



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Operating Instructions

Nivotester FailSafe FTL825

Vibronic

With intrinsically safe signal circuit for point level switch

Liquiphant FailSafe FTL8x

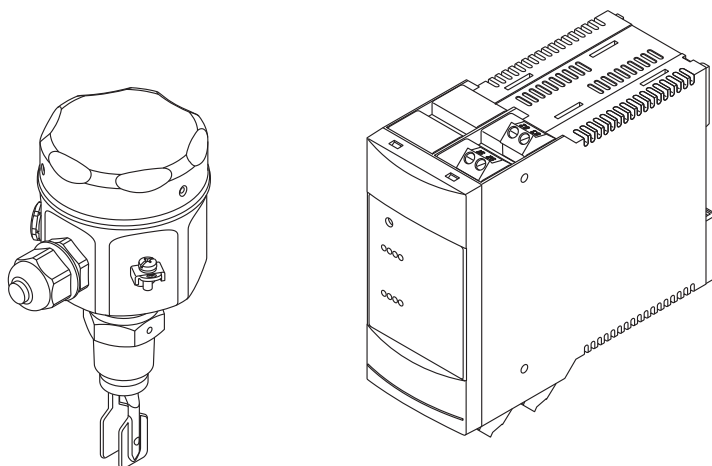


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1 Important document information

1.1 About this document

1.1.1 Document function

These Operating Instructions contain all the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.

1.1.2 Additional standard device documentation

Document	Purpose and content of the document
TI01027F	Planning aid for your device (Technical Information) The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
TI00367F	Protective housing IP 66 for field mounting of top-hat rail devices
SD00350F	Functional Safety Manual

1.1.3 Safety Instructions (XA) for the device

Depending on the device approval Safety Instructions (XA) are supplied with the device. These are considered an integral part of the Operating Instructions.



Note!

The document types listed are available at: www.endress.com → Download

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

1.2 Notes on safety conventions and icons

In order to highlight safety-related or alternative operating procedures in the manual, the following conventions have been used, each indicated by a corresponding icon in the margin.

Safety instructions	
	Warning! Indicates an action or procedure which, if not performed correctly, can result in serious personal injury, a safety hazard or the destruction of the device.
	Caution! Indicates an action or procedure which, if not performed correctly, can result in personal injury or the incorrect operation of the device.
	Note! Indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.
Type of protection	
	Explosion-protected, type-examined equipment If this symbol appears on the nameplate of the device, the device can be used in hazardous or non-hazardous areas according to its approval.
	Hazardous area This symbol is used in the drawings of these Operating Instructions to indicate hazardous areas. Devices in hazardous areas, or cables for such devices, must have an appropriate type of protection.
	Safe area (non-hazardous area) This symbol is used in the drawings of these Operating Instructions to indicate non-hazardous areas. Devices in the non-hazardous area also have to be certified if connecting cables lead into the hazardous area.
Electrical symbols	
	Direct current A terminal at which DC voltage is present or through which direct current flows.
	Alternating current A terminal at which alternating voltage (sinusoidal) is present or through which alternating current flows.
	Connecting cable immunity to temperature change Indicates that the connecting cables must be able to withstand temperatures of at least 85 °C.
LED symbols	
	Not relevant
	Off
	Flashing
	Lit

2 Basic safety instructions

2.1 Personnel requirements

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- Trained, qualified specialists must have a relevant qualification for this specific task
- Are authorized by the plant owner/operator
- Are familiar with federal/national regulations
- Before beginning work, the specialist staff must have read and understood the instructions in the Operating Instructions and supplementary documentation as well as in the certificates (depending on the application)
- Follow instructions and comply with conditions
- Be instructed and authorized according to the requirements of the task by the facility's owner-operator
- Follow the instructions in these Operating Instructions

2.2 Designated use

Functional Safety Manual



Caution!

Pay close attention to the information in the separate SIL documentation SD00350F for functional safety requirements in accordance with IEC 61508.

Application and media

The measuring device described in this manual may only be used in conjunction with Liquiphant FailSafe FTL8x from Endress+Hauser. In compliance with the limit values specified in the "Technical data" section and the general conditions indicated in the manual and supplementary documentation, the measuring system may only be used for the following measurements:

- Measured variables: point level

To ensure that the measuring device remains in proper operating condition for its service life, all the limit values must be observed.

- Technical data in the related documentation →  3.

Incorrect use

The manufacturer is not liable for damage resulting from improper or non-designated use.

2.3 Occupational safety

When working on or with the device, always wear the necessary personal protective equipment as defined in national regulations.

2.4 Operational safety



Caution! Risk of injury.

- Only operate the device if it is in a perfect technical condition free from errors and faults.
- The operator is responsible for the trouble-free operation of the device.

Conversions to the device

Unauthorized modifications to the device are not permitted.

Repair

To ensure operational safety:

- Only perform repair work on the device if this is expressly permitted.
- Comply strictly with national regulations concerning the repair of electrical equipment.
- Only use genuine Endress+Hauser spare parts and accessories.

Hazardous area

To exclude any risks to individuals or the facility when operating the device in the hazardous areas (e.g. explosion protection, pressure equipment safety):

- Based on the nameplate, check whether the ordered device is permitted for the intended use in the hazardous area.
- Comply with the instructions in the separate supplementary documentation, which is an integral part of this manual.

2.5 Product safety

This measuring device is designed to meet state-of-the-art safety requirements in accordance with sound engineering practice, has been tested and left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. Furthermore, it complies with the EC directives which are listed in the device-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

3 Product description

The Nivotester FailSafe FTL825 is a transmitter power supply unit for the Liquiphant FailSafe FTL8x. Outstanding features of the Nivotester FailSafe FTL825 include:

- Fail-safe point level detection in liquids
- For point level switches up to Zone 0
- Pump dry running protection and overflow protection for tanks with flammable, explosive, toxic (water-polluting) liquids
- Use in safety systems requiring functional safety to SIL3 in accordance with IEC 61508 Ed.2.0 / IEC 61511-1 / ISA 84-1

3.1 Signal transmission

The Nivotester supplies direct current to the Liquiphant FailSafe FTL8x point level switch via a two-wire cable. At the same time, it analyzes the current values (4 to 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.

LIVE signal

It is possible to automatically check whether a Liquiphant FailSafe FTL8x is connected. For this purpose a LIVE signal is modulated within the range limits.

The LIVE signal is a square-wave signal of 0.25 Hz and ± 0.5 mA amplitude (the signal changes by 1 mA every 2000 ms ± 50 ms).

3.2 Signal analysis

The Nivotester FailSafe FTL825:

- Evaluates the current 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 on the front panel by means of a yellow LED

3.3 Product structure

3.3.1 Top terminal blocks

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

3.3.2 Bottom terminal blocks

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

3.3.3 Proof test button

The proof test button is used to confirm configuration changes and enable the proof test.

3.3.4 Interlock switch

The interlock switch is used to secure a certain operating mode.

3.3.5 Light emitting diodes (LEDs)

The light emitting diodes are used to indicate different operating states.

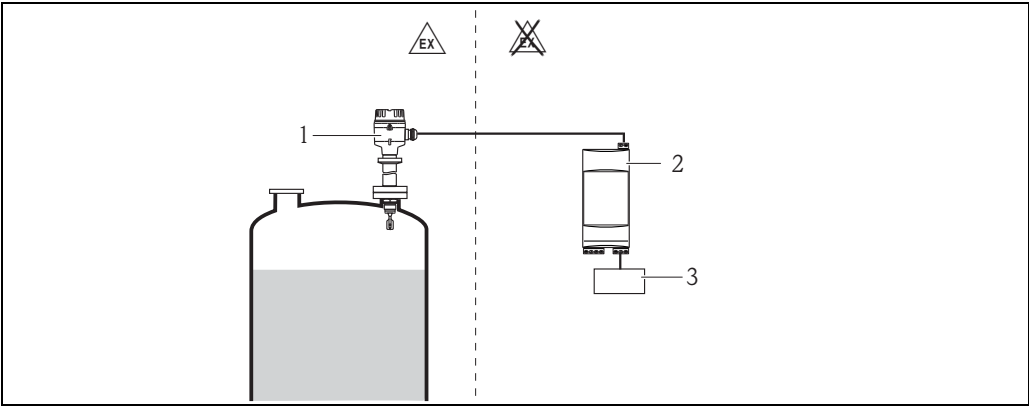
3.3.6 Fuses

The two output channels are protected against damage by two fuses.

3.4 System components

The measuring system consists of the following components:

- Nivotester FailSafe FTL825 (transmitter supply unit)
- Liquiphant FailSafe FTL8x with FEL85 electronic insert (point level switch)

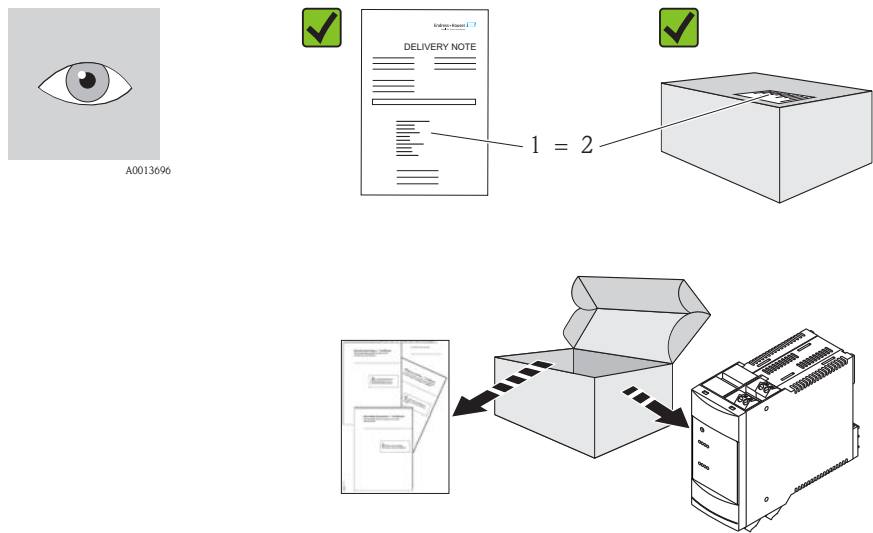


- 1 *Liquiphant FailSafe FTL8x with FEL85 electronic insert (4-20 mA)*
2 *Separate switching unit: Nivotester FailSafe FTL825*
3 *Actuator*

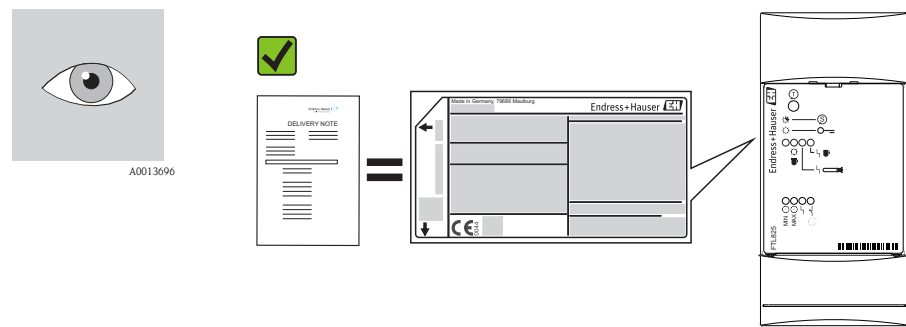
4 Incoming acceptance and product identification

4.1 Incoming acceptance

Is the order code on the delivery note (1) identical to the order code on the product sticker (2)?



Do the data on the nameplate match the order data and the delivery note?



TI01005F_xx_018

4.2 Product configuration: www.endress.com

Detailed ordering information is available:

- In the Product configurator on the Endress+Hauser website: www.endress.com → Select country → Instruments → Select device → Product page function: Configure this product
- From your Endress+Hauser sales center: www.endress.com/worldwide



Note! Product configurator – the tool for individual product configuration

- Up-to-date configuration data
- Direct entry of data specific to the measuring point, such as the measuring range or operating language, depending on the device
- Exclusion criteria automatically checked
- Automatic order code generation with code breakdown output in PDF or Excel format
- Possible to order directly in the Endress+Hauser online shop

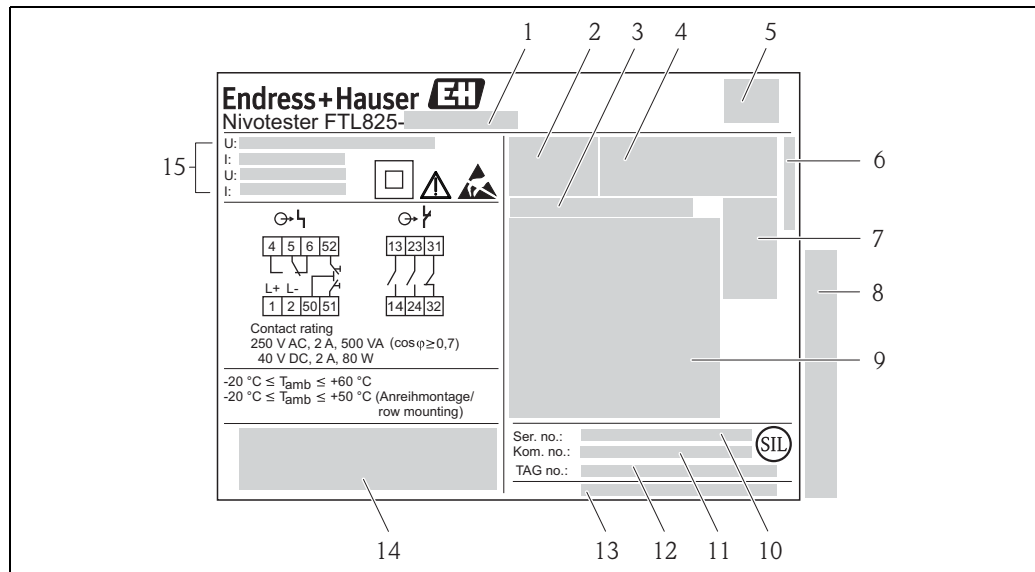
4.3 Product identification

It is possible to identify the measuring device in the following ways:

- Using the nameplate specifications
- Using the order code with a breakdown of the device features on the delivery note
- By entering the serial number on the nameplates into the W@M Device Viewer (www.endress.com/deviceviewer): All the information pertaining to the measuring device is displayed.

For an overview of the scope of the technical documentation supplied with the device, enter the serial number on the nameplates into the W@M Device Viewer (www.endress.com/deviceviewer)

4.3.1 Nameplate



BA01038F_04

- 1 Order code
- 2 Certificate symbols
- 3 Document numbers of Safety Instructions: e.g. XA, ZD, ZE
- 4 Certificate- and approval-specific data
- 5 CE mark
- 6 Layout number
- 7 Power supply data
- 8 Barcode (serial number)
- 9 Information on certificates and approvals
- 10 Serial number
- 11 Order number
- 12 TAG number
- 13 Manufacturer's address
- 14 Barcode (order number)
- 15 Connection data

5 Storage and transport

5.1 Storage conditions

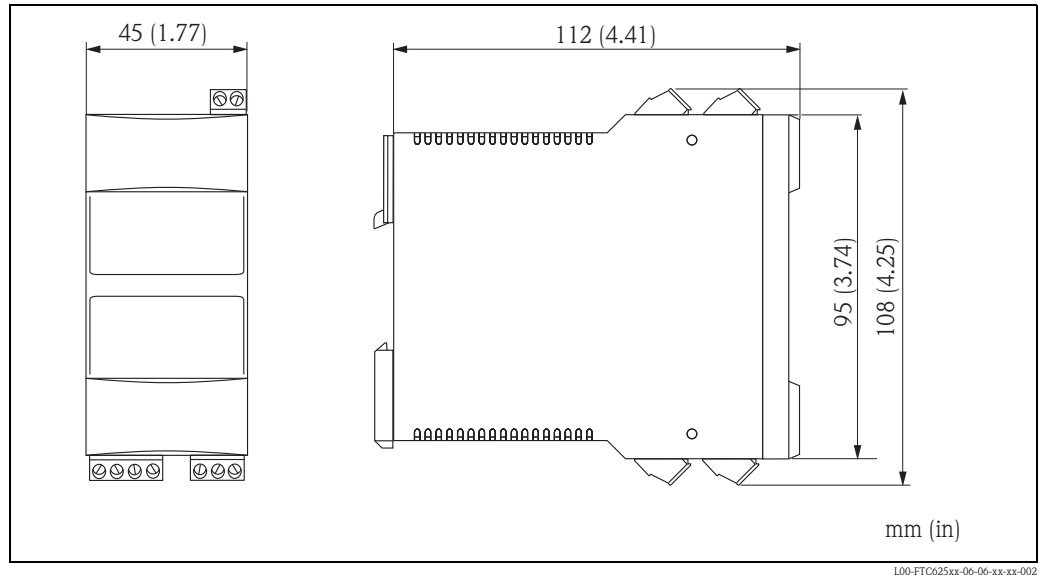
-20 to +85 °C preferably at +20 °C (-4 to +185 °F preferably +68 °F)

5.2 Transporting the product

Transport the measuring device to the measuring point in its original packaging.

6 Installation

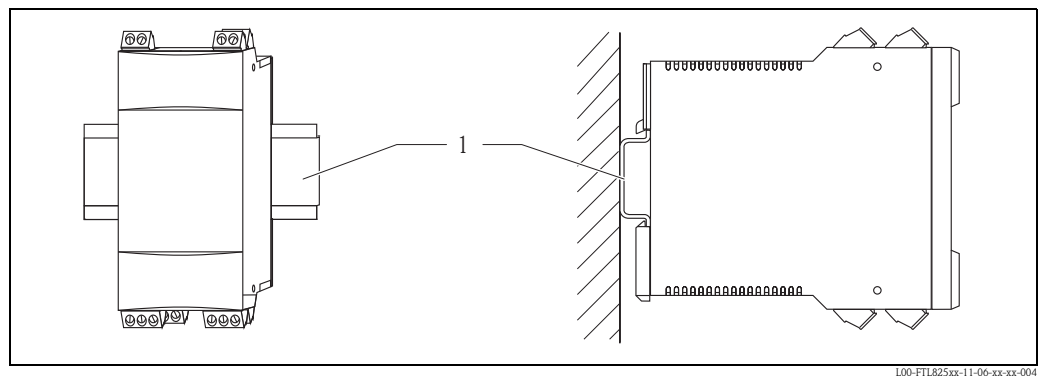
6.1 Dimensions



6.2 Installation instructions

6.2.1 Orientation

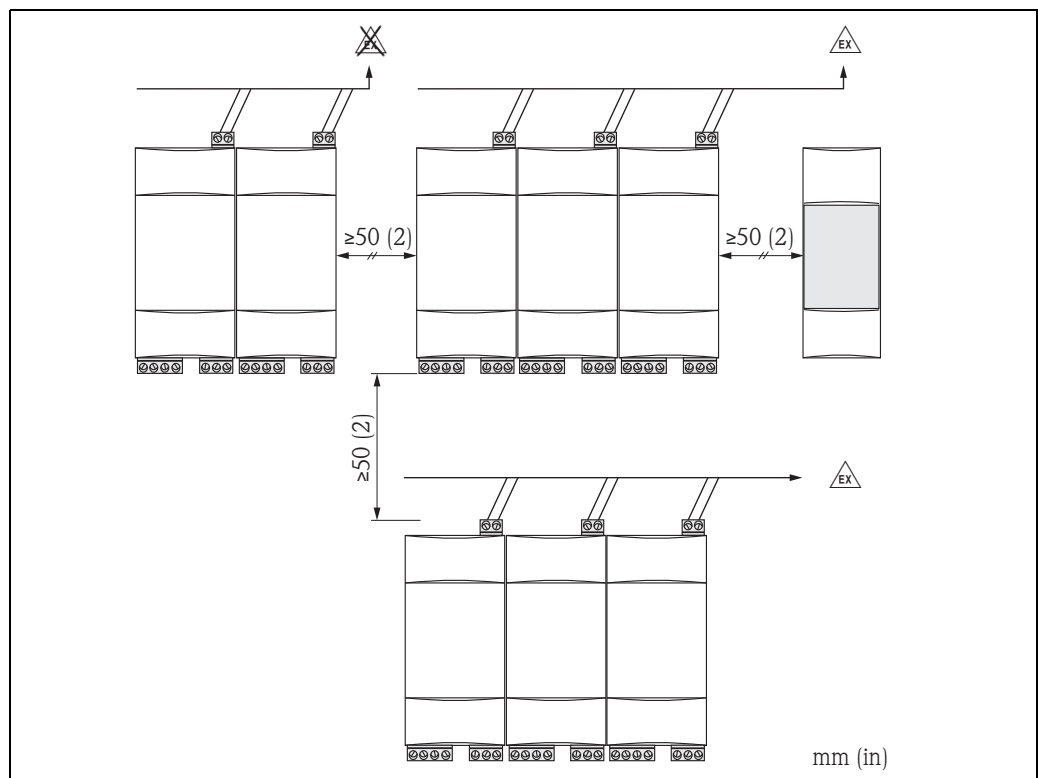
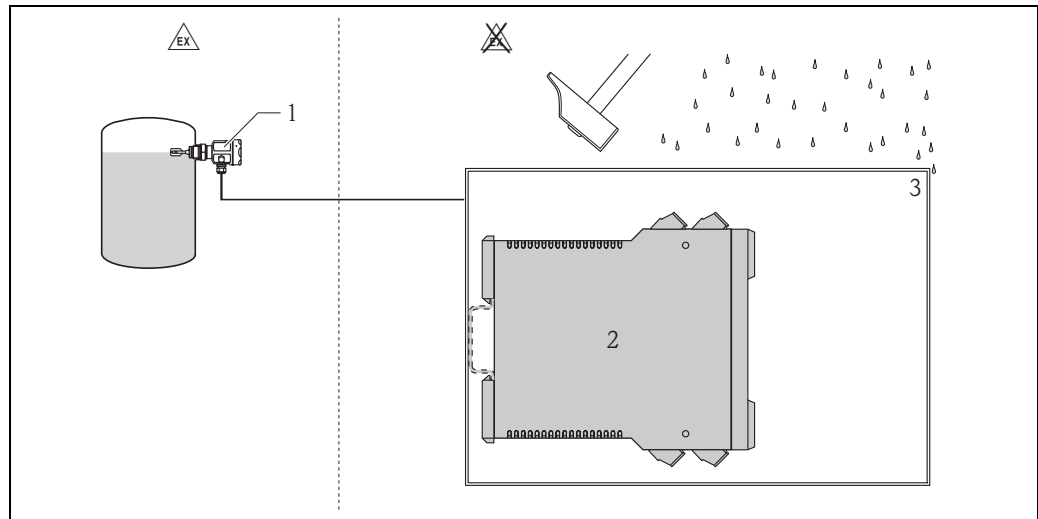
- Housing: plastic row housing
- Mounting: vertically, on DIN rail to EN 60715 TH 35-7.5 or EN 60715 TH 35-15



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)

6.2.2 Installation location

The Nivotester must be installed outside the hazardous area. It has been designed for installation in a cabinet. A protective housing (IP66) for up to two Nivotester FailSafe FTL825 devices is also available for mounting in the open air. For additional information on the protective housing: → 3 "Additional standard device documentation"



6.2.3 Environment

For individual mounting

- -20 to $+60$ °C (-4 to $+140$ °F)

For series mounting without lateral spacing

- -20 to $+50$ °C (-4 to $+122$ °F)

When installing in protective housing

- -20 to +50 °C (-4 to +122 °F)
- A maximum of three Nivotesters may be installed in the protective housing in order to ensure adequate ventilation. For further information on the protective housing: →  3 "Additional standard device documentation"

**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.

6.2.4 Climatic and mechanical application class

3K3

In accordance with DIN EN 60721-3-3

3M2

In accordance with DIN EN 60721-3-3

Humidity

- 5-95% (non-condensating)

6.2.5 Vibration resistance

As per IEC 60068-2-64, load class 0.5 (m/s²)/Hz, 3 x 100 minutes

6.2.6 Degree of protection

IP20

6.2.7 Electromagnetic compatibility (EMC)

Interference emission to EN 61326, Electrical Equipment Class B

Interference immunity to EN 61326-3-2; Appendix A (industrial) and NAMUR Recommendation NE 21

6.2.8 Material**Housing**

- Polycarbonate
Color: light-gray

Front cover

- Polypropylene PPN
Color: charcoal-gray

Fixing slide (for securing on DIN rail)

- Polycarbonate
Color: light-gray

6.2.9 Weight

Approx. 270 g (9.52 oz)

6.3 Mounting the device

6.3.1 Tools

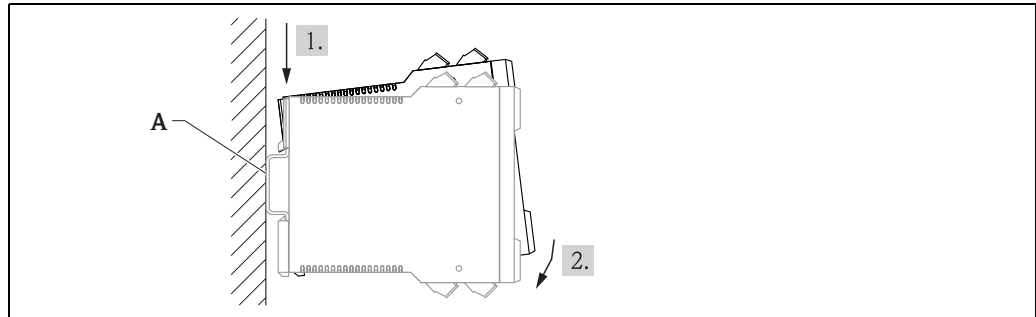
Screwdriver

6.3.2 Installation in a cabinet



Caution!

Comply with instructions concerning the installation location and spacing! → 11 "Installation location"

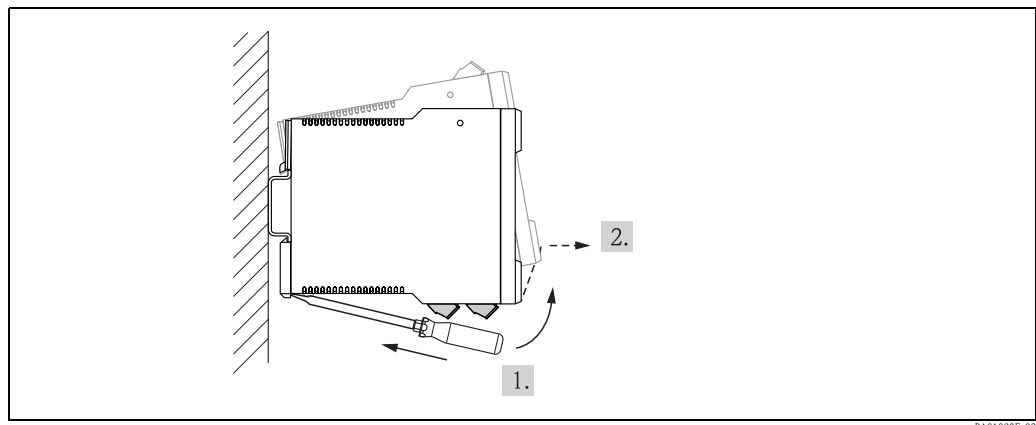


A EN 500222 TH 35-7.5 mm (1.38-0.3 in) or EN 60715 TH 35-15 mm (1.38-0.6 in)

Locking the device into place on the top-hat rail:

1. Fit the device on the top-hat rail.
2. Press the device onto the top-hat rail until it snaps into place.

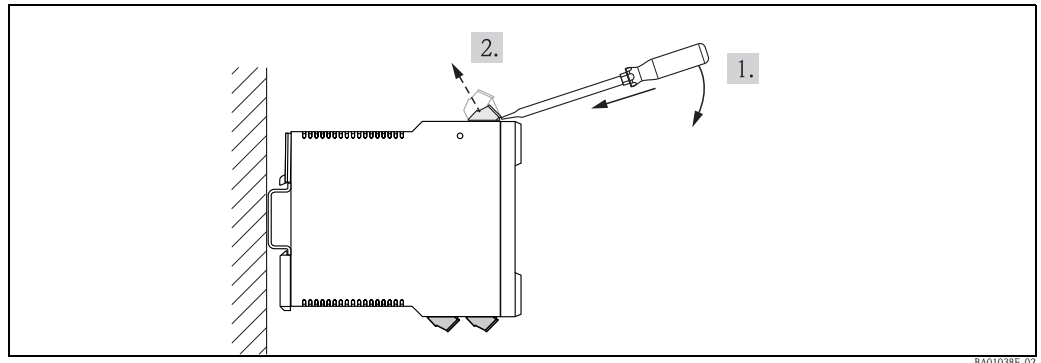
6.3.3 Removing the device from the top-hat rail



Example

1. Push down the catch.
2. Lift the device slightly.

6.3.4 Removing the terminal blocks



Example

1. Use the screwdriver as a lever.
2. Lift up the terminal block.

6.4 Post-installation check

- ☐ Is the device undamaged (visual inspection)?
- ☐ Does the device meet the specifications of the measuring point, e.g. ambient temperature?
- ☐ Are the measuring point identification and labeling correct (visual inspection)?
- ☐ Is the device adequately protected from precipitation and direct sunlight?
- ☐ Are the securing screw and securing clamp securely tightened?
- ☐ Have functional safety requirements been considered (optional)?

7 Electrical connection



Caution!
Comply with national standards and regulations!

7.1 Cable diameter and wire cross-section

Maximum permitted wire cross-section 1 x 2.5 mm² (1 x 14 AWG) or 2 x 1.5 mm² (2 x 16 AWG).
For additional information, see Operating Instructions BA01037F for Liquiphant FailSafe FTL8x.

7.2 Connection data

7.2.1 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.

7.2.2 Connecting the point level switch (top terminal blocks)

Only one single Liquiphant FailSafe FTL8x point level switch may be connected to the Nivotester FailSafe FTL825. 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 cable capacitance 100 nF (typically 1000 m (3281 ft)).

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.

7.2.3 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, →  3.

7.2.4 Connecting the signal and control units (bottom terminal blocks)

Pay attention to the function of the output contacts 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 contacts.

- Relay outputs:
 - 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 with connection wiring)
 - One floating NC contact (signaling contact)
 - Fault-signaling relay: floating changeover contact for fault signaling
- Switching capacity per relay contact:
 - 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

7.2.5 Connecting the supply voltage (bottom terminal blocks)

As a non-replaceable 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.

7.3 Power supply

7.3.1 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

7.3.2 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} = 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)

7.3.3 Galvanic isolation

All the input and output channels and the relay contacts are galvanically isolated safely from one another. 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.

7.4 Connecting the device

7.4.1 Connection depending on the operating mode

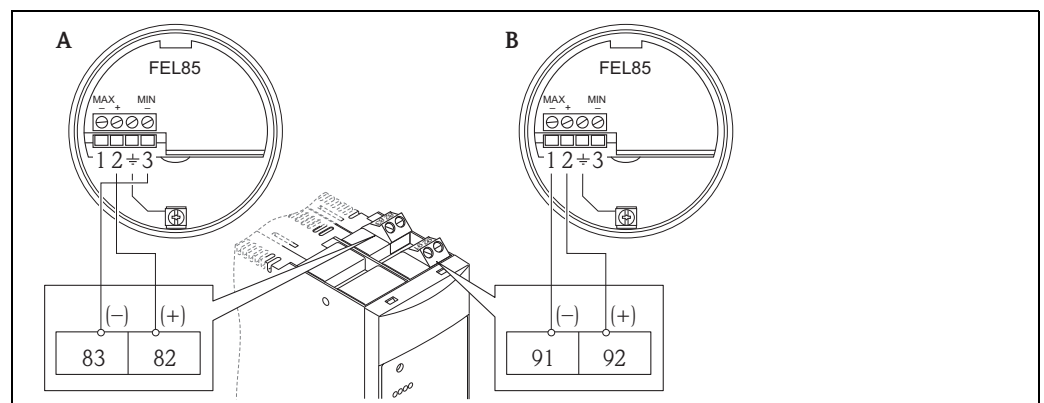
Minimum/maximum detection (MIN/MAX) is selected by connection coding on the electronic insert.

A: MIN = minimum detection:

The output switches in a safety-oriented manner when the probe is uncovered (demand mode). Used for dry running protection, pump protection for example.

B: MAX = maximum detection:

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

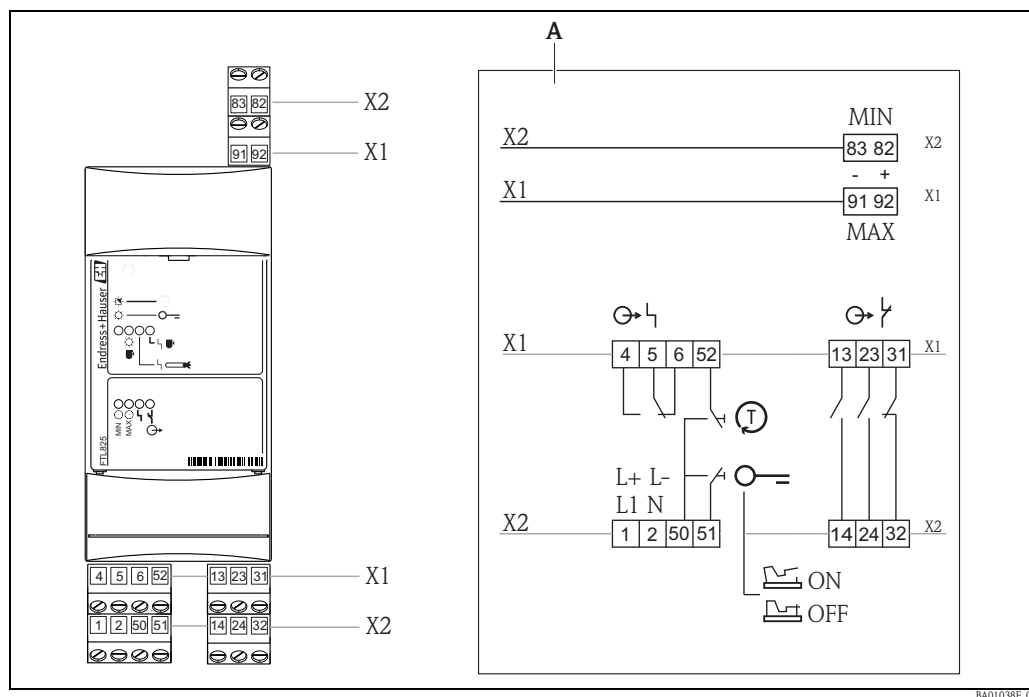


A Minimum detection (dry running protection)

B Maximum detection (overflow protection)

SD00350Fxx11

7.4.2 All the connections on the Nivotester FailSafe FTL8x



A Front cover (open)

Terminal blocks:

X1, gray (top): 2 screw terminals, sensor connection MAX detection (91, 92)

X2, gray (top): 2 screw terminals, sensor connection MIN detection (83, 82)

X1, gray (bottom): 4 screw terminals, fault-signaling contact (4, 5, 6) and remote control (52)

X2, green (bottom): 4 screw terminals, supply voltage (1, 2) and unlocking (50, 51)

X1, gray (bottom): 3 screw terminals, safety contacts (13, 23) and signaling contact (31)

X2, gray (bottom): 3 screw terminals, safety contacts (14, 24) and signaling contact (32)

7.5 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 contact is de-energized (without power) in the event of errors caused by:

- Point level switch (3.6 mA)
- Faulty wiring
- Nivotester
- No LIVE signal

Additional information → 24 "Troubleshooting".

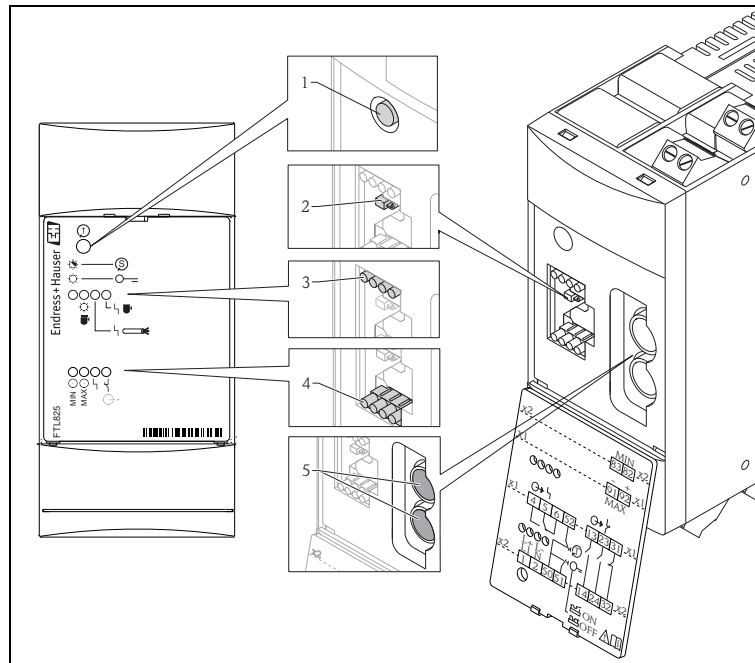
7.6 Post-connection check

- ☐ Are cables or the device undamaged (visual inspection)?
- ☐ Do the cables used comply with the requirements?
- ☐ Does the supply voltage match the specifications on the nameplate?
- ☐ Is the terminal assignment correct?
- ☐ If power is supplied, is the device ready for operation?

8 Operation

8.1 Operating and display elements

Carefully open the front cover with a screwdriver.



FTL825_1

Operating elements

- 1: proof test button (T)
- 2: interlock switch

Display elements: light emitting diodes (LEDs)

3: LEDs (from left)

- LIVE signal (flashes yellow) and interlocking (lit yellow)
- Sensor covered (yellow)
- Faulty wiring (red)
- Liquiphant fault (red)

4: LEDs (from left)

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

Fuses

5: Two replaceable fuses for the two safety contacts (→ 29 "Spare parts")
(3.15 A; T; 250 V; design 5x20)

9 Commissioning

9.1 Function check

Make sure that the post-installation and post-connection checks have been completed before you commission the measuring point:

- Checklist for "Post-installation check" → 15
- Checklist for "Post-connection check" → 18

9.2 Interlocking

Interlocking prevents the device from restarting automatically (safety contacts enabled) when the demand mode or a malfunction is over. This state is maintained until the system is unlocked again.



Note!
To use the interlock, a key must be wired between terminals 50/51. To unlock the system, these two terminals must be short-circuited for at least 1 second.



A Key to acknowledge demand mode in the interlocked state
B Configuration via the interlock switch (ON/OFF)

Configuration via the interlock switch "B"	Switch position
Interlocked (demand mode or malfunction (latching))	Open (ON)
Automatic restart (in the "Good" state)	Closed (OFF)



Note!
Each change to the configuration generates an alarm:

- LED "Nivotester fault (red)" flashes
- All outputs assume the safety-oriented state → 24 "Response of outputs to alarms"
- The change is only enabled when the proof test button is pressed by way of confirmation

If a proof test is performed in the interlocked state, the system must be unlocked afterwards before regular operation can resume.

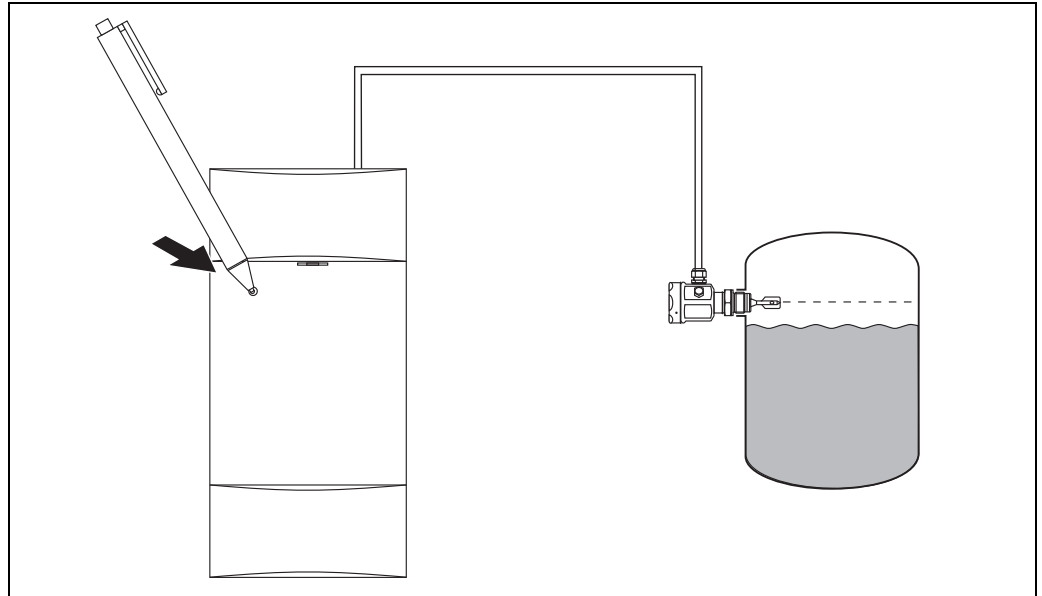
9.3 Performing a proof test

Point level detection in safety-related applications require regular proof tests (see Functional Safety Manual SD00350F). The Nivotester FailSafe and downstream system components can undergo a simple proof test. The proof test is started by pressing the proof test button or via remote control.



Note!

Once the proof test has been activated, all the relays are de-energized and all the LEDs on the Nivotester flash for 10 seconds. If all of the Nivotester's functions are operating correctly, the Nivotester resumes regular operation. If there is a fault, a fault signal is output (red LED). If a proof test is performed in the interlocked state, the demand must first be acknowledged before regular operation can resume.



100-FTL825xx-19-06-xx-xx-001

9.4 Device behavior during operation



- Note!
- Please refer to the Functional Safety Manual for applications with functional safety requirements in accordance with IEC 61508 (SIL) → 3.
 - LED signaling (off, on, flashing, not relevant): for the meaning of the LEDs please see → 4, "Notes on safety conventions and icons"

9.4.1 Device behavior during power-up

After power-up, the device goes through a diagnostic phase for a maximum of 5 seconds. All the contacts are without power during this time. The two green operation LEDs are lit. All the others are off. The following graphic provides an overview of the states of the LEDs and the contacts:

MIN			MAX		
LED signals			LED signals		
on, off, flashing			on, off, flashing		
Fault-signaling contact	Safety contact	Signaling contact	Fault-signaling contact	Safety contact	Signaling contact

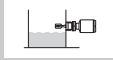
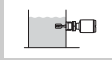
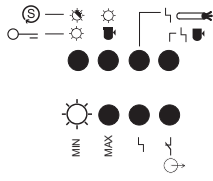
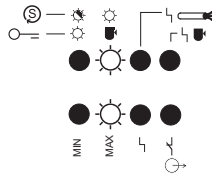
9.4.2 Device behavior in the "GOOD" state

All the contacts are energized (supplied with power) in the "Good" state. The following graphic provides an overview of the states of the LEDs and the contacts:

MIN			MAX		
LED signals			LED signals		
on, off, flashing			on, off, flashing		
Fault-signaling contact	Safety contact	Signaling contact	Fault-signaling contact	Safety contact	Signaling contact

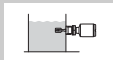
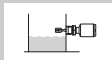
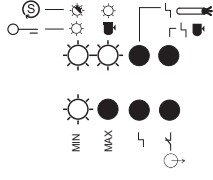
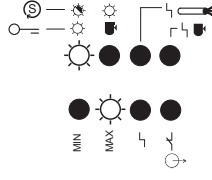
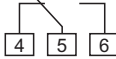
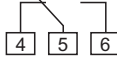
9.4.3 Device behavior in demand mode

The following graphic provides an overview of the states of the LEDs and the contacts:

MIN 			MAX 		
LED signals  ⬤ on, ○ off, ◐ flashing			LED signals  ⬤ on, ○ off, ◐ flashing		
Fault-signaling contact	Safety contact	Signaling contact	Fault-signaling contact	Safety contact	Signaling contact
					

9.4.4 Device behavior in the interlocked state

The following graphic provides an overview of the states of the LEDs and the contacts:

MIN 			MAX 		
LED signals  ⬤ on, ○ off, ◐ flashing			LED signals  ⬤ on, ○ off, ◐ flashing		
Fault-signaling contact	Safety contact	Signaling contact	Fault-signaling contact	Safety contact	Signaling contact
					

The Nivotester FailSafe FTL825 is always interlocked when it switches to the "Good" state. This state can occur after the following events:

- Demand mode
- Restart
- Alarm
- Proof test

10 Troubleshooting



- Note!
- Please refer to the Functional Safety Manual for applications with functional safety requirements in accordance with IEC 61508 (SIL) → 3.
 - LED signaling (off, on, flashing, not relevant): for the meaning of the LEDs please see → 4, "Notes on safety conventions and icons"

10.1 Response of outputs to alarms

All the contacts are without power during a malfunction.

Fault-signaling contact	Safety contact	Signaling contact

10.2 Troubleshooting



This section explains possible causes of faults, how these faults are signaled and remedial measures.

Note!
The proof test button must be pressed before troubleshooting.

Pay close attention to the following two test steps to quickly narrow down the possible causes of the fault and immediately start looking in the right fault group.

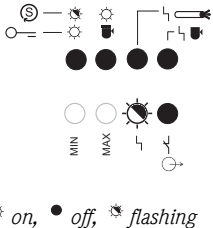
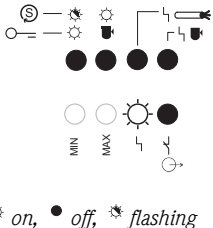
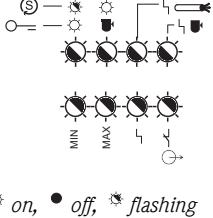
Test step 1

Is LED 1 lit or flashing?	Yes	No
	See fault group: Fault group: Nivotester → 25	See Test step 2

Test step 2

Is LED 2 lit or flashing?	Yes	No
	See fault group: Fault group: Liquiphant → 27	See fault group: Fault group: wiring → 26

10.2.1 Fault group: Nivotester

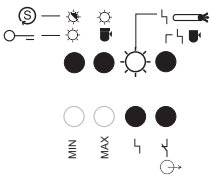
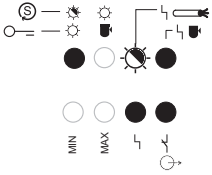
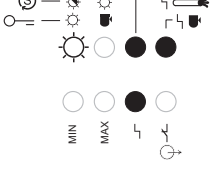
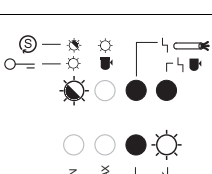
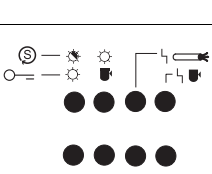
LED signals	Description
  <i>on</i>,  <i>off</i>,  <i>flashing</i>	Cause of error Change of configuration of the interlock switch has not been confirmed. Measures Press the proof test button to confirm the configuration change. See →  20 "Interlocking".
  <i>on</i>,  <i>off</i>,  <i>flashing</i>	Cause of error Error at Nivotester FailSafe FTL825. Measures ■ Restart the device by disconnecting the power supply. ■ Replace the device.
  <i>on</i>,  <i>off</i>,  <i>flashing</i>	Cause of error Short-circuit at the input of the remote control (external key: terminals 50/52). Measures Check wiring for short-circuit.



Note!

A proof test must be carried out following successful troubleshooting.

10.2.2 Fault group: wiring

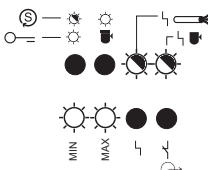
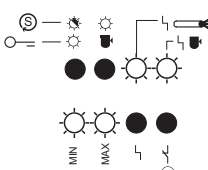
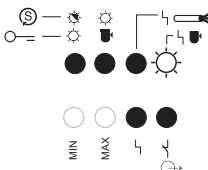
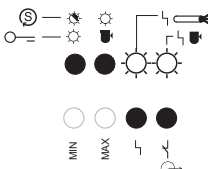
LED signals	Description
 MIN MAX L1 ☀ on, ● off, ✨ flashing	Cause of error Short-circuit in the connecting cable between the Liquiphant FailSafe FTL8x and the Nivotester FailSafe FTL825 (MIN or MAX detection). Measures Check the connecting cable.
 MIN MAX L1 L2 ☀ on, ● off, ✨ flashing	Cause of error Incorrect wiring (MIN or MAX detection) between the Liquiphant FailSafe FTL8x and the Nivotester FailSafe FTL825. Measures Check the wiring. See → 17 "Connection depending on the operating mode"
 MIN MAX L1 L2 ☀ on, ● off, ✨ flashing	Fault pattern Safety contacts remain open in the "Good" state. Cause of error Interlock was enabled but not acknowledged. Measures Unlock the interlock switch or acknowledge via external key (terminals 50/51).
 MIN MAX L1 L2 ☀ on, ● off, ✨ flashing	Fault pattern Safety contacts remain open in the "Good" state. Cause of error Fuse defective. Measures Replace defective fuse.
 MIN MAX L1 L2 ☀ on, ● off, ✨ flashing	Cause of error No power supply or defective device. Measures ■ Check the power supply and wiring. ■ Replace the device.



Note!

A proof test must be carried out following successful troubleshooting.

10.2.3 Fault group: Liquiphant

LED signals	Description
 ☼ on, ● off, ✨ flashing	Cause of error ■ No sensor connected. ■ Interruption between Liquiphant FailSafe FTL8x and Nivotester FailSafe FTL825. ■ Reversed sensor polarity. Measures ■ Connect the sensor. ■ Check the connecting cable to the sensor (interruption, reverse polarity).
 ☼ on, ● off, ✨ flashing	Cause of error ■ Short-circuit between the terminals for MIN and MAX detection on the Nivotester FailSafe FTL825. ■ Two Liquiphant FailSafe FTL8x devices connected to one Nivotester FailSafe FTL825 Measures ■ Only operate Nivotester FailSafe FTL825 with one sensor. ■ Check the connecting cable.
 ☼ on, ● off, ✨ flashing	Cause of error Error at Liquiphant FailSafe FTL8x. Measures See the "Troubleshooting" section of Operating Instructions (BA01037F) for Liquiphant FailSafe FTL8x.
 ☼ on, ● off, ✨ flashing	Cause of error ■ No LIVE signal from Liquiphant FailSafe FTL8x. ■ Wrong sensor connected (not Liquiphant FailSafe FTL8x). Measures ■ Check sensor. ■ Check the connecting cable.



Note!

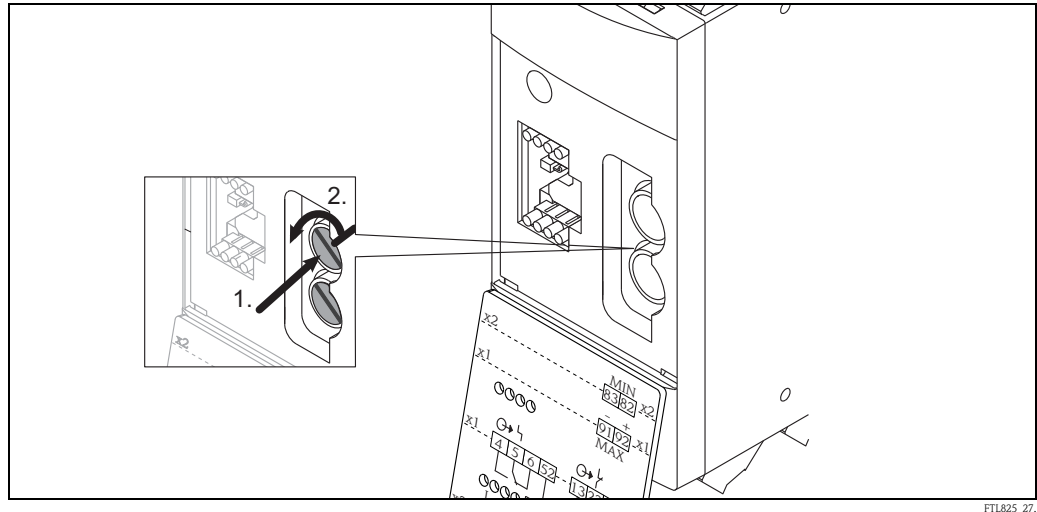
A proof test must be carried out following successful troubleshooting.

10.3 Replacing the fuses

The fuses are provided to protect the safety contacts.

Proceed as follows to change the fuses:

- Press in the fuse holder (bayonet lock) slightly with a suitable screwdriver and unscrew (1. and 2.)
- Remove the fuse holder



Note!

Suitable replacement fuses (fine-wire fuse 3.15 A; slow-blow), including a fuse holder with a bayonet lock, can be ordered as spare parts from Endress+Hauser → [29 "Spare parts"](#).

10.4 Spare parts

Information on the spare parts that are available for your measuring device is provided on the Internet site

"www.endress.com". Proceed as follows here:

1. Select "www.endress.com" and then select the country.
2. Click "Instruments"



3. Enter the product name in the "Product name" field.

Endress+Hauser Produkt Suche

Über den Produktnamen
Geben sie einen Produktnamen ein

4. Select the measuring device.
5. Switch to the "Accessories/spare parts" tab

Allgemeine Informationen	Technische Information	Dokumente/ Software	Service	Zubehör/ Ersatzteile
--------------------------	------------------------	---------------------	---------	-----------------------------

► Zubehör
▼ Alle Ersatzteile

- Gehäuse/Gehäuse Zubehör
- Dichtung
- Abdeckung
- Klemmenmodul
- HF-Modul
- Elektronik
- Hilfsenergie
- Antennenmodul

Hinweis
Hier finden Sie eine Liste mit allem verfügbaren Zubehör und Ersatzteilen. Um sich Zubehör und Ersatzteile spezifisch zu Ihrem Produkt(en) anzeigen zu lassen, kontaktieren Sie uns bitte und fragen nach unserem Life Cycle Management Service.



◀ | 1 / 2 | ▶ | 🔍

6. Select the spare parts (also use the overview drawings on the right-hand side of the screen).
- When ordering a spare part, always indicate the serial number that is indicated on the nameplate. Where necessary, replacement instructions are provided with the spare parts.

11 Technical data

For technical data, please refer to the planning aid for your device, Nivotester FailSafe FTL825
→  3, "Additional standard device documentation".

12 Repair

The devices should only ever be repaired by Endress+Hauser.

If repair work is performed by another party, there is no longer any guarantee for the safety-related functions.

Exception:

The customer may replace the following components if genuine spare parts are used, the repair technician has received appropriate training from Endress+Hauser beforehand and the repair instructions are followed:

- Fuses with holder (bayonet lock)



Note!

If one of the components mentioned above is replaced on devices deployed in SIL-certified areas, a new proof test must be performed. For further information, see SD00350F and →  3.

The replaced device must be returned to Endress+Hauser for fault analysis.

If a SIL-rated Endress+Hauser device that was operated in a protective system fails, the device must be returned along with the "Declaration of Hazardous Material and Decontamination" which must contain the information "Used as SIL-instrument in Protective System".

12.1 Repairing Ex-certified devices

The following information also has to be taken into account when repairing Ex-certified devices:

- Ex-certified devices may only be repaired by experienced, skilled staff or by Endress+Hauser Service.
- Applicable standards, national regulations as well as the Safety Instructions (XA) and certificates must be observed.
- Only genuine Endress+Hauser spare parts may be used.
- When ordering spare parts, please check the device designation on the nameplate. Only identical parts may be used as replacements.
- Carry out repairs according to the instructions. Following the repair, the individual tests specified for the device must be carried out.
- A certified device may only be converted to another certified device version by Endress+Hauser Service.
- All repairs and modifications must be documented.

12.2 Replacing a device

See post-installation check, post-connection check, operating options and commissioning.

13 Maintenance

No special maintenance work is required.

14 Return

The following procedures must be carried out before a device requiring inspection, for example, is returned to Endress+Hauser:

- Remove all residues of medium, paying special attention to the grooves for seals and crevices which could contain residues. This is particularly important if the substance is hazardous to health, e.g. flammable, toxic, caustic, carcinogenic, etc.
- Always enclose a fully completed "Declaration of Contamination" form with the device (a copy of the "Declaration of Contamination" can be found at the end of these Operating Instructions). Only then can Endress +Hauser examine and repair a returned device.
- Enclose special handling instructions if necessary, for example a safety data sheet as per EN 91/155/EEC.

In addition, specify the following:

- The chemical and physical properties of the medium
- A description of the application
- A description of the error that occurred (specify error code if possible)
- The length of time the device was in operation

15 Disposal

When disposing, separate and recycle the device components based on the materials.

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邮箱: sales@ainstru.com

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