



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Nivotester FTC625 PFM

Capacitive

Point level switch with Intrinsically Safe Signal Circuit for Connection to a Capacitance Sensor



Applications

- Point level detection in tanks containing liquids and silos containing bulk solids. For capacitance level probes, which may also be applied in hazardous areas of category ATEX II (1) GD
- Overspill protection for tanks containing flammable or non-flammable fluids hazardous to water
- Dry running protection for pumps

Your benefits

- Intrinsically safe signal circuit for using sensors in hazardous areas
- Calibration using operating keys
- High functional safety thanks to:
 - Fail-safe PFM technology
 - Cable monitoring up to sensor
 - Checkable relay function using operating keys
- Compact housing for easy series mounting on standard DIN rail in the cabinet
- Pluggable terminal blocks make wiring easy
- RS485 interface, e.g. with Fieldgate for remote monitoring
- RS232 diagnosis socket with connection to, for example, FieldCare for reading out data
- Permanent self-monitoring with FEI57S
- Protection against maloperation and manipulation
Every change in the switch setting triggers a red LED signal and a fault message
- Full- or empty push button calibration

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Function and system design

Measuring principle

Function

Probe and tank (or ground tube/counterpotential) form a capacitor whose capacitance changes with the level of the product. The electronic insert converts the capacitance change into a PFM frequency change, which switches the output relay in the Nivotester FTC625.

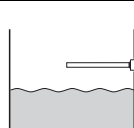
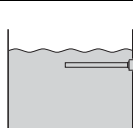
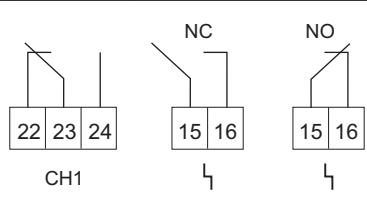
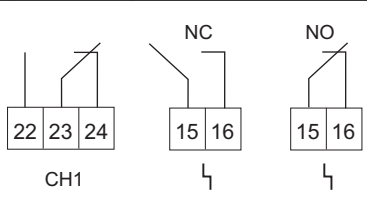
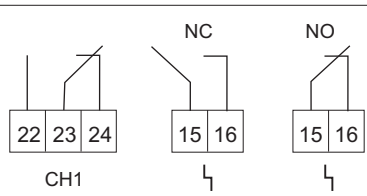
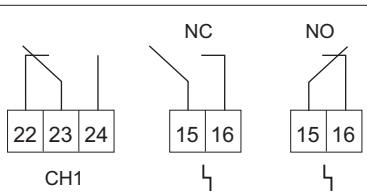
Signal transmission

The Nivotester FTC625 limit switch's intrinsically safe signal input is galvanically isolated from the mains and from the output. The Nivotester supplies the capacitance sensor with power via a two-wire cable with direct current and receives a frequency from it which signals whether the level limit has been reached or not. Here, the transmitter superimposes current pulses (PFM signals) with a pulse width of approx. 200 µs and an amperage of approx. 10 mA on the supply current.

Fail-safe circuit

Selecting the correct fail-safe circuit ensures that the relay always works in quiescent current fail-safe mode.

- Maximum fail-safe mode: The relay de-energizes when the level rises above the switch point (sensor covered), a fault occurs or the power fails.
- Minimum fail-safe mode: The relay de-energizes when the level falls below the switch point (sensor uncovered), a fault occurs or the power fails.

Level	 Probe uncovered	 Probe covered
Maximum safety circuit		
Minimum safety circuit		

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Function of the limit indicator dependent on the level and fail-safe circuit.

Function monitoring

To increase operational safety, the Nivotester is equipped with a function monitoring facility.

A fault is displayed by the red light emitting diode and de-energises the relay for the level alarm and the alarm relay. A fault is indicated if the Nivotester does not receive any more current pulses. This occurs, for example, when:

- there is a short-circuit
- the signal line to the sensor is interrupted
- the sensor electronics are defective
- the Nivotester's input switching is defective

Permanent function monitoring is implemented by the FEI57S electronic insert. Here, the Nivotester sends a test pulse to the FEI57S which then returns it. This occurs in one second cycles. If the frequency measurement is interrupted, the Nivotester triggers the alarm.



Note!

The Nivotester FTC625 was optimised for the new electronic inserts of Liquicap M and Solicap M series. From the software version (SV) 1.4 the Nivotester is fully compatible with the FEI57S.

The function alarm priority ensures that a point level indication is not signaled before a fault message. With this setting you ensure that a fault message has the first priority.

After calibration, every further change to the device configuration de-energises the relay. A fault message is signalled via the red LED.

Calibration key (red)

Calibration is carried out automatically by means of operating keys. This makes setting via rotary switches inapplicable.

Adjustable switching delay and switch point shift

- An adjustable switching delay of 0...45 s allows for the relay to be switched with a delay when covering or uncovering the probe. In the opposite direction, each switching delay is 0.2 s.
- A 16-stage switch point shift allows for safe system operation even when using media that are prone to build-up.

The test/correction key (green):

- allows for a function check of the output relay and alarm relay.
- confirms a change in the operating mode - e.g. by changing the switching delay after initial calibration. This enables a correction of the operating mode without requiring recalibration. The changed settings are saved by pressing the operating key.

Diagnosis plug (RS232)

The RS232 interface serves as a PC interface and enables on-site operation using a laptop in conjunction with a FieldCare.

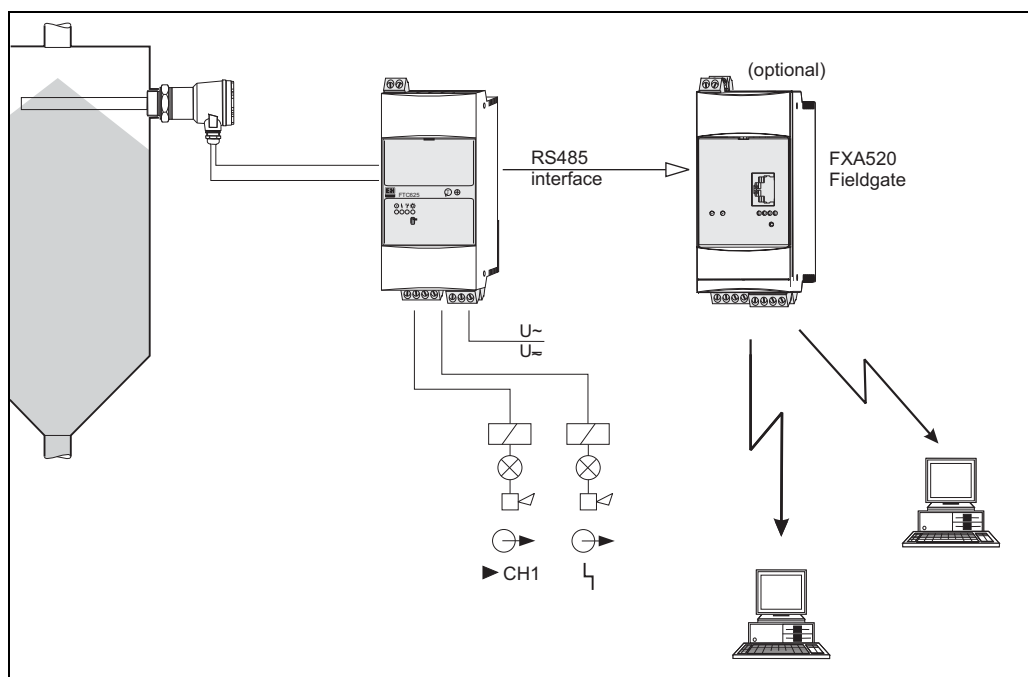
RS485 interface

The RS485 interface enables, for example, connection to a Fieldgate, with which remote monitoring can also be performed via the Internet. This remotely monitors the probe frequency, for example in order to receive a message by e-mail should build-up occur and to initiate a new calibration.

Measuring system

A measuring system consists of a capacitance sensor, a Nivotester FTC625 and the control or signal instruments. The following sensors can be used in conjunction with the electronic inserts listed.

- Liquicap M (FTI51, FTI52) with FEI57S
- Solicap M (FTI55, FTI56) with FEI57S
- Solicap S (FTI77) with FEI57S



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Input

Measured variable	The point level signal is generated at minimum or maximum point level, depending on the selection
Measuring range	The measuring range is dependent on the mounting location of the probes.
Input signal	<ul style="list-style-type: none"> ■ FTC625 input: galvanically isolated from power supply and output ■ Type of protection: intrinsic safety [EEx ia] IIC ■ Connectable sensors: <ul style="list-style-type: none"> Liquicap M (FTI51, FTI52) with FEI57S Solicap M (FTI55, FTI56) with FEI57S Solicap S (FTI77) with FEI57S ■ Connecting cable: two-wire, screening not required, except for strong electromagnetic interferences (see also page 6) ■ Cable resistance: max. 25 Ω per wire ■ Signal transmission: pulse-frequency modulation (PFM)

Output

Output signal	<ul style="list-style-type: none"> ■ Relay output: a potential-free change-over contact for the level alarm ■ RS485 interface for connection to, for example, Fieldgate (remote monitoring) ■ Quiescent current fail-safe circuit: minimum/maximum fail-safe mode can be selected using the DIL switch ■ Alarm relay: potential-free change-over contact for fault indication, only two contacts made (NC or NO contact) ■ Switching delay: 0...45 s relay switches when covering or uncovering the probe, depending on the setting ■ Switching capacity of relay contacts: <ul style="list-style-type: none"> U~ maximum 253 V I~ maximum 2 A P~ maximum 500 VA at $\cos \varphi \geq 0.7$ ■ U- maximum 40 V ■ I- maximum 2 A ■ P- maximum 80 W ■ Service life: at least 10^5 switching cycles at maximum contact load ■ Function indicator: light emitting diodes for operation/communication, level alarm, fault and level signal (lights up as long as the probe is covered)
Signal on alarm	Limit relay de-energised; fault indication via red LED, alarm relay de-energised
Galvanic isolation	All input and output channels and relay contacts are galvanically safe isolated from each other. When making a simultaneous connection from the power supply circuit to the function's extra-low voltage or to the alarm relay's contacts, safe galvanic isolation is guaranteed up to a voltage of 150 V AC.
Overvoltage category as per EN 61010	II
Protection class	II (double or increased insulation)

Power supply

Electrical connection	<p>Terminal blocks</p> <p>The removable terminal blocks are isolated after intrinsically safe connections (top of device) and non-intrinsically safe connections (bottom of device). Furthermore, the terminal blocks are also colour-coded. Blue is for the intrinsically safe area and grey for the non-intrinsically safe area. These distinctions allow for safe cable routing.</p>
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Sensor connection

(To the upper, blue terminal blocks).

Use a usual commercial instrument cable or multi-core cable for measuring purposes for the two-wire connecting cable between the Nivotester FTC625 and the sensor. Cable resistance of maximum 25 Ω per wire. If strong electromagnetic interferences have to be expected, e.g. from machines or radios, a screened cable must be used. Only connect the screening to the grounding connection in the sensor, not to the Nivotester.

Using the sensor in hazardous areas

Compliance with the national explosion protection regulations for the design and routing of the intrinsically safe signal cable is mandatory.

High-reliability values for capacitance and inductance are contained in Safety Instructions XA 195F.

Connection of signal and control instruments

(To the lower, grey terminal blocks)

The relay function must be observed dependent on the level and fail-safe circuit.

If a device with high inductance (e.g. contactor, solenoid valve, etc.) is connected, a spark suppressor must be added to protect the relay contact.

Supply voltage connection

(To the lower, grey terminal blocks)

For voltage versions, see the Ordering information.

A fuse (T 200mA) is built in to the power supply circuit, so that it is not necessary to pre-connect a fine-wire fuse. The Nivotester is equipped with reverse polarity protection.

Supply voltage

Alternating current version (AC):

Voltage ranges: 85...253 V, 50/60 Hz

Direct current version (DC):

- Voltage range: 20...30 V AC / 20...60 V DC
- Power supply direct current: maximum 100 mA
- Permitted residual ripple within the tolerance: U_{ss} = maximum 2 V

Power consumption

- AC version: maximum 6.0 VA
- DC version: maximum 2.0 W (at U_{min} 20 V)

Installation

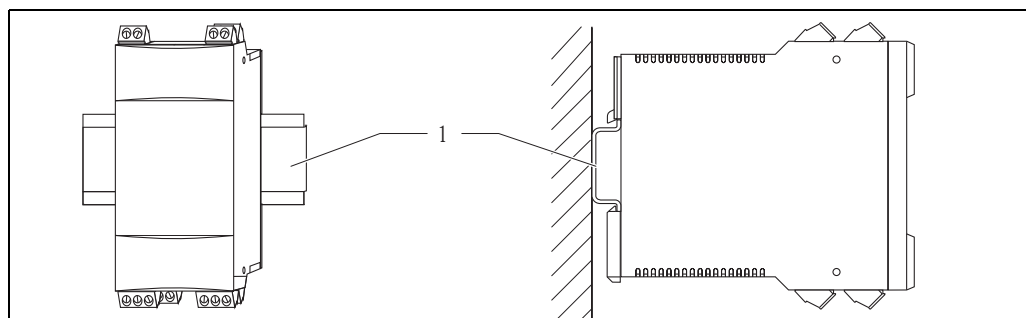
Installation instructions

The Nivotester must be housed outside of hazardous areas in a cabinet. For installation outdoors, there is also a protective housing (→ 11 "Accessories") available for up to three Nivotester FTC625.



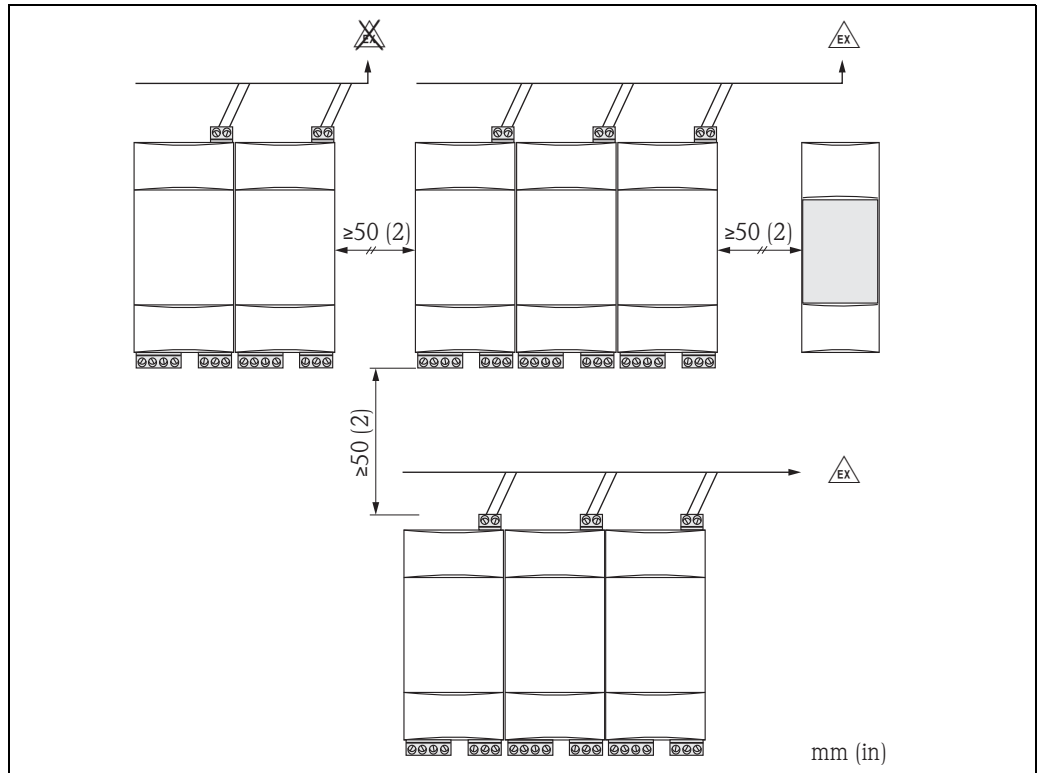
Note!

The devices should be installed in locations which are protected from direct solar radiation, weather and impacts. This is of particular importance in hot climates.



1 EN 60715 TH 35-7.5 mm (1.38-0.3 in) or EN 60715 TH 35-15 mm (1.38-0.6 in)

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Environment

Ambient temperatures

- For single mounting: -20 to +60 °C (-4 to +140 °F)
- For series mounting without lateral spacing: -20 to +50 °C (-4 to +122 °F)
- Storage temperature: -25 to +85 °C, preferably at +20 °C (-77 to +185 °F, preferably at +68 °F)
- Installation in protective housing: -20 to +40 °C (-4 to +104 °F)
(No more than three Nivotesters can be installed in one protective housing.)

Climatic and mechanical application class

3K3: As per DIN EN 60721-3-3
3M2: As per DIN EN 60721-3-3

Degree of protection

IP20

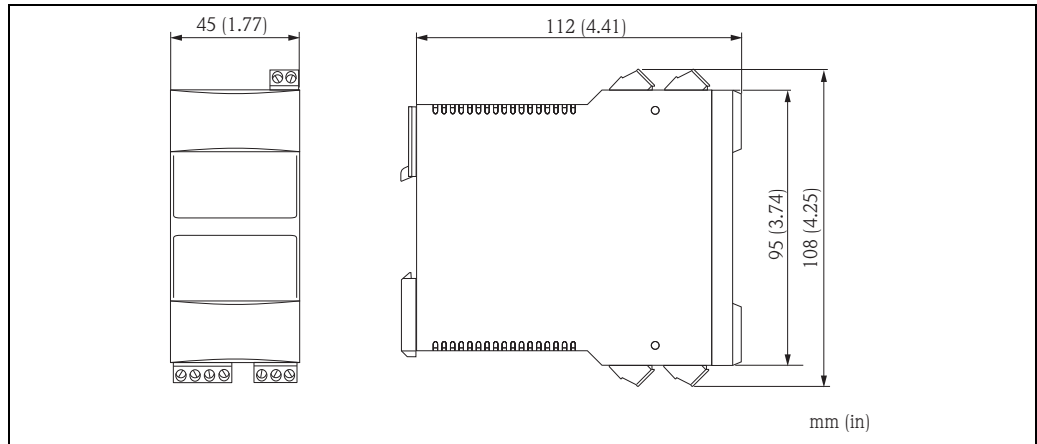
Electromagnetic Compatibility (EMC)

Interference emission as per EN 61326; Equipment Class B
Interference immunity as per EN 61326; Appendix A (industrial applications) and NAMUR Recommendation NE 21 (EMC)

Mechanical construction

Design, dimensions

Row housing made of plastic



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Weight

approx. 250 g (approx. 8.82 oz)

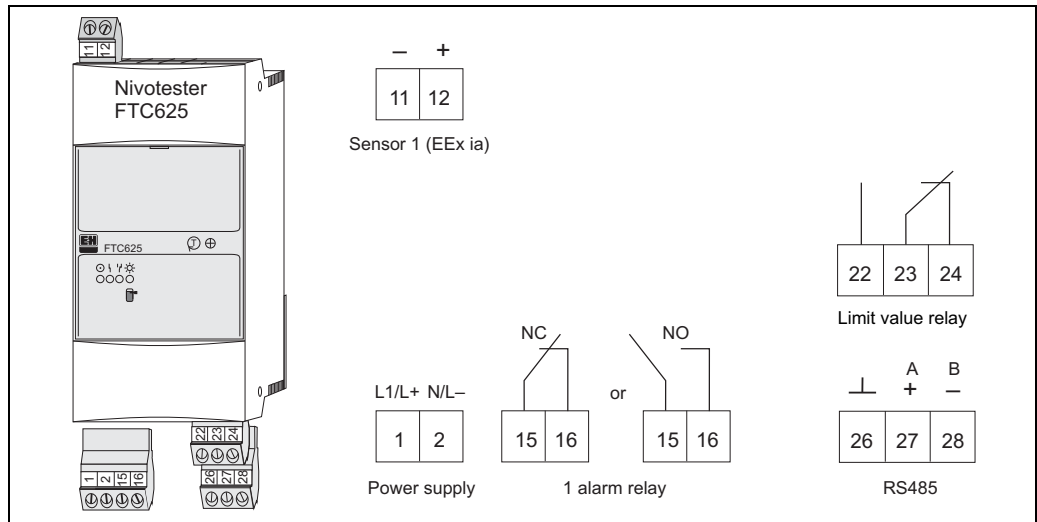
Materials

- Housing: Polycarbonate, light gray (RAL 7035)
- Front cover: Polypropylene PPN, blue
- Fixing bracket (for securing on the DIN rail: Polyamide PA6, black (RAL 9005)

Terminals

Connection cross-section

1 x ≤ 2.5 mm (1 x ≤ 14 AWG) or 2 x ≤ 1.5 mm (2 x ≤ 16 AWG)



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Operability

Operating concept

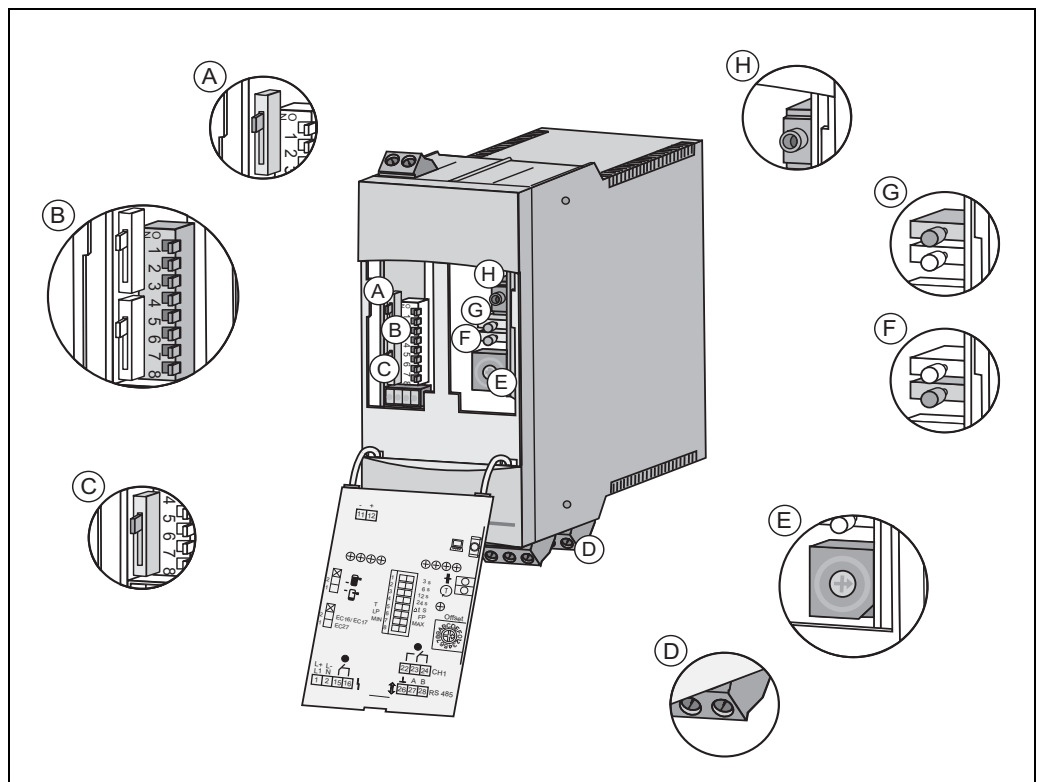
On-site configuration with switches behind the folding front panel

Display elements

- red light emitting diode: fault indication
- green light emitting diode: standby (flashing = communication)
- yellow light emitting diode (left): "limit relay energized"
- yellow light emitting diode (right): "probe uncovered/covered" level indication independent of the selected fail-safe circuit

Operating elements

- A Calibration for covered or uncovered probe
- B DIL switches 1-4: switching delay (3 s, 6 s, 12 s, 24 s) = max. 45 s
DIL switch 5: delay when covering or uncovering the probe
DIL switch 6: Only with FEI57S - point level indication immediately or after functional test
DIL switch 7: min/max fail-safe mode
DIL switch 8: no function
- C Electronics selection: FEI57S
- D RS485 interface
- E Switch point shift for build-up compensation (16-stage)
- F Correction key (green)
- G Calibration key (red)
- H Diagnosis socket (RS232/FieldCare)



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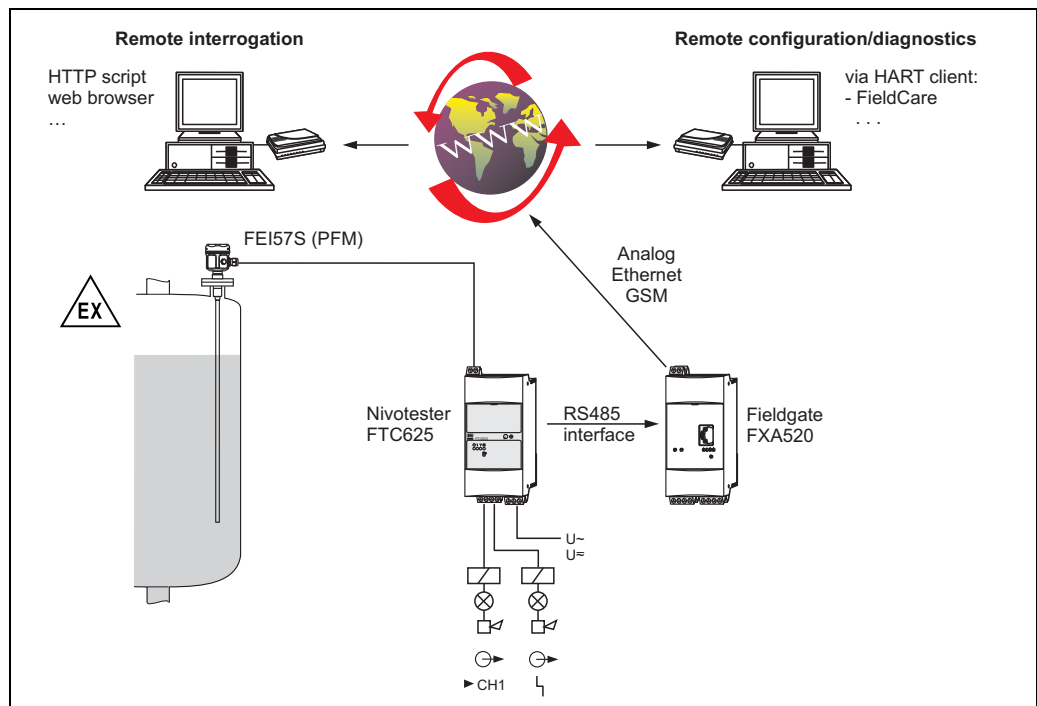
System integration via Fieldgate

Vendor managed inventory

The remote interrogation of tank or silo levels via Fieldgate enables suppliers of raw materials to gather information about the current inventories of their regular customers at any time and, for example, take this into account in their own production planning. The Fieldgate monitors the configured point levels and automatically triggers the next order as required. Here, the range of possibilities ranges from simple requisitioning by e-mail through to fully automatic order processing by incorporating XML data into the planning systems on both sides.

Remote maintenance of measuring systems

Not only does Fieldgate transmit the current measured values, it also alerts the standby personnel responsible by e-mail or SMS as required. Fieldgate forwards the information transparently. In this way, all options of the operating software in question are available remotely. By using remote diagnosis and remote configuration some onsite service operations can be avoided and all others can at least be planned and prepared better.



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Certificates and approvals

CE mark

The Nivotester meets all the statutory requirements arising from EC directives. Endress+Hauser confirms the successful testing of the device by affixing the CE symbol.

Ex approval



All the relevant data for explosion protection are contained in separate Ex documentation (see Documentation)

Note!
Suitable for supplying devices in zone 2 dust-explosion atmospheres (type of protection Ex nA), protect housing from impact.

Type of protection

[EEx ia] IIC

Overspill protection

WHG

Other standards and regulations

Other standards and regulations which were complied with during the conception and development of the Nivotester FTC625.

- EN 60529
Degrees of protection provided by enclosures (IP code)
- EN 61010
Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326
Interference emission (Equipment Class B), interference immunity (Appendix A - industrial applications)

Ordering information



Note!

Further details on product configuration and product features can be found in the Online Configurator on the product pages. See www.endress.com.

Accessories

Protective housing

The protective housing in protection class IP66 is equipped with an integrated DIN rail and closed by a transparent cover, which can also be lead-sealed.

Dimensions in mm (in):

W/H/D: 180/182/165 (7.1/7.2/6.5)

Technical Data:

- Ingress protection (EN 60529): IP66
- Lower housing section: fibre-glass reinforced polycarbonate, grey
- Upper housing section: polycarbonate, transparent
- Cover screws: PA, 4 pieces, 2 of which are sealing
- Seal: PU seal
- Top-hat rail (EN 50022): galvanized
- Cable entries: 5 pieces M 20x1,5
- Part number: 52010132

Cable

Cable for connecting the Nivotester FTC625 to a PC (RS232/3.5 mm jack plug)

Part number: 52013982 (included in scope of supply)

Supplementary Documentation

Technical Information (TI)

Capacitance measuring devices

- Liquicap M, FTI51, FTI52
TI417F/00
- Solicap S, FTI77
TI433F/00
- Solicap M, FTI55, FTI56
TI418F/00

Protective housing

- Protective housing
TI367F/00

Fieldgate

- FXA320, FXA520
TI369F/00

Operating Instructions (KA)

- Nivotester FTC625
KA194F/00

Certificates**ATEX:**

- Nivotester FTC625
XA195F/00

FM:

- Nivotester FTC625
ZD156F/00

CSA:

- Nivotester FTC625
ZD155F/00

WHG (DIBt):

- Nivotester FTC625
ZE211F/00

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