



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

Nivotester FailSafe FTL825

Point level switch

For Liquiphant FailSafe FTL80, FTL81 and FTL85



Application

- Fail-safe point level detection in liquids
- For point level switches to zone 0
- Use in safety systems requiring functional safety to SIL3 in accordance with IEC 61508 Ed.2.0 / IEC 61511-1 / ISA 84-1
- Safety-critical systems up to SIL3 in the chemicals, petrochemicals and oil & gas industries where
 - redundant or diverse systems are either not recommended or not possible
 - the longest possible test cycles are desirable
 - proof tests are either not possible or only with great difficulty and expense

Your benefits

- SIL3 functional safety due to:
 - internal two-channel design and permanent self-monitoring
 - line monitoring up to the sensor
 - permanent monitoring of the Liquiphant FailSafe point level switch
- Permanent, visualized LIVE signal
- Advanced diagnostic function and fault display
- Verification of the entire measuring system, including downstream control and signal devices, by means of proof test button or remote control
- Integrated locking function (self-holding)
- Clear identification ensures there is no risk of confusion (LIVE signal)
- 4 switching outputs (can be analyzed separately):
 - 2 as level safety contacts based on the quiescent current principle for a redundant output signal
 - 1 x signaling contact (e.g. lamp)
 - 1 x fault-signaling contact as changeover contact
- Proof test:
 - proof testing interval up to 12 years

Table of contents

Function and system design	3	Ordering information	13
Measuring principle	3	Accessories	13
Measuring system	5	Protective housing	13
Input	6	Documentation	14
Measured variable	6	Technical Information (TI)	14
Measuring range	6	Operating Instructions (BA)	14
Input signal	6	Functional safety	14
Output	6	Safety Instructions (ATEX, NEPSI, Control Drawings)	14
Output signal	6		
Overvoltage category to EN 61010	6		
Protection class	6		
Signal on alarm	6		
Galvanic isolation	6		
Switch-on behavior	6		
Power supply	7		
Electrical connection	7		
Mains voltage version	7		
Extra-low voltage version	7		
Operating conditions	8		
Installation instructions	8		
Environment	9		
Location of use	9		
Permitted ambient temperatures	9		
Climatic and mechanical application class	9		
Degree of protection	9		
Electromagnetic compatibility (EMC)	9		
Vibration resistance	9		
Mechanical construction	10		
Design, dimensions	10		
Weight	10		
Material	11		
Terminals	11		
Human interface	12		
Operating concept	12		
Operating and display elements	12		
Certificates and approvals	13		
CE mark, Declaration of Conformity	13		
Ex approval	13		
Type of protection	13		
Overfill protection and leakage (WHG)	13		
Marine approval	13		
Other standards and guidelines	13		
Liquefied gas approval	13		
Functional safety	13		

Function and system design

Measuring principle

Signal transmission

The Nivotester supplies the Liquiphant FailSafe FTL8x point level switch with direct voltage via a two-wire cable. At the same time, it analyzes the current values (4-20 mA discrete) of the Liquiphant and returns a switching signal. The signal inputs of the Nivotester FTL825 are galvanically isolated from the mains and the output and can be ordered as intrinsically safe inputs.

Signal analysis

The Nivotester FailSafe FTL825:

- Evaluates the current of the point level switch and switches the safety contacts for the level alarm accordingly
- Switches a signaling contact in addition to the safety contacts
- Switches a separate fault-signaling contact in the event of a device malfunction
- Evaluates a dynamic signal (LIVE signal) and indicates the status of this signal using an LED
- Signals the switching state of the point level switch on the front panel by means of a yellow LED

Operating mode

Minimum/maximum detection (MIN/MAX) can be selected by connection coding on the electronic insert and Nivotester.

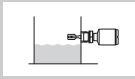
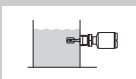
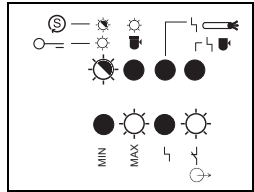
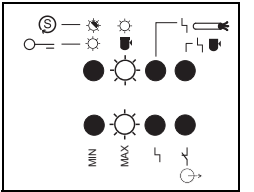


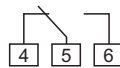


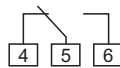
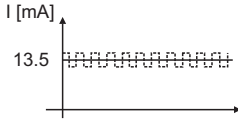
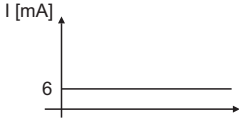
MAX = maximum detection:

The output of the Nivotester switches in a safety-oriented manner when the tuning fork is covered (demand mode). Used for overflow protection for example.

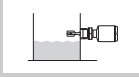
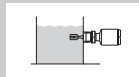
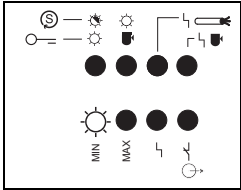
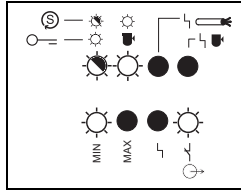

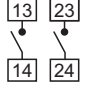
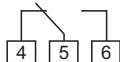

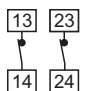
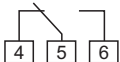
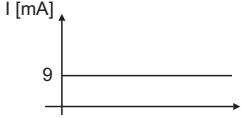
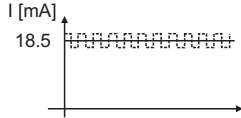
MIN = minimum detection:

The output of the Nivotester switches in a safety-oriented manner when the tuning fork is exposed (demand mode). Used for dry running protection and pump protection for example.



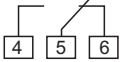
Maximum detection (MAX)

Tuning fork free			Tuning fork covered		
					
LED signals			LED signals		
					
☼ On ● Off ✨ Flashing			☼ On ● Off ✨ Flashing		
Signaling contact	Safety contact	Fault-signaling contact	Signaling contact	Safety contact	Fault-signaling contact
					
Current signal			Current signal		
					
<i>Current signal with superimposed LIVE signal</i>					

Minimum detection (MIN)

Tuning fork free			Tuning fork covered		
					
<p>LED signals</p>  <p> On Off Flashing </p>			<p>LED signals</p>  <p> On Off Flashing </p>		
<p>Signaling contact</p> 	<p>Safety contact</p> 	<p>Fault-signaling contact</p> 	<p>Signaling contact</p> 	<p>Safety contact</p> 	<p>Fault-signaling contact</p> 
<p>Current signal</p> 			<p>Current signal</p>  <p><i>Current signal with superimposed LIVE signal</i></p>		

De-energized status

Signaling contact	Safety contact	Fault-signaling contact
		



Note!

Please follow the instructions in the functional safety manual for applications requiring functional safety in accordance with IEC 61508 (SIL) → 13.

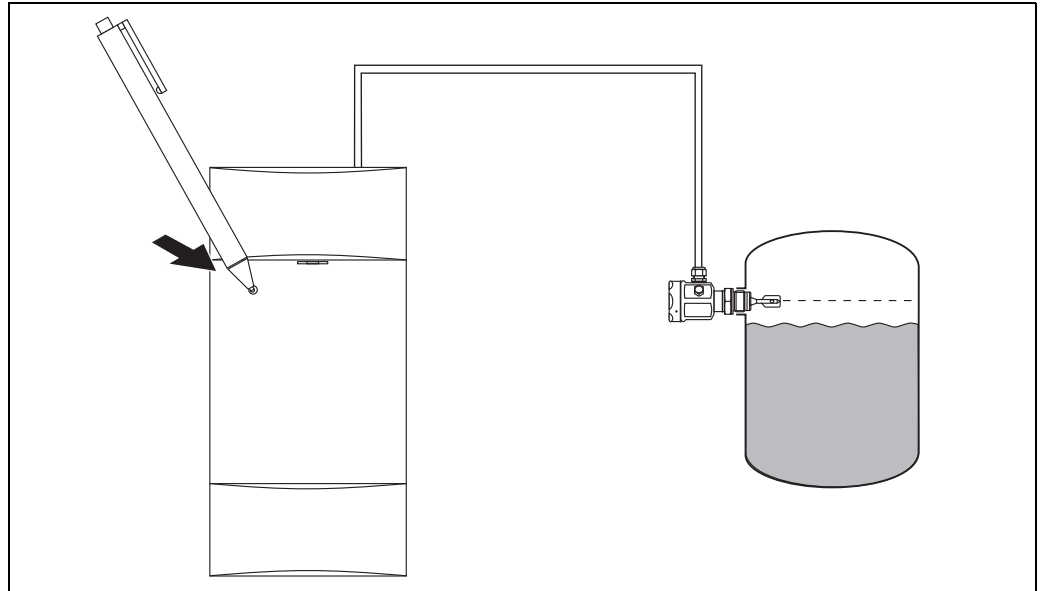
Function monitoring

To increase operational safety, the Nivotester is equipped with permanent function monitoring. A fault is indicated by a red light emitting diode, the safety contacts open and the fault-signaling relay is de-energized in the following cases:

- Fault in the point level switch (3.6 mA)
- Faulty wiring
- Fault in the Nivotester FailSafe FTL825
- No LIVE signal from the Liquiphant FailSafe FTL8x in the "Good" state.

Liquiphant FailSafe FTL8x proof test

Point level detection in safety-related applications require regular functional checks. The Nivotester FailSafe and downstream system components can undergo a simple functional test. This test is activated by pressing the proof test button on the front panel or via remote control. During this time, all of the LEDs on the Nivotester flash for 10 s. If all of the Nivotester's functions are operating correctly, normal operation is resumed. If there is a fault, a fault signal is output (red LED).

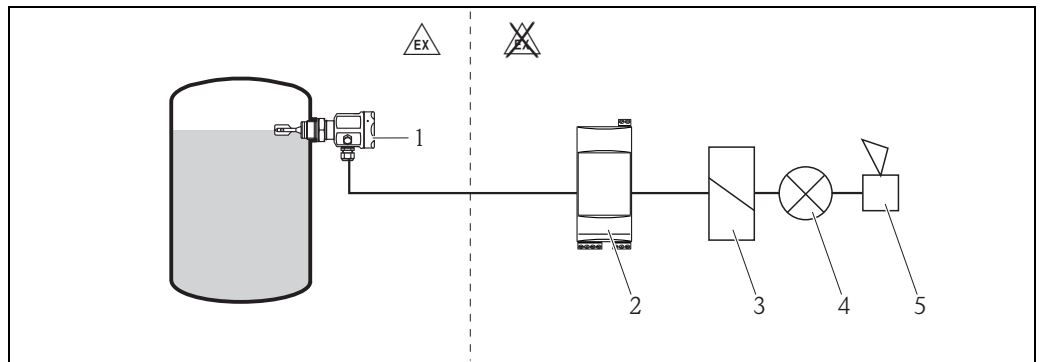


L00-FTL825xx-19-06-xx-xx-001

Measuring system

The measuring system consists of:

- Liquiphant FailSafe FTL8x with FEL85 electronic insert
- Nivotester FailSafe FTL825



L00-FTL825xx-14-06-xx-xx-001

- 1 *Liquiphant FailSafe FTL8x with FEL85 electronic insert*
- 2 *Separate switching unit: Nivotester FailSafe FTL825*
- 3 *Ampere meter*
- 4 *Bulb*
- 5 *Horn*

Input

Measured variable	Point level
Measuring range	4 to 20 mA signal The current value is discrete depending on the selected operating mode (MIN or MAX).
Input signal	<ul style="list-style-type: none"> ■ Connectable point level switch: Liquiphant FailSafe FTL8x with FEL85 electronic insert ■ Point level switch power supply: from the Nivotester FailSafe FTL825 ■ Connecting cable: twin-core, screening not required ■ Cable resistance: maximum 25 Ω per core ■ Cable length between Nivotester and point level switch: 1,000 m (3,281 ft) maximum ■ Maximum 100 nF cable capacitance ■ Signal transmission: 4 to 20 mA as per NAMUR NE 43 with additional LIVE signal

Output

Output signal	<ul style="list-style-type: none"> ■ Relay outputs: <ul style="list-style-type: none"> – Two floating NO contacts (supervised safety contacts based on the quiescent current principle) with integrated 3.15 A fuse (exchangeable) Quiescent current operating mode: MIN/MAX (operating mode can be selected via connection wiring) – One floating NC contact (signaling contact) – Fault-signaling relay: floating changeover contact for fault signaling ■ Switching capacity per relay contact: <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 ■ Operating life: at least 10^5 switching operations with maximum contact load ■ Recommended minimum current: 1 mA ■ Function indicators: light emitting diodes for operation, point level and fault ■ Sum of voltages of relay output and power supply max. 300 V
Overvoltage category to EN 61010	Category II
Protection class	II (doubled or reinforced isolation)
Signal on alarm	Safety contacts open, signaling contact closed, fault indicated by red LED
Galvanic isolation	All input channels, output channels and relay contacts are galvanically isolated from each other. Safe galvanic isolation is guaranteed up to a voltage of 150 V AC if the supply circuit or the contacts of the fault-signaling relay are connected simultaneously to the functional extra-low voltage.
Switch-on behavior	When switching on the power supply, the output assumes the alarm signal. Operational after max. 5 s

Power supply

Electrical connection

Terminal blocks

The removable terminal blocks (intrinsically safe version) are divided into intrinsically safe circuits (at the top of the device) and non-intrinsically safe circuits (at the bottom of the device). This distinction enables the safe routing of the connecting cable.


Connecting the point level switch (top terminal blocks)

Only one Liquiphant FailSafe FTL8x point level switch may be connected to the Nivotester FailSafe FTL825. The MIN/MAX operating mode can be selected via connection wiring. A commercially available instrument cable can be used for the twin-core connecting cable between the two devices. Maximum 25 Ω cable resistance per core. Maximum 100 nF (typically 1,000 m (3,281 ft)) cable capacitance.

A shielded cable should be used if strong electromagnetic interference is expected (from machines or radio equipment). The shield is connected to the ground connection in the point level switch. The use of shielded cables can improve EMC interference immunity.

Using the point level switch in hazardous areas

Observe national explosion protection regulations surrounding the design and routing of intrinsically safe signal cables.

Please refer to the associated safety instructions for information on the capacitance and inductance limit values. For more information on the documents, →  13.

Connecting the signal and control units (bottom terminal blocks)

Pay attention to the relay function depending on the level and operating mode.

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

Connecting the supply voltage (bottom terminal blocks)

As a fuse is incorporated in the power supply circuit it is not necessary to connect an upstream fine-wire fuse. The Nivotester has reverse polarity protection.

Mains voltage version

- Nominal supply voltage: AC/DC 230/115 V
- Supply voltage range: AC 85 to 253 V, 50/60 Hz
DC 85 to 253 V
- Power consumption: ≤ 3.8 VA, ≤ 2.0 W

Extra-low voltage version

- Nominal supply voltage: AC/DC 24 V
- Supply voltage range:
AC 20 to 30 V, 50/60 Hz
DC 20 to 60 V
- D/C power supply: maximum 95 mA
- Permitted residual ripple inside the tolerance: $U_{ss} = \text{maximum } 2$ V

Power consumption: ≤ 3.6 VA, ≤ 2.5 W

Reverse polarity protection: yes

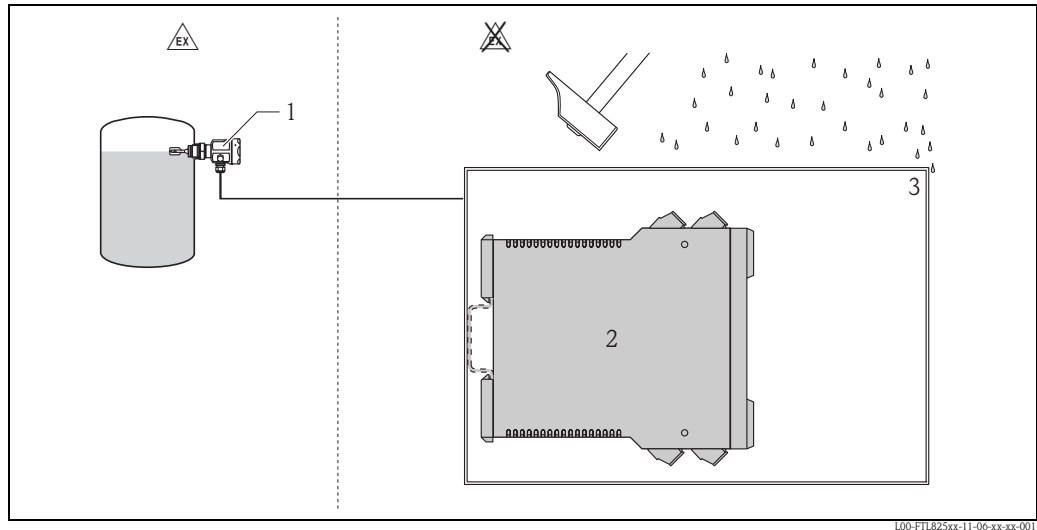
Overvoltage protection FTL825: category II (2000 m (6562 ft) above MSL)

Operating conditions

Installation instructions

Location of use

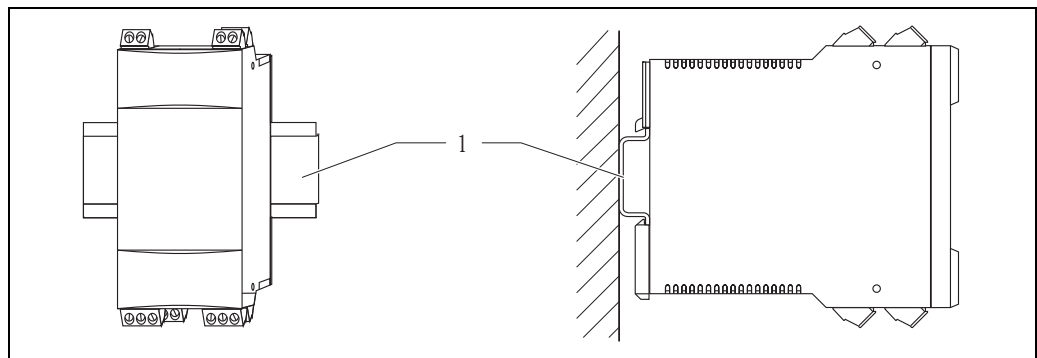
The Nivotester must be installed outside the hazardous area. It has been designed for installation in a cabinet. A protective housing (IP65) for up to two Nivotester FailSafe FTL825 devices is also available for mounting in the open air. For further information on the protective housing: → 14 "Technical Information"



- 1 Liquiphant FTL
2 Nivotester FTL
3 \geq IP65


Orientation

Vertical on DIN rail (TS 35 in acc. with EN 50022).



- 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)

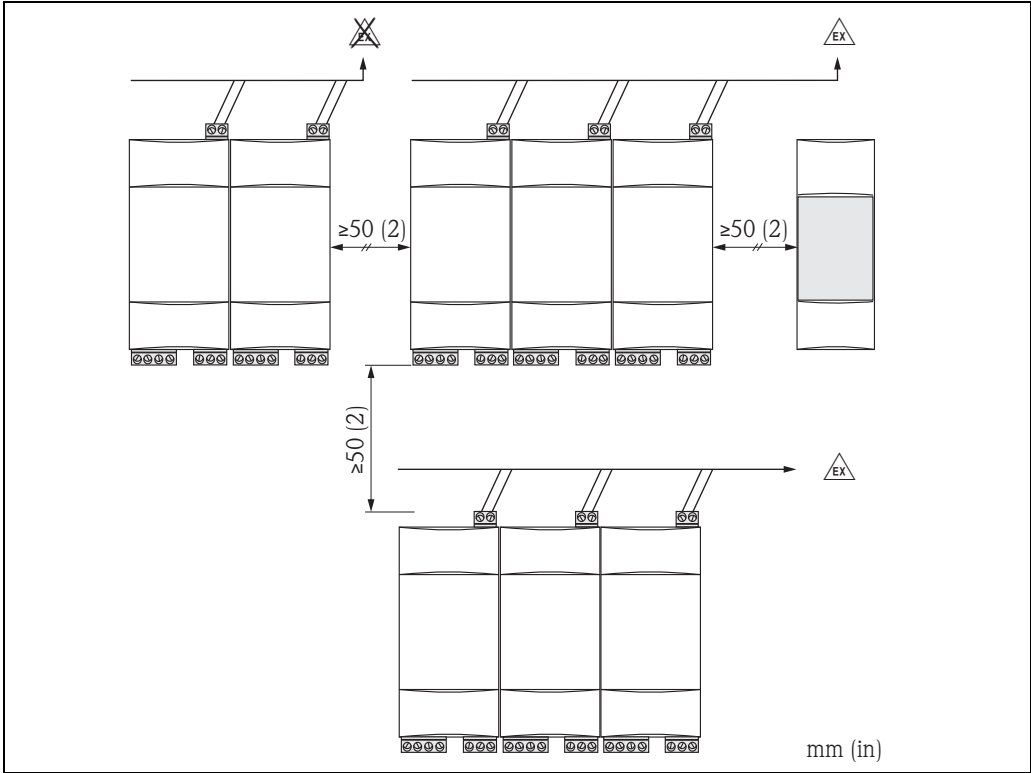
Environment

Location of use	Cabinet or protective housing
Permitted ambient temperatures	<p>For individual mounting</p> <ul style="list-style-type: none"> ■ -20 to +60 °C (-4 to +140 °F) <p>For series mounting without lateral spacing</p> <ul style="list-style-type: none"> ■ -20 to +50 °C (-4 to +122 °F) <p>Storage temperature</p> <ul style="list-style-type: none"> ■ -20 to +85 °C preferably at +20 °C (-4 to +185 °F preferably +68 °F) <p>Installation in protective housing</p> <ul style="list-style-type: none"> ■ -20 to +60 °C (-4 to +140 °F) ■ A maximum of two Nivotesters may be installed in the protective housing in order to ensure adequate ventilation. <p> Caution! The devices should be mounted in areas which are protected from weather conditions and impact and, if possible, which are not exposed to direct sunlight. This factor should be observed particularly in warm climates.</p>
Climatic and mechanical application class	<p>3K3 In accordance with DIN EN 60721-3-3</p> <p>3M2 In accordance with DIN EN 60721-3-3</p> <p>Humidity: 5-95% (non-condensating)</p>
Degree of protection	IP20
Electromagnetic compatibility (EMC)	Electromagnetic compatibility in accordance with all of the relevant requirements of the EN 61326 series and NAMUR Recommendation EMC (NE 21). Please refer to the Declaration of Conformity for details.
Vibration resistance	As per IEC 60068-2-64, load class 0.5 (m/s ²) ² /Hz, 3 x 100 minutes

Mechanical construction

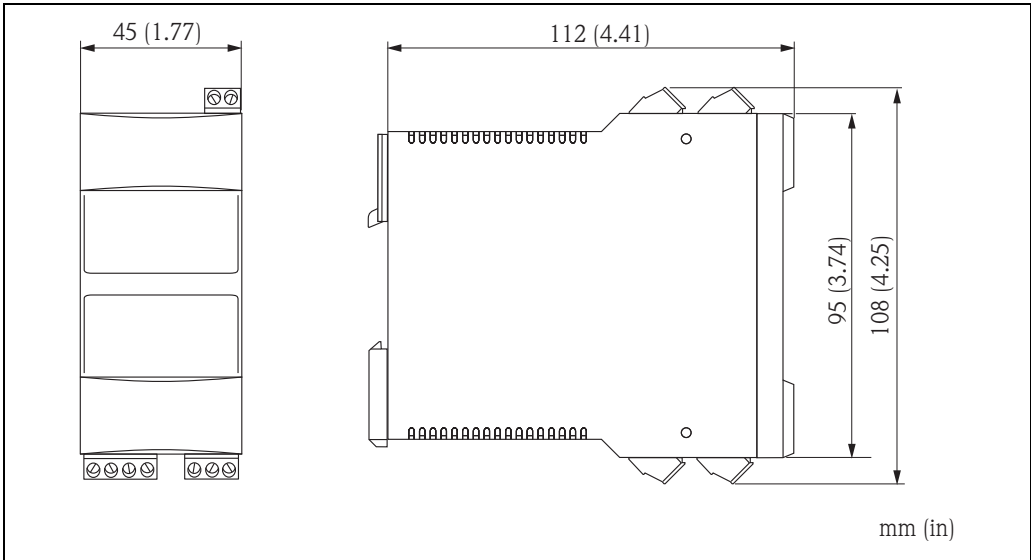
Design, dimensions

- Housing: plastic row housing
- Mounting: on DIN rail to EN 60715 TH 35-7.5 or EN 60715 TH 35-15



L00-FTC625xx-06-06-xx-xx-001

Dimensions



L00-FTC625xx-06-06-xx-xx-002

Weight

Approx. 270 g (9.52 oz)

Material

Housing

- Polycarbonate
- Color: light-gray

Front cover

- Polypropylene PPN
- Color: charcoal-gray

Fixing slide (for securing on DIN rail)

- Polycarbonate
- Color: light-gray

Terminals

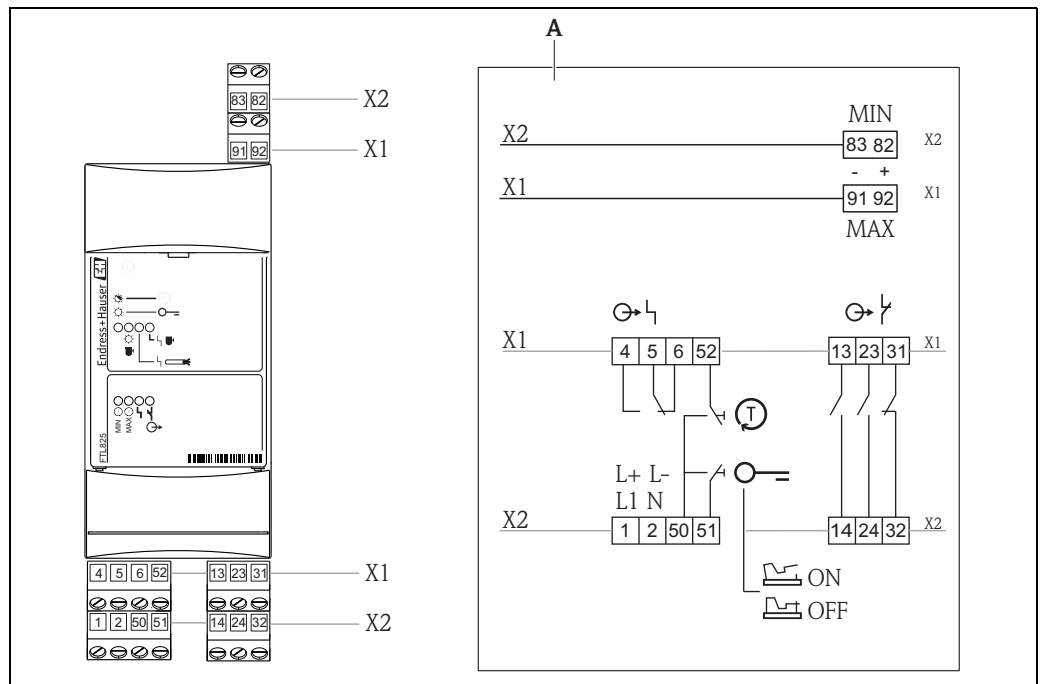
Nivotester FailSafe FTL825

Top terminal blocks

- 2 screw terminals (X1, gray): sensor connection MAX detection (91, 92)
- 2 screw terminals (X2, gray): sensor connection MIN detection (83, 82)

Bottom terminal blocks

- 4 screw terminals (X1, gray): fault-signaling relay (4, 5, 6) and remote control (52)
- 4 screw terminals (X2, green): supply voltage (1, 2) and unlocking (50, 51)
- 3 screw terminals (X1, gray): safety contacts (13, 23) and signaling contact (31)
- 3 screw terminals (X2, gray): safety contacts (14, 24) and signaling contact (32)



A Front flap (open)

Cross-section for connection

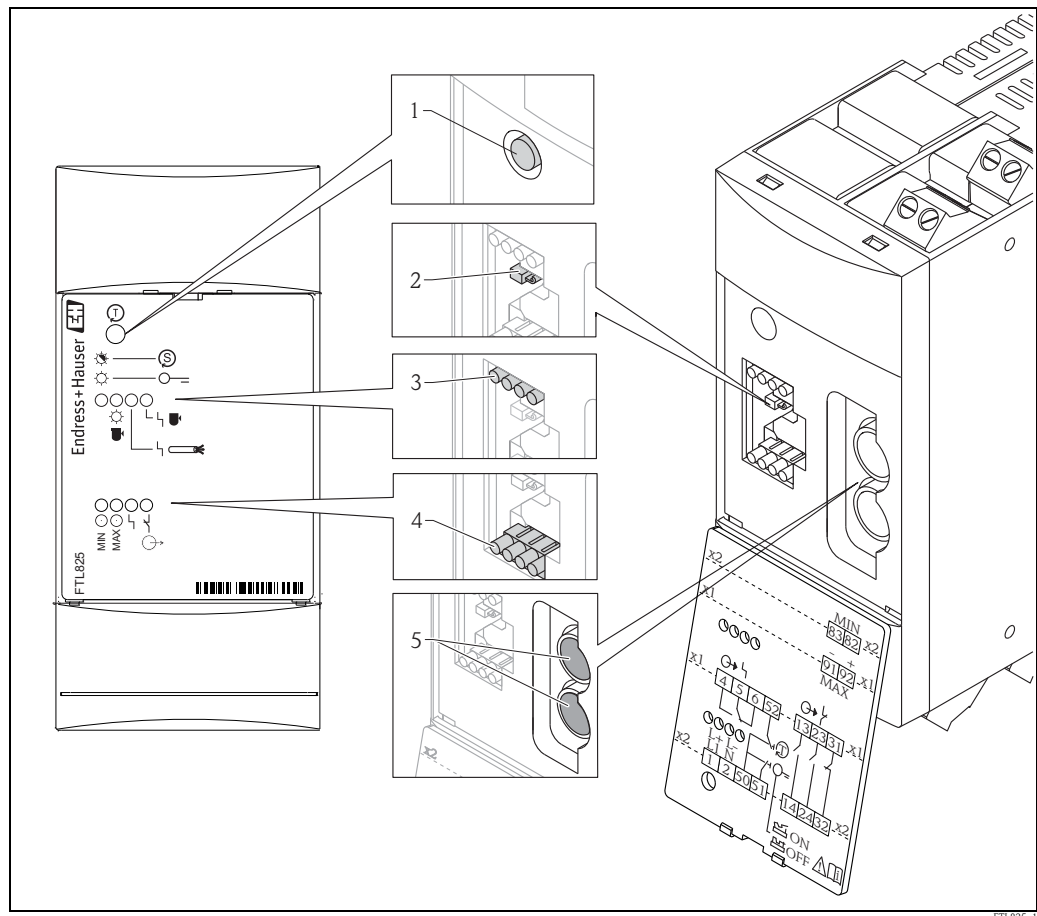
Maximum: 1 x 2.5 mm² (1 x 14 AWG) or 2 x 1.5 mm² (2 x 16 AWG)

Human interface

Operating concept

Local configuration with proof test button and interlock switch behind retractable front panel

Operating and display elements



Operating elements

- 1: proof test button
- 2: interlock switch

Display elements: light emitting diodes (LEDs)

3: LEDs (from left)

- LIVE signal and lock (yellow)
- Sensor covered (yellow)
- Faulty wiring (red)
- Liquiphant fault (red)

4: LEDs (from left)

- MIN operating mode (green)
- MAX operating mode (green)
- Nivotester fault (red)
- Safety contacts closed (yellow)

Fuses

5: two replaceable fuses for the two safety contacts

Certificates and approvals

CE mark, Declaration of Conformity	The devices are designed to meet state-of-the-art safety requirements, have been tested, and left the factory in a condition in which they are safe to operate. The devices comply with the applicable standards and regulations that are listed in the EC Declaration of Conformity and thus meet the legal requirements of the EC Directives. Endress+Hauser confirms the conformity of the device by affixing to it the CE mark.
Ex approval	Information about currently available Ex versions (IECEx; ATEX Ex ia; TIIS; NEPSI; FM IS; CSA IS) is supplied by your E+H Sales Center. All explosion protection data are given in a separate documentation (see: Documentation) which is available upon request.
Type of protection	[Ex ia] IIC
Overfill protection and leakage (WHG)	<ul style="list-style-type: none"> ■ Overfill detection system: Z-65.11-507 ■ Leak detection system: Z-65.40-508
Marine approval	GL, ABS marine approval
Other standards and guidelines	Other standards and guidelines which were observed when designing and developing the Nivotester FTL825. <ul style="list-style-type: none"> ■ EN 60529 Degrees of protection provided by enclosures (IP code) ■ EN 61010 Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures ■ EN 61326 Interference emission (electrical Class B), interference immunity (Appendix A - industrial) ■ IEC 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems (E/E/PES)
Liquefied gas approval	VdTÜV100
Functional safety	Up to SIL3 in conjunction with FEL85 for safety functions (MIN/MAX detection). Please follow the instructions in Functional safety manual SD00350F!

Ordering information



Note!

Further information 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 of protection class IP66 is equipped with an integrated DIN rail and is closed with a transparent cover which can be lead-sealed.
	Dimensions in mm (in): B: 180 (7.09)/ H 182 (7.17)/ T 165 (6.5)
	Color: light-gray Item number: 52010132

Documentation

Technical Information (TI)	<ul style="list-style-type: none"> ■ Liquiphant FailSafe FTL8x Point level switch for liquids TI01026F/00/en ■ Protective housing TI00367F/00/en
Operating Instructions (BA)	<ul style="list-style-type: none"> ■ Nivotester FailSafe FTL825 Point level switch with intrinsically safe signal circuit for point level switches BA01038F/00 ■ Liquiphant FailSafe FTL8x Point level switch for liquids BA01037F/00
Functional safety	<ul style="list-style-type: none"> ■ Nivotester FTL825 SD00350F/00/en
Safety Instructions (ATEX, NEPSI, Control Drawings)	<p>DIBt:</p> <ul style="list-style-type: none"> ■ Liquiphant and Nivotester FailSafe FTL8x, FTL825 ZE00xxxF/00/en

Document	Type of protection
XA00603F	ATEX Ex ia G/D ATEX II (1)G [Ex ia Ga] IIC ATEX II (1)D [Ex ia Da] IIIC, IECEx Ex ia G/D IECEx [Ex ia Ga] IIC IECEx [Ex ia Da] IIIC, ATEX/IECEx Ex ia G/D ATEX II (1)G [Ex ia Ga] IIC ATEX II (1)D [Ex ia Da] IIIC IECEx [Ex ia Ga] IIC IECEx [Ex ia Da] IIIC
XA00647F	CSA C/US AIS/ANI AIS Cl. I, II, III, Div 1, Gr. A-G, [AEx/Ex ia] IIC ANI Cl. I, Div 2 Gr. A-D [AEx/Ex ic/nL] IIC
XA00646F	FM C/US AIS/ANI AIS Cl. I, II, III, Div 1, Gr. A-G, [AEx/Ex ia] IIC ANI Cl. I, Div 2 Gr. A-D [AEx/Ex ic/nL] IIC
XA00663F	NEPSI Ex ia G/D NEPSI [Ex ia Ga] IIC NEPSI [Ex ia Da] IIIC

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel.+41 61 715 81 00
Fax+41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser 
People for Process Automation

