electrode protects the sensor from interference from the vessel wall or from the effects of material build-up.

Depending on the fail-safe mode selected and the level, the Nivector switches and signals in the following cases:

- point level is reached
- fault
- power failure (electrical switch is locked)

<table>
<thead>
<tr>
<th>Level / fail-safe mode</th>
<th>LED</th>
<th>AC</th>
<th>DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX</td>
<td></td>
<td>![AC Diagram]</td>
<td>![DC Diagram]</td>
</tr>
<tr>
<td>MIN</td>
<td></td>
<td>![AC Diagram]</td>
<td>![DC Diagram]</td>
</tr>
<tr>
<td></td>
<td>![LED Symbol]</td>
<td>![AC Diagram]</td>
<td>![DC Diagram]</td>
</tr>
</tbody>
</table>

Measuring system

The Nivector FTC is a compact point level switch to which a miniature contactor, a solenoid valve or a programmable logic controller (PLC) can be directly connected.

Modularity

Compact point level 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

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Level (limit, binary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>Determined by mounting point in silo</td>
</tr>
</tbody>
</table>

## Output

<table>
<thead>
<tr>
<th>Output signal</th>
<th>Binary: Output blocked if point level is reached</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal on alarm</td>
<td>Output is blocked</td>
</tr>
</tbody>
</table>

### Load

**AC version**
- Load switched 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 resistant to short-circuit)
  - continuous max. 87 VA at 253 V (with FTC968Z max. 250 V), 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

**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/ maximum quiescent current, switchable
  - **MIN** = Minimum safety: The output switches in a safety-oriented manner when the probe is cleared.
    (Signal on alarm). Used for example for dry-running protection
  - **MAX** = Maximum safety: The output switches in a safety-oriented manner when the sensor is covered.
    (Signal on alarm). Used for example for overflow protection

### Switching time
- approx. 0.2 s after covering or clearing
Power supply

**Electrical connection**
Screw terminals for max. 1.5 mm² (16 AWG) wire in sleeve A 1.5 - 7 as per DIN 46228;
Cable gland Pg11, for cable diameter 6 to 8 mm (0.24...0.31 in)

**Two-wire AC connection**
Always connect a load in series!
Take account of the voltage drop across the electronics when connected (max. 12V), 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.

![AC Connection Diagram](image1)

**Three-wire DC connection**
Preferred for programmable logic controllers (PLCs).
Positive signal at the switching output of the electronics (PNP).
A ground connection is required only for the FTC968Z.
The Nivector FTC968 has double isolation.

![DC Connection Diagram](image2)

**AC version**
Voltage at terminals 1 and 3: 21 to 253 V, 50/60 Hz (with FTC968Z max. 250 V);
Current consumption (stand-by) max. 4 mA

**DC version**
10 to 55 V, ripple max. 1.7 V, 0 to 400 Hz;
Current consumption max. 15 mA, reverse polarity protection
Installation

The Nivector FTC968 may be installed and positioned in any orientation in a bulk solids silo.

Face >20 mm (>0.79 in) projecting into silo
Silo wall thickness <35 mm (<1.38 in) or G1 welding socket <50 mm (<1.97 in) long

Orientation

a. Standard mounting with external G1 thread adapter
b. Where build-up occurs on the silo wall with internal G1 thread adapter
c. Without thread adapter but with drilled hole or threaded directly in the silo wall or a flange
d. With "Protector" built-in adapter *¹ for G1 1/2 thread adapter; outflow protection sleeve for function testing when the silo is full.
Protection of point level switch against damage by particularly abrasive or coarse product.
e. In extension tube for mounting from above (not with FTC968Z)
f. Dimensions of the "Protector"*¹ (accessory)

*¹ FDA-compliant
Environment

**Ambient temperature**  
-20...+60 °C (-4...140 °F)

**Limiting temperature range**  
-20...+60 °C (-4...140 °F)

**Storage temperature**  
-25...+85 °C (-13...185 °F)

**Degree of protection**  
- FTC968: IP65/IP67 as per EN 60529  
- FTC968Z: IP65

**Electromagnetic compatibility**  
Interference Emission to EN 61326, Electrical Equipment Class B  
Interference Immunity to EN 61326

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**Process**

**Medium temperature**  
- FTC968: -20...+80 °C (-4...176 °F), see also above diagram  
- FTC968Z: -20...+75 °C (-4...167 °F), see also above diagram

**Medium temperature limits**  
- FTC968: -40...+80 °C (-40...176 °F)  
- FTC968Z: -20...+75 °C (-4...137 °F)

**Medium pressure $p_e$**  
-1 to +6 bar (-15...90 psi), see also the following diagram

**Medium pressure limits**  
Test pressure: 10 bar (145 psi) at 20 °C (68 °F)

**Medium particle size**  
<10 mm (0,39 in)

**Relative dielectric constant $\epsilon_r$ of product**  
Min. 1.6

Permissible values for operating pressure $p_e$ in silo are dependent on the operating temperature $T_B$ in the silo.
Mechanical construction

Design, dimensions

<table>
<thead>
<tr>
<th>FTC968</th>
<th>FTC968Z *</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Thread made of plastic)</td>
<td>(Thread made of metal, ground connection)</td>
</tr>
</tbody>
</table>

* for use in dust-explosion hazardous area, zone 20

*1 G1 (cylindrical), DIN ISO 228/1

*2 R1 (conical), DIN 2999 (ISO 7/1)

*3 2 loose nuts 41 AF

Weight

- FTC968: 0.14 kg (0.31 lbs)
- FTC968Z: 0.25 kg (0.55 lbs)

Material

Wetted

- FTC968: Housing in blue PC, locking nuts in black PA
- FTC968Z: Housing in white ECTFE, threaded sleeve in nickel-plated brass, locking nuts in black PA
- "Protector" built-in adapter: FDA-listed material (as per 21 CFR Part 177.1660)

Not wetted

- Connection compartment in transparent PC

Process connections

- FTC968:
  - Cylindrical G1A thread with 2 nuts for mounting in a threaded coupling or wall opening
  - R1 thread (DIN 2999) for mounting in extension tube

- FTC968Z:
  - Cylindrical G1A thread with 2 nuts for mounting in a threaded coupling or wall opening

Operability

Display elements

- Red LED in connection compartment to indicate switching status, visible from outside

Operating elements

- Rotary switch to switch between minimum/maximum fail-safe mode
- Adjuster for sensitivity in connection compartment
  (set in factory to $e_r > 1.6$ with Protector, to $e_r > 2.0$ without Protector)
Certificates and approvals

CE Mark
The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

Ex approval
DMT 00 ATEX E 026
Dust-Ex design approval
ATEX: C E  II 1/3 D

Note!
For applications in dust-explosive atmospheres, protect housing against impact.

Ordering information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Ac version</th>
<th>Dc version</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTC968</td>
<td></td>
<td>Order no. 918098-0000</td>
<td>Order no. 918098-0140</td>
</tr>
<tr>
<td>FTC968Z</td>
<td></td>
<td>Order no. 918098-1000</td>
<td>Order no. 918098-1140</td>
</tr>
</tbody>
</table>

Accessories

"Protector" built-in adapter and outflow protection
G1 1/2 A: Order no. 917255-1000
Wetted part of "Protector" built-in adapter:
FDA-listed material (as per 21 CFR Part 177.1660)

Documentation

Safety Instructions (FTC968Z) XA00078F/00/a3 (ATEX)
General information on EMC TI00241F/00/en
Certificates ZE00168F/00/en (design approval)