Operating Instructions
Overfill Prevention System SOP600

For reliable and secure tank overfill prevention

Endress+Hauser
People for Process Automation

Revision history

Product version	Operating Instructions	Modifications	Comments
1.02.xx	BA01587S/04/EN/01.16	Initial version	-

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1 Document information

1.1 Document function

These Operating Instructions contain all the information that is required in 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.

1.2 Symbols used

1.2.1 Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

1.2.2 Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
▶	Notice or individual step to be observed
1., 2., 3...	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.3 Electrical symbols

Symbol	Meaning	Symbol	Meaning
⎓	Direct current	~	Alternating current
⎓ ~	Direct current and alternating current	⏚	**Ground connection** A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
⏚	**Protective ground connection** A terminal which must be connected to ground prior to establishing any other connections.	⏚	**Equipotential connection** A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

1.2.4 Software symbols

Symbol	Function	Meaning
	Login	Opens the dialog box for user login/logout
	Lamp Test	Opens the **Lamp/Horn-Test** screen
	Proof Test	Opens the **Proof-Test** screen
	Settings	Opens the **Settings** screen
	Alarms	Opens the **Alarm** screen
	Logout	Logout (the DEFAULT user is logged in automatically)
	Password	Opens the **Standard Panel Password Input** dialog box
	History	Opens the **History** screen (only users with **Operator** and **Administrator** roles)
	Module Status	Opens the **Safety I/O Module Status** screen
	Reset	Resets the safety relays (same function as door button)
	Ack. All	Acknowledge all the warnings and alarms (same function as door button)
	Ack.	Acknowledge a single warning or alarm that has been selected
	Arrow keys	Scroll up or down
	Keys with double arrows	Scroll up or down a page

Symbol	Function	Meaning
	Close	Closes the window
	Yes	Notification that the check was successful
	No	Notification that the check was not successful
	Next	Opens the next screen
	Print	Opens a new screen with a white background
	Start	Opens the **Step 1** screen and starts the proof test (High-High Level transmitter)
	Cancel	Cancels the operation
	Repeat	Repeats the operation
	Tank Sett.	Opens the **Tank Settings** screen
	Date/Time	Opens the **Date/Time** dialog box
	Test Time	Opens the **Proof-Test Time** dialog box
	License Key	Opens the **License Key** dialog box
	Remote	Opens the **Remote Modem** dialog box
	Events	Opens the **Log File** screen
	System Info	Opens the **System Info** screen
	Apply	Applies the changes made to the settings
	Enable	Enables the remote maintenance modem (after confirming with **Apply**)
	Disable	Disables the remote maintenance modem (after confirming with **Disable**)
	Overview	Opens the **Overview** screen
	Proof-Test	Opens the **Proof-Test** screen
	Lamp-Test	Opens the **Lamp-Test** screen
	Enable	Manually enable the corresponding component

1.3 Text emphasis

Emphasis	Meaning	Example
Bold	Keys, buttons, program icons, tabs, menus, commands	**Start → Programs → Endress+Hauser** In the **File** menu, select the **Print** option.
Angle brackets	Variables	<DVD drive>

1.4 Acronyms used

Acronyms	Meaning
AC	Alternating Current
AOPS	Automated Overfill Prevention System
DC	Direct Current
HMI	Human Machine Interface (e.g. operating panel)
MOPS	Manual Overfill Prevention System
PLC	Programmable logic controller (PLC)
UPS	Uninterruptible power supply
WAN	Wide Area Network (possible communication channel for remote maintenance modem)
WHG	German Federal Water Act
3G	Wireless data transmission standard (possible communication channel for remote maintenance modem)
I/O	Input/output

1.5 Valid versions

Component	Version
PLC program	V1.02.xx
HMI program	V1.02.xx
Hardware platform	V1.02.xx

1.6 Registered trademarks

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2 Basic safety instructions

2.1 Requirements for personnel

The staff responsible for installation, commissioning, diagnosis and maintenance must meet the following requirements:
- They must be suitably qualified experts who have been trained by Endress+Hauser, or they must be experts from the Endress+Hauser service organization
- The safety-related components must be installed, repaired or replaced by certified Endress+Hauser staff
- They must be authorized by the plant owner/operator
- They must be familiar with the regional/national requirements and regulations
- Prior to commencing work, the staff must have read and understood the instructions in these Operating Instructions and in the supplementary documentation (depending on the application)
- They must follow the instructions and comply with the basic requirements.

Operating personnel must meet the following requirements:
- They must be instructed and authorized to suit the requirements of the task
- They must comply with the instructions in these Operating Instructions
- They must comply with the instructions in the Functional Safety Manual

2.2 Designated use

The SOP600 has been designed as a safety function to monitor High-High Levels in tanks (1 to 16). The function is only guaranteed with appropriate Endress+Hauser point level switches (Liquiphant FTL5x, 7x or 8x (depending on the safety level)). Any other use is considered to be non-designated use. Designated use entails compliance with the operating and maintenance requirements specified by the manufacturer. Furthermore, the SOP600 must be installed in a safe environment (not in danger zones or Ex zones). It is advisable to install the SOP600 in a dry, air-conditioned room.

The SOP600 is a Safety Integrated System. Anyone making changes to the system must be appropriately trained and authorized. Any modifications to the hardware or software must be agreed beforehand with Endress+Hauser Process Solutions AG.

Dangers

It is the responsibility of the owner/operator to assess any dangers for the systems. These dangers must be assessed by the owner/operator and the measures resulting from the assessment must be implemented. While the SOP600 can be form part of such a measure, responsibility for the entire safety function always rests with the owner/operator, particularly the taking of suitable measures if the SOP600 signals an alarm. We also specifically state that relevant measures must also be assessed from a process engineering perspective.

Incorrect use

Non-designated use can compromise safety. The manufacturer is not liable for damage caused by improper or non-designated use.

2.3 Workplace safety

- Wear the necessary personal protective equipment as stipulated in regional/national regulations when working on and with the device
- When welding, do not ground the welding unit via the system
- If working on and with the device with wet hands always wear gloves due to the increased risk of electric shock

2.4 Operational safety

- Operate the device in proper technical and fail-safe condition only
- The operator is responsible for trouble-free operation of the device

2.4.1 Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers:
If, despite this, modifications are required, consult with Endress+Hauser

2.4.2 Repair

To ensure continued operational safety and reliability:
- Repairs must only be performed by certified Endress+Hauser specialists
- Observe federal/national regulations pertaining to the repair of an electrical device
- Use original spare parts and accessories from Endress+Hauser only

2.5 Product safety

This device is designed in accordance with industry practice to meet state-of-the-art safety requirements, 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. It also complies with the EC directives listed in the product-specific EC Declaration of Conformity. Endress+Hauser confirms this by affixing the CE mark to the device.

2.6 IT security

We only provide a warranty if the system is installed and used as described in the Operating Instructions. The system is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

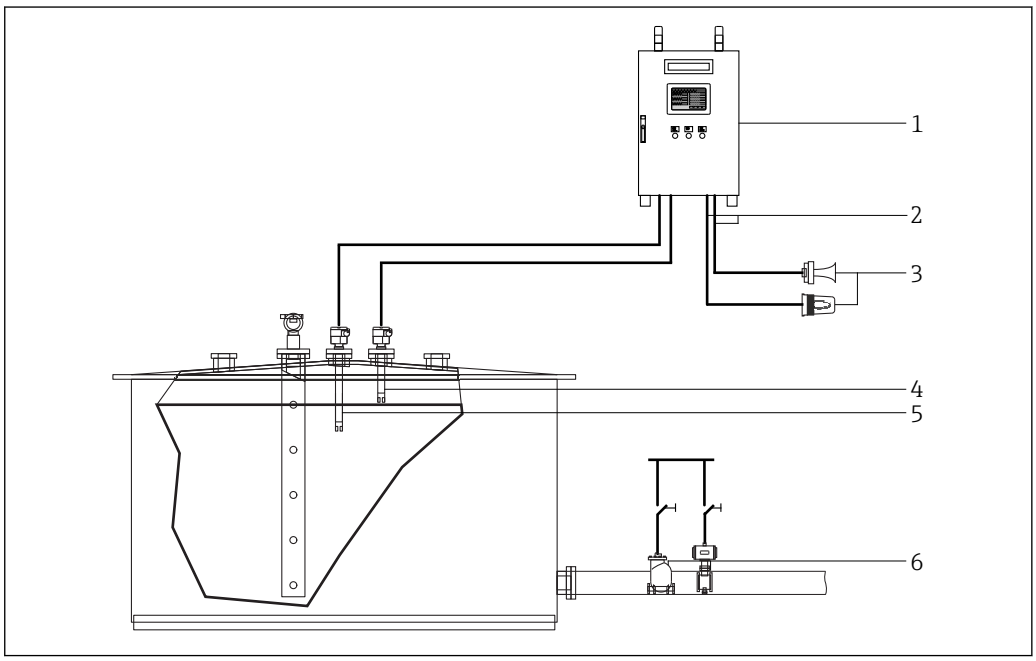
IT security measures in line with operators' security standards and designed to provide additional protection for the system and system data transfer must be implemented by the operators themselves.

3 Product description

3.1 Product design

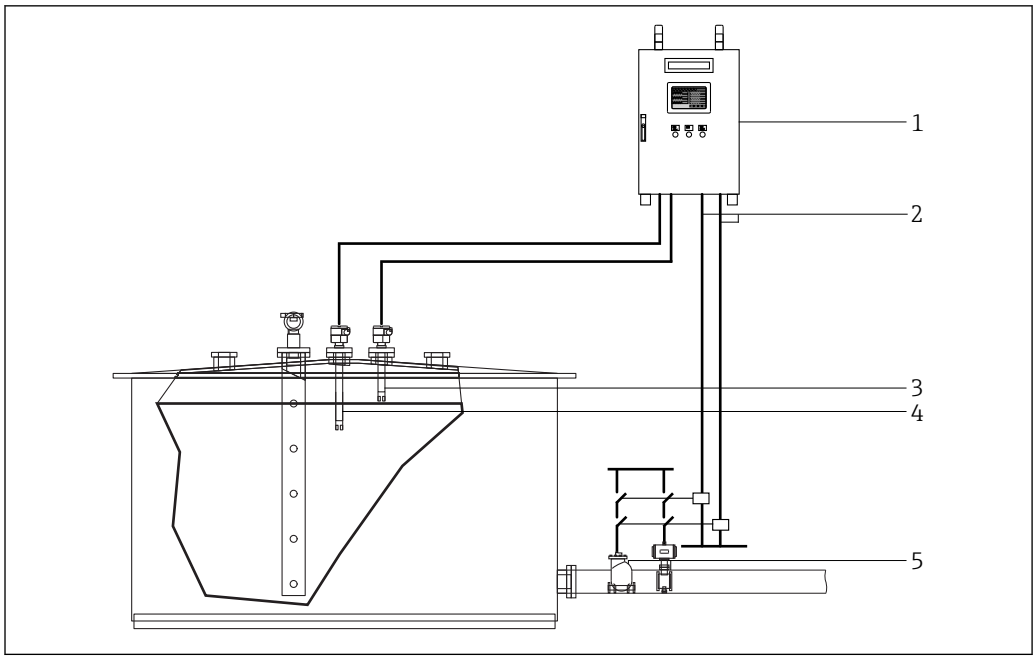
This solution package offers superior safety compliance (up to SIL3 according to IEC 61511) for an Overfill Prevention System that is primarily geared to the oil, gas and chemical industry. The system measures the level using Endress+Hauser sensors and transmitters and, in the event of an alarm, switches the safety relays and activates alarm signalization devices in the field.

The system supports Manual Overfill Prevention Systems (MOPS) and Automated Overfill Prevention Systems (AOPS). The actuator connected to the safety relay is not part of this product. Actuators are plant-specific and are therefore the responsibility of the plant owner/operator.



1 Manual Overfill Prevention System (MOPS) - overview

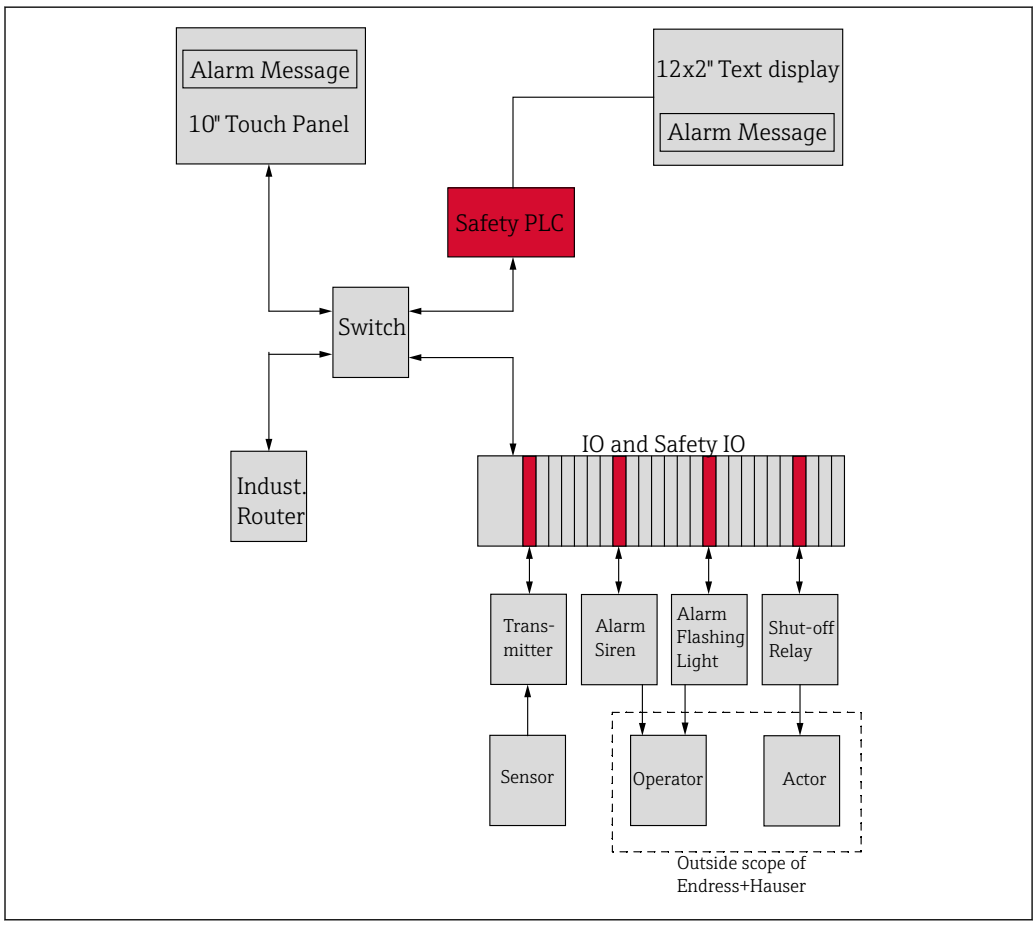
1 Cabinet for Overfill Prevention System
2 Safety relay output
3 Field signalization
4 Sensor, High-High alarm
5 Sensor, High warning
6 Actuator to be disabled manually



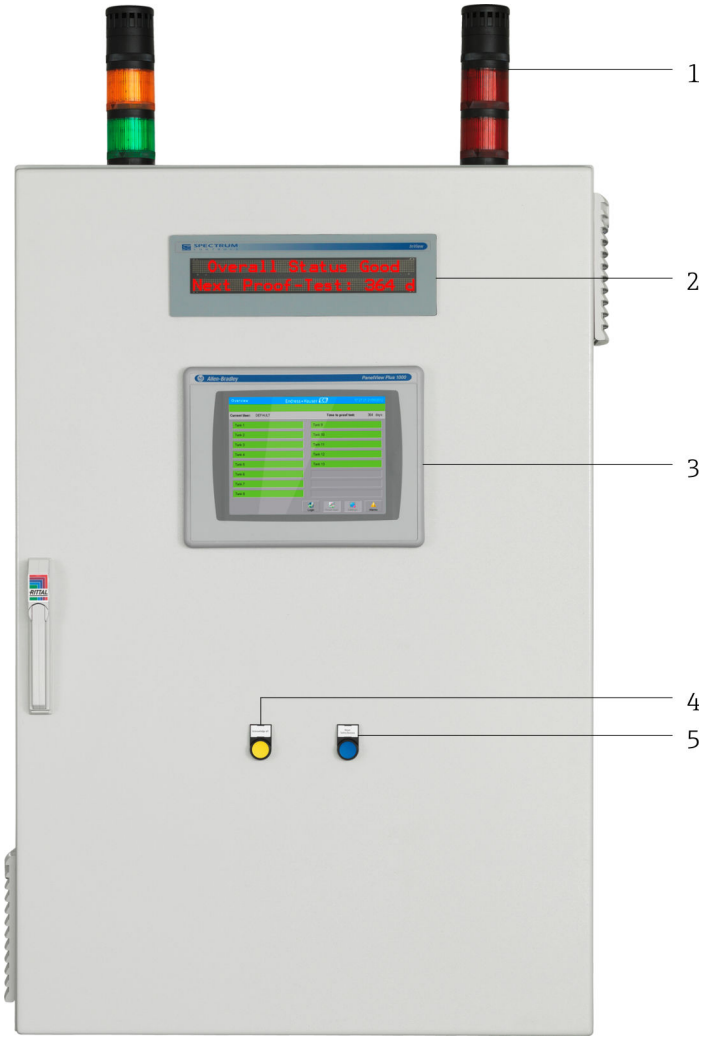
2 *Automated Overfill Prevention System (AOPS) - overview*

1 *Cabinet for Overfill Prevention System*
2 *Safety relay output*
3 *Sensor, High-High alarm*
4 *Sensor, High warning*
5 *Automatically disabled actuator*

3.1.1 System overview

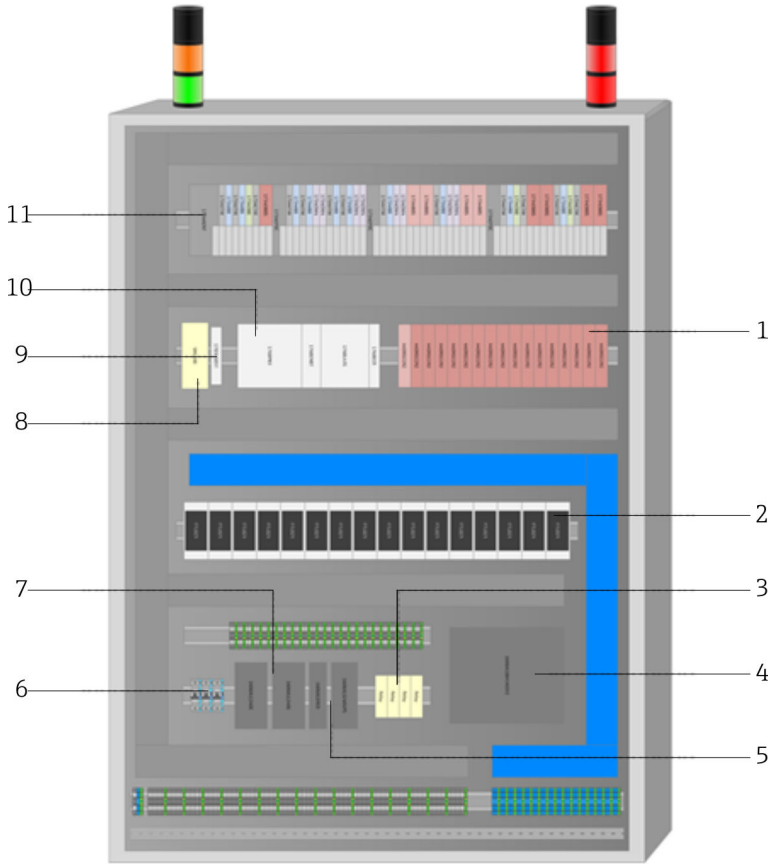


3 *System overview*



4 *Cabinet, exterior view for 16 tanks (SIL3, High-High Level, AOPS)*

1 *Control room stack lights*
2 *12 x 2" text display unit (optional)*
3 *10" touch panel*
4 *Acknowledge all button*
5 *Reset safety device button*



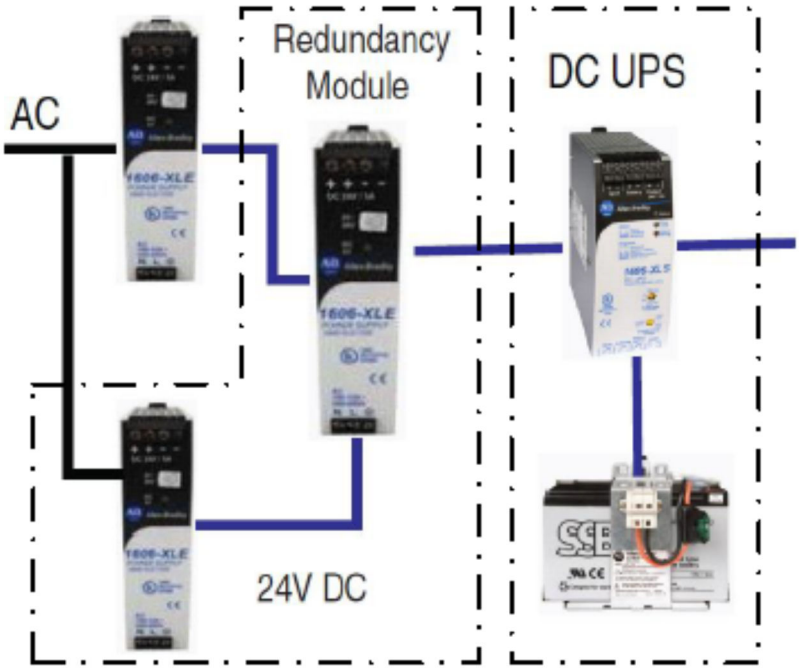
5 *Cabinet, interior view for 16 tanks (SIL3, High-High Level, AOPS)*

1 *Safety relay (AOPS)*
2 *Nivotester*
3 *Safety relay (general and MOPS)*
4 *Battery pack for UPS (30 min.)*
5 *UPS*
6 *Protection switch*
7 *Power supply*
8 *Remote maintenance modem*
9 *Ethernet switch*
10 *Safety PLC*
11 *PLC input/output modules*

The arrangement varies depending on the configuration.

3.1.2 Energy management

With an AOPS, energy management comprises at least one power unit which converts the supply voltage from 115 to 230 V_{AC} 50 to 60 Hz to 24 V_{DC}. In the case of a MOPS, a UPS is also needed which guarantees power supply for at least 30 minutes. The UPS is optional on an AOPS.



Mains current

System connection to the mains: 115 to 230 V_{AC} 50 to 60 Hz

DC power supply

The system provides a DC power supply which powers all the system components (including the field devices).

Power monitoring

The system monitors the power supply and issues an explicit warning if the mains voltage fails.

Uninterruptible power supply (optional)

The system provides an uninterruptible DC power supply (UPS) which powers the device for 30 minutes if the AC mains voltage fails.

The **Warning: UPS not ready** message is displayed in the following situations:
- Battery less than 85 % charged
- Incorrect wiring detected

⚠ CAUTION

Defective batteries and leaking battery fluid
can cause skin lesions and poisoning.
▶ Avoid any contact with leaked battery fluid and the inhalation of vapors.

The battery fuse must be inserted during commissioning. The **Warning: UPS not ready** message disappears as soon as the battery is fully charged.

If the power supply to the UPS is interrupted for longer, the fuse should be removed to prevent the UPS battery from discharging fully.

3.1.3 High-High Level detection

A High-High Level alarm signal (SIL2 or SIL3) is evaluated for every tank. The signal is generated by appropriate Liquiphant and Nivotester devices and connected to a failsafe digital input. For SIL3, the signal is generated by a Liquiphant FTL8x (with FEL85 electronic insert), transmitted via a Nivotester FTL825 and detected by the safety PLC. For SIL2, the signal is generated by a Liquiphant FTL5x or FTL7x (with FEL57 electronic insert), transmitted via a Nivotester FTL325P and detected by the safety PLC.

In the case of tanks located in hazardous areas, the signals sent by the Liquiphant devices to the Nivotester are considered Ex-i signals (intrinsically safe signals). This depends on the Liquiphants used.

3.1.4 High Level detection (optional)

A High Level warning can be evaluated per tank. This is optional. The signal is generated by appropriate Liquiphant and Nivotester devices and connected to a standard digital input.

In the case of tanks located in hazardous areas, the signals sent by the Liquiphant devices to the Nivotester are considered Ex-i signals (intrinsically safe signals). This depends on the Liquiphants used.

3.1.5 Safety relay for automatic shutdown (AOPS only)

Each tank has two floating contacts for the safety shutdown of pumps and/or valves. This is mandatory for AOPS applications. If a tank-related safety alarm is issued, the corresponding safety relay is disabled (contacts open). More information can be found in the **Functional Safety Manual SD01599S/04/EN**.

3.1.6 Stack lights

6 Warning stack lights

1 Buzzer module warning
2 Lamp module warning - yellow
3 Steady light module, OK status - green

7 Alarm stack lights

1 Siren module alarm
2 Strobe module alarm (not acknowledged)
3 Steady light module alarm (acknowledged)

Buzzer module warning	If a warning is active, the buzzer sounds continuously. The buzzer switches off once the warning has been acknowledged via the touch panel or the door button. The buzzer is reactivated as soon as a new warning occurs.
Lamp module warning - yellow	The yellow LED flashes if a warning is active. The LED is lit continuously once the warning has been acknowledged via the touch panel or the door button. The LED flashes yellow again as soon as a new warning occurs.
Steady light module OK status - green	If the LED is lit continuously, this indicates that the system status is normal and no alarms or warnings are active.
Siren module alarm	The alarm siren sounds if an alarm is active. The siren switches off once the alarm has been acknowledged via the touch panel or the door button. The siren sounds again as soon as a new alarm occurs.
Strobe module alarm	The alarm strobe light flashes if an alarm is active but has not yet been acknowledged. The alarm strobe light switches off again once the alarm has been acknowledged via the touch panel or the door button.
Steady light module alarm	The alarm steady light is lit if an alarm has been acknowledged but is still active. The alarm steady light switches off if the alarm condition is rectified. The alarm steady light switches off and the alarm strobe light is active again as soon as a new alarm occurs.

3.1.7 Field signalization (optional for AOPS)

8 *Alarm strobe*

9 *Alarm siren*

Alarm strobe	The red strobe light is activated if an alarm is active. The strobe light switches off once the alarm has been acknowledged via the touch panel or the door button. The strobe light is activated again as soon as a new alarm occurs.
Alarm siren	⚠ CAUTION **Noise from alarm siren (105 dB up to one meter)** can cause temporary hearing impairment and stress. ► Only install alarm siren outdoors. The siren sounds if an alarm is active. The siren switches off once the alarm has been acknowledged via the touch panel or the door button. The alarm siren is activated again as soon as a new alarm occurs.

3.1.8 Temperature monitoring

To ensure a long UPS battery life, the temperature in the cabinet is monitored by a temperature switch with a High and Low contact output. The lower limit value is 5 °C, and the upper limit value is 40 °C. A warning is generated if the temperature falls outside the range.

10 Thermophant TTR 31

11 Thermostat for the cabinet fan

The thermostat for the cabinet fan must be set to a suitable value: this is normally 25 to 35 °C depending on the ambient temperature. Set the thermostat to 25 °C if the **Temperature High** warning is frequently activated. If the **Temperature High** warning is not activated and the fan works continuously, set the thermostat to 35 °C.

3.1.9 EtherNet/IP or Modbus TCP interface (optional)

The system has an optional Ethernet/IP or Modbus TCP interface. All the alarms and warnings can be communicated via these interfaces.

3.1.10 Remote maintenance modem (optional)

The system supports remote maintenance via a VPN modem for service mode. It can be connected to the Internet via WAN or 3G (SIM card not included in the delivery). The remote maintenance modem is switched on via the password-protected **Remote** HMI screen or - if the PLC is not in RUN mode - via the key switch beside the modem.

12 *Modem with key switch*

3.2 Important system features

- Scalable from 1 to max. 16 tanks per system
- Certified according to IEC 61511 up to SIL3 by Risknowlogy
- Meets API2350 and WHG requirements
- For automated and manually operated systems
- Failsafe detection of High-High Level alarms
- Detection of High Level warnings (optional)
- Integrated automated proof testing
- Printout function to print proof test report
- UPS for independent operation for 30 minutes (optional for AOPS)
- Detailed warnings and alarms
- Independent signalization for warnings and alarms

3.3 Scaling

Feature	Definition	SIL2	SIL3
Number of tanks	1-16	Mandatory	Mandatory
High Level warnings	1 per tank	Optional	Optional
High-High Level alarms	1 per tank	Mandatory	Mandatory
InView text display	1 per system	Optional	Optional
Relay output	1 per tank (2 floating contacts)	Mandatory for AOPS	Mandatory for AOPS
Field signalization	1 SIL strobe and 1 SIL siren	Field signalization mandatory for MOPS and optional for AOPS	Field signalization mandatory for MOPS and optional for AOPS

3.4 Customer benefits

- Solution with fully independent SIL2/SIL3 certification for maximum trust and reliability. Certification is performed by independent safety inspectors with operations worldwide
- Safe investment as the solution is modular, scalable and extensible
- Integrated automated proof testing shortens the time for commissioning and maintenance
- Detailed warnings and alarms help users to make quick decisions and take immediate action

- Seamless integration into monitoring systems for remote monitoring via standard interfaces such as EtherNet/IP or Modbus TCP
- Traceability and transparency with automatic event and user intervention log
- Reduced engineering and commissioning time and lower maintenance costs

4 Incoming acceptance and product identification

4.1 Incoming acceptance

- Check the packaging for visible damage arising from transportation
- To avoid damage, remove the packaging with care
- Retain all the accompanying documents
- The documentation is included in the scope of delivery of the Overfill Prevention System and comprises:
  - These **Operating Instructions BA01587S/04/EN**
  - Overfill Prevention System wiring drawing

The device may not be put into operation if the contents are found to be damaged beforehand. In this case, please contact the Endress+Hauser Sales Center. Return the device to Endress+Hauser in the original packaging where possible.

4.2 Product identification

The system can be identified by the nameplate, which is fitted on every cabinet.

4.2.1 Endress+Hauser products

You can identify the components in the following ways:
- Enter the serial number indicated on the nameplate in W@M Device Viewer (www.endress.com → About us → W@M Life Cycle Management → Operations → The right device information always at hand (find spare part) → Access device-specific information → Enter serial number): all the information relating to the system/device is then displayed.
- Enter the serial number indicated on the nameplate into the Endress+Hauser Operations App or scan the 2-D matrix code (QR code) on the nameplate with the Endress+Hauser Operations App: all the information relating to the measuring device is then displayed.

4.3 Storage and transport

- The cabinet is packed in such a way that it is fully protected against shock when in storage and during transportation. The original packaging offers the best protection.
- The permitted storage temperature is −20 to 60 °C (−4 to 140 °F), preferably 20 °C (68 °F).
- When transporting the cabinet protect it from direct sunshine to avoid excessively high surface temperatures
- Store the cabinet packaged in a dry place
- Transport the cabinet to its final destination in the transportation box in which it was delivered

5 Installation

DANGER

If the cabinet or field signalization system are installed in a hazardous area,
an explosion can result.
- ▶ The cabinet and field signalization system must be installed in a safe environment (non-hazardous zone).

5.1 Installation conditions

Control cabinet
- The cabinet must be installed in a dry, air-conditioned and explosion-proof indoor area
- Ambient temperature range: 5 to 25 °C
- Humidity: maximum 85%

CAUTION

Defective cables and components
cause a short-circuit.
- ▶ Avoid moisture on the cabinet interior.
- ▶ Check cables and components regularly.

Field signalization:
- The strobe light and siren can be mounted in the field in an explosion-proof area
- Ambient temperature range: –25 to 55 °C
- Humidity: maximum 90%
- The strobe light and siren must be protected from direct sunlight

Liquiphant:
For precise installation conditions see:
– Operating Instructions BA01037F/00/EN
– Brief Operating Instructions KA00143F/00/EN
– Brief Operating Instructions KA00172F/00/EN

5.2 Mounting the cabinet

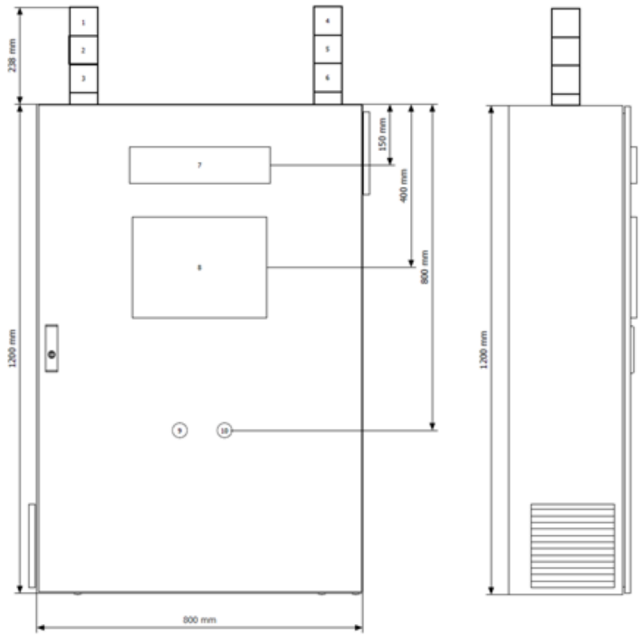
CAUTION

When the cabinet is being mounted or removed or if the cabinet is incorrectly secured
the cabinet can topple over and cause crushing.
- ▶ Observe the mounting instructions and technical aids.

CAUTION

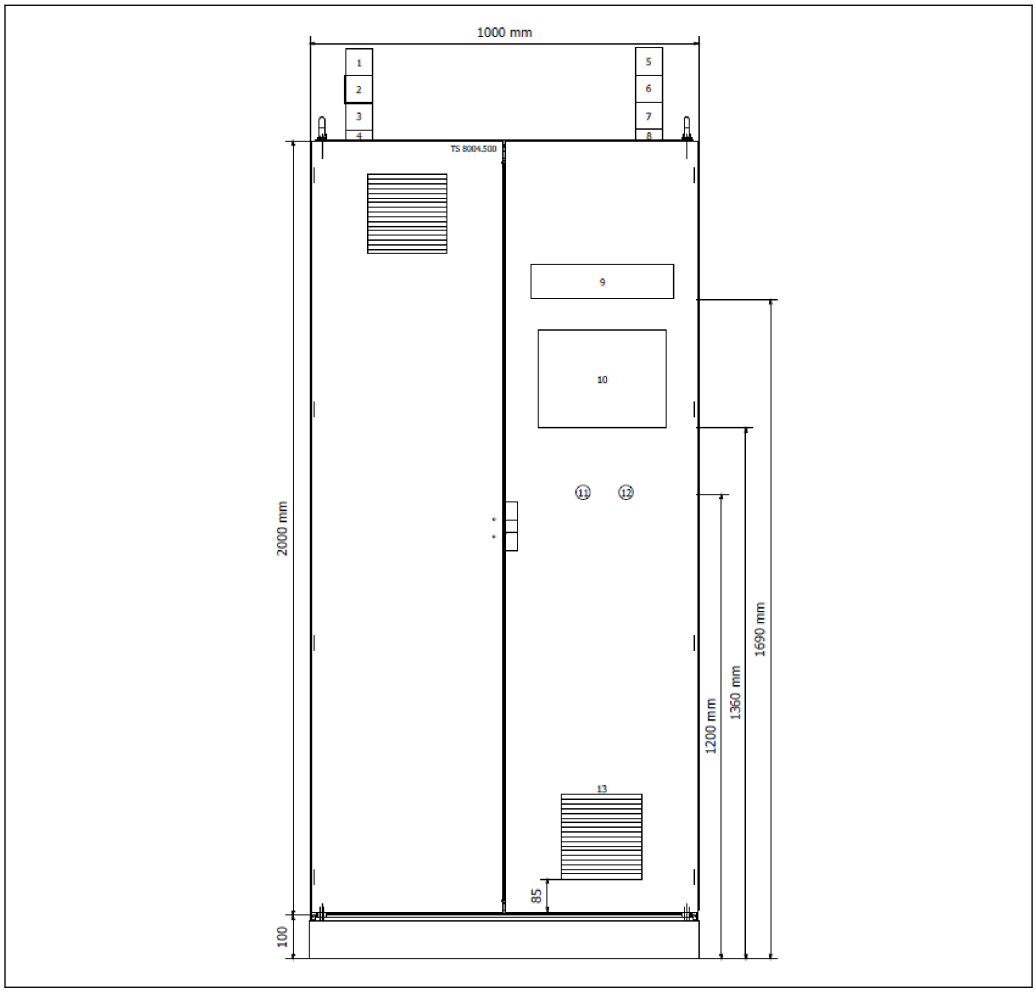
If the cable connections are not routed correctly,
people can trip or fall, resulting in injury.
- ▶ Connecting cables must be laid correctly in appropriate cable ducts.

The 1200 mm high wall cabinet is supplied with brackets for wall mounting and must be mounted on a stable wall using suitable mounting equipment.



13 *Example: cabinet for wall mounting (e.g. for 8 tanks)*

The 2 000 mm high freestanding cabinet is supplied with a 100 mm base. The customer must ensure that the cabinet is screwed onto a firm, even floor.



14 *Example: freestanding cabinet (e.g. for 16 tanks)*

The cable entries are located on the underside of the cabinet in the case of both the 1 200 mm high wall cabinet and the 2 000 mm high freestanding cabinet.

5.2.1 Mounting a signalization system on the cabinet

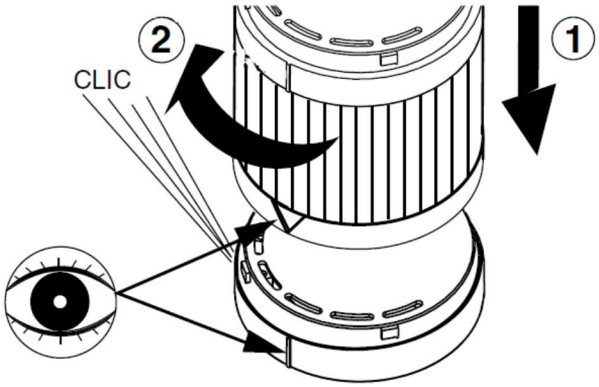
You must first mount the O-rings supplied with the documents in the cabinet bag.

15 *Plug-in base without O-ring*

16 *Plug-in base with O-ring*

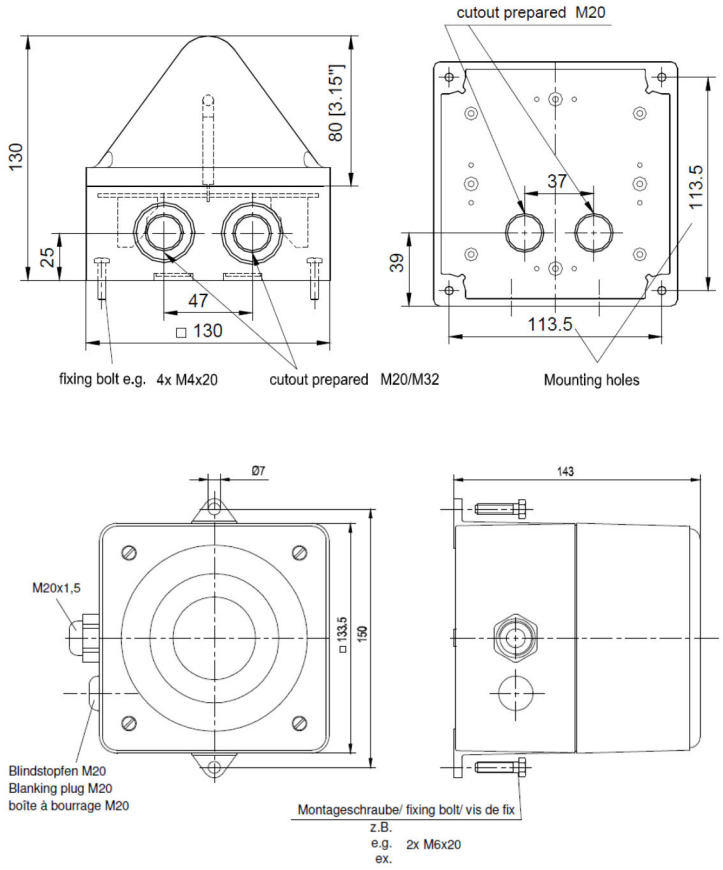
Then the stack light with the green light can be mounted on the left-hand side and the stack light with the red light can be mounted on the right-hand side.

The stack lights are supplied unassembled in the cabinet.



5.2.2 Mounting the field signalization system

The strobe light and siren must be mounted on a stable and even apparatus using the dimensioned drawings provided below. If possible, the devices should be mounted with the cable glands pointing downwards.



5.3 Post-installation check

Are the mounted components undamaged (visual inspection)?	❑
Do all the components meet the required specifications? For example: ▪ Ambient temperature ▪ Humidity ▪ Explosion protection	❑
Is the correct orientation selected?	❑
Are the measuring point identification and labeling correct (visual inspection)?	❑
Is the device adequately protected from precipitation and direct sunlight?	❑
Are the securing screws tightened securely?	❑

6 Electrical connection

6.1 Connection conditions

6.1.1 Required tools

- For cable entries: use suitable tools
- Wire stripper
- When using stranded cables: crimper for wire end ferrule
- For removing cables from terminal: flat blade screwdriver ≤ 3 mm (0.12 in)

6.1.2 Requirements for connecting cable

The connecting cables provided must fulfill the following requirements.

Electrical safety

In accordance with applicable national regulations

Power feed

- L/N/PE
- 115 to 230 V_{AC}
- 50 to 60 Hz
- 3 to 5 A depending on the system design
- The owner/operator must fuse the SOP600 Overfill Prevention System with a 16 A fuse
- The supply cable should have a cross-section of 2.5 mm^2 (individual country-specific standards must be observed)

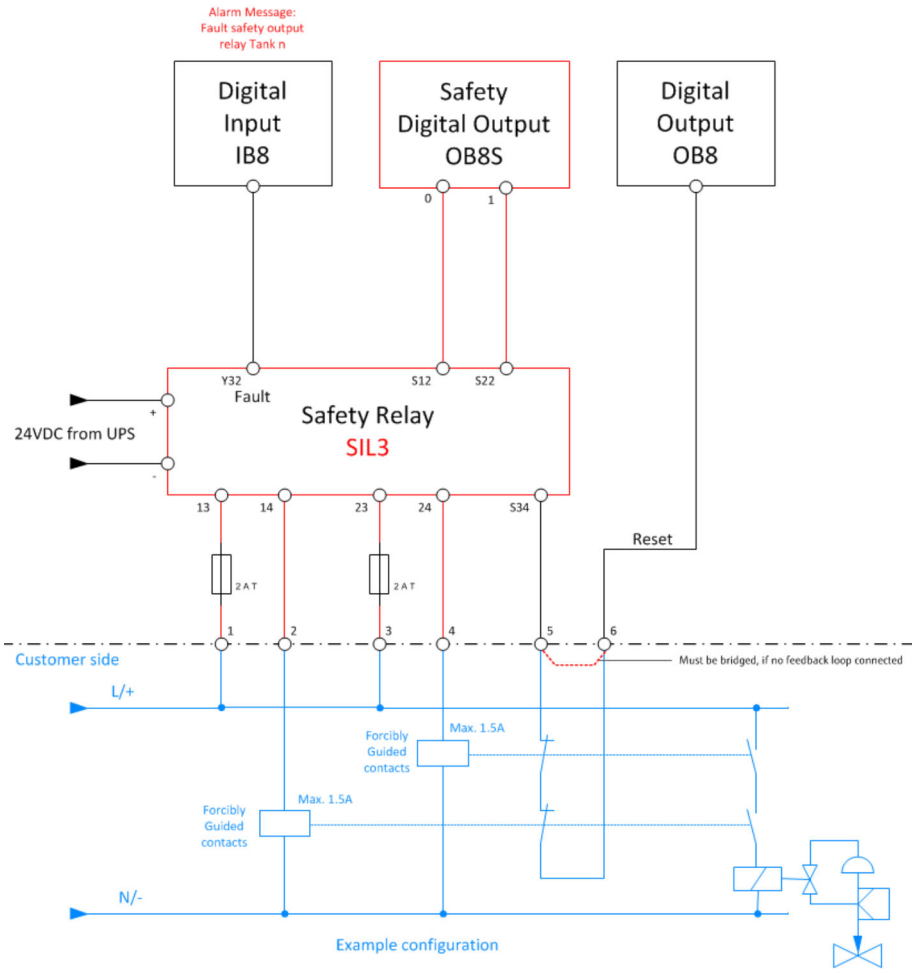
Connecting the actuators

Two floating safety contacts switch the actuators through the safety relay. The safety contacts are fused with a 2 Ampere slow-blow terminal fuse.

Output nominal load

- UL: C 300
- AC-15: 1.5 A/250 V_{AC}
- DC-13: 2 A/ 24 V_{DC} (0.1 Hz)

Connection example for a valve



NOTICE

If there is no feedback signal from the actuator (valve closed/pump switched off),
it is not possible to reset the safety relay.

- ► The reset signal must be bridged (terminals 5 and 6 in the example above).

Connecting the field signalization system

Robust cables with a conductor cross-section of 1.5 to 2.5 mm^2 must be used. We recommend routing the cables for the strobe light and the siren separately or in different protective conduits. It is essential to ensure that the cables are suitable for outdoor use.

Connecting the sensors (Liquiphant sensors)

The twin-core connecting cable (instrument cable) with a maximum length of 1 000 m is connected to the screw terminals (conductor cross-sections 0.5 to 2.5 mm^2) in the connection compartment.

In the event of increased electromagnetic interference, a shielded connecting cable is recommended and the shield must be connected to the sensor and the power supply.

More information on the connection procedure and on the cable specifications can be found in the documentation for the Liquiphant and Nivotester devices used.

Cable diameter

- The wall cabinet is provided with M20 cable glands for cable diameters of 8 to 12 mm for the supply cable and control cable
- M16 cable glands for cable diameters measuring 6 to 10 mm are available for the signal cables
- M20 cable glands for cable diameters measuring 8 to 12 mm are available for the field devices (strobe and siren)

6.1.3 Terminal assignment

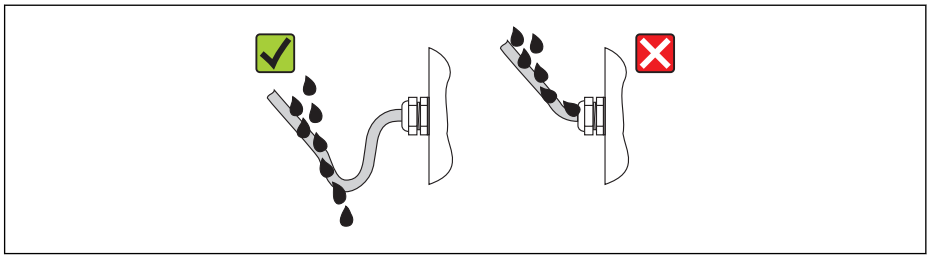
The terminal assignment varies depending on the system layout. Therefore, the cabling must always be performed according to the project-specific circuit diagram.

6.1.4 Ensuring the degree of protection

- The cabinet is only approved for indoor use (IP55)
- The field signalization system meets all the requirements of IP66/67 protection
- Depending on the version ordered, the Liquiphant meets all the requirements from IP65 protection and higher

1. Ensure that the housing seals are clean and mounted correctly. Dry, clean or replace the seals if necessary.
2. Tighten all housing screws and screw covers.
3. Tighten cable glands.
4. Ensure that moisture cannot penetrate the cable entry by laying the cable in such a way that it forms a U shape in front of the cable entry (**water trap**).

   ↳



5. Seal off any unused cable entries using dummy plugs.

6.2 Post-connection check

Are the device and cable undamaged (visual check)?	❑
Do the cables comply with the requirements ?	❑
Do the cables have adequate strain relief?	❑
Are all cable glands installed, securely tightened and leak-tight? Cable run with water trap?	❑
Does the supply voltage match the specifications on the device nameplate?	❑
Is the terminal assignment correct ?	❑
Are all housing covers installed and securely tightened?	❑
Are all unused cable entries sealed with a dummy plug?	❑
Are the cables of the field signalization system routed separately?	❑

7 Operation options

The device is operated via the touch panel installed in the cabinet door. In addition, there is a button for acknowledging alarms and a button to reset the safety alarm. For signalization, there are stack lights (alarm and warning stack lights) and an optional text display in addition to the touch panel. Safety-oriented field signalization devices (strobe and siren) are also supplied for manual systems. Field signalization is optional for automated systems (AOPS) but is not relevant to SIL. In addition, there is the added option of supplying data to a higher-order system via Modbus TCP or Ethernet/IP.

8 Commissioning

8.1 Function check

Before commissioning the Overfill Prevention System:
Make sure that the post-installation and post-connection checks have been performed:
– "Post-installation" checklist, **Section 5.3** → 30
– "Post-connection" checklist, **Section 6.2** → 33

8.2 Switching on the Overfill Prevention System

Switch on the Overfill Prevention System once everything has been mounted, the cables have been connected and the checks performed:

1. Switch on the three two-pole circuit breakers on the left-hand side.
2. Insert the fuse for the UPS battery into the fuse holder.

8.3 Configuring the Overfill Prevention System

- Acknowledge warnings and alarms using the **Acknowledge all** built-in door button
- Reset safety alarms using the **Reset safety device** built-in door button
- Assign a password for every user, **Section 9.3.2** → 41
- Set the current local time using the touch screen **Section 9.3.16** → 58
- Set the desired proof test interval using the touch screen **Section 9.3.16** → 58
- Activate the proof test using the touch screen **Section 9.3.15** → 50
  Only if the system is in perfect operating condition and no error messages are displayed (the warning **UPS not ready** is displayed until the battery is fully charged)
- Print out proof test log

8.4 Configuring the measuring devices

More information on the Liquiphant FTL8x and Liquiphant M FTL5x/FTL7x can be found in:
- Operating Instructions BA01037F/00/EN
- Brief Operating Instructions KA00143F/00/A6
- Brief Operating Instructions KA00143F/00/A6

8.4.1 Liquiphant FTL8x

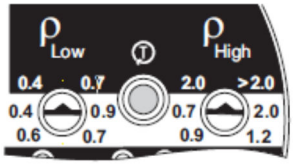
Density settings

- The decision to operate in the MIN or MAX detection mode is made when you wire the device
- The device is not ready for operation when it is delivered
- The density range must be set to commission the device. Otherwise the device starts with an error message.

⚠ WARNING

If the wrong medium density range is set
the safety function can no longer be guaranteed.
► The density range must be adjusted to suit the medium.

The density of the medium under the prevailing process conditions dictates the density range to be set. The density ranges that can be selected at the electronics are preprogrammed for typical groups of media (e.g. liquefied gas, alcohol, aqueous solution, acid) under the maximum process parameters that are permitted. When the device is delivered the position of the rotary switches is not valid.



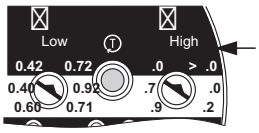
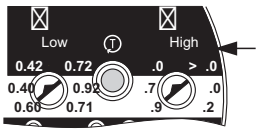
17 *Position of rotary switches when delivered*

The rotary switches are surrounded by scales that indicate the individual density ranges (MIN detection - white, MAX detection - black). The rotary switches must be parallel to one another to select a valid density range. The pointer of the left rotary switch (low density) must point to the lower density value of the selected range and the pointer of the right rotary switch (high density) must point to the upper density value of the selected range.

⚠ WARNING

If the rotary switches are not parallel to one another,
the selected density range is not valid and the red error LED flashes in alternation with the green LED.
► The rotary switches must be set so that they are parallel to one another.

Setting for MAX detection mode

Type of liquid	Low density P_{Low} g/cm³ (SGU)	High density P_{High} g/cm³ (SGU)	MAX detection operating mode (black area above rotary switch)
e.g. liquefied gas	0.4 (0.4)	2.0 (2.0)	
Other liquids	0.7 (0.7)	> 2.0 (>2.0)	

The configuration can be confirmed in two different ways:
- By pressing the test button on the Liquiphant FailSafe FTL80, FTL81, FTL85
- By disconnecting the measuring system (FailSafe) from the supply voltage (restart)

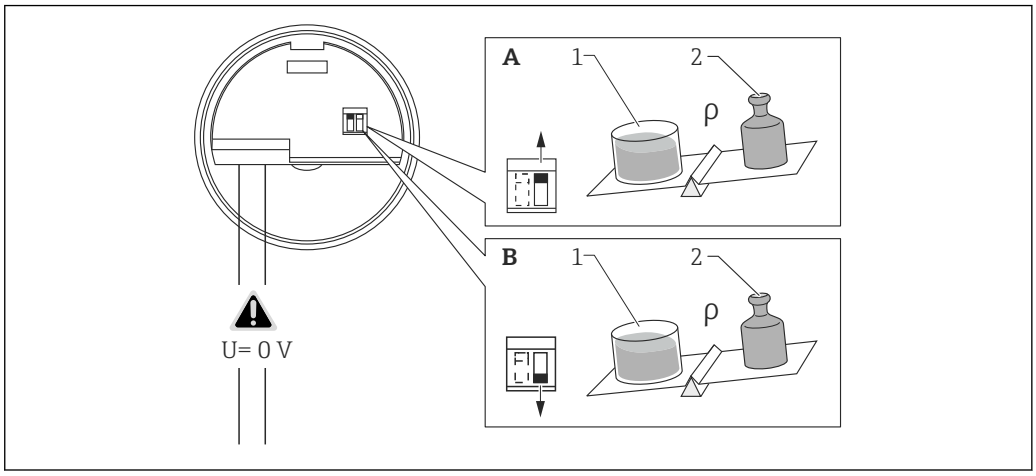
8.4.2 Liquiphant M FTL5x/FTL7x

Density settings

⚠ WARNING

If the wrong medium density range is set
the safety function can no longer be guaranteed.
▶ The density range must be adjusted to suit the medium.

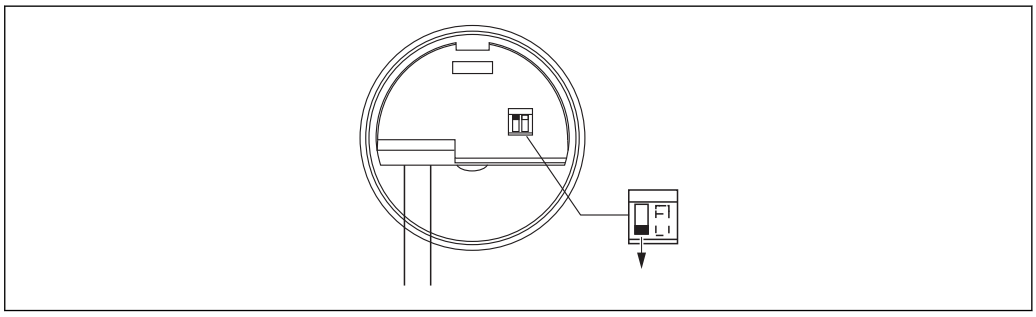
The density of the medium under the prevailing process conditions dictates the density range to be set. The density ranges that can be selected at the electronics are preprogrammed for typical groups of media (e.g. liquefied gas, alcohol, aqueous solution, acid) under the maximum process parameters that are permitted.



A Standard >0.7
A-1 1l
A-2 Min. 0.7 kg
B e.g. propane >0.5
B-1 1l
B-2 0.5 to 0.7kg

Self-test settings:

The self-test must be set to EXT as otherwise the proof test will not work via the operator terminal.



The Liquiphant must be disconnected from the supply voltage (restart) to confirm the configuration.

9 Operation

9.1 Built-in door button

9.1.1 Acknowledge all

This button confirms all active alarms and warnings in one go. Once the warnings and/or alarms have been acknowledged and the system has returned to its normal operating state, the alarms/warnings are automatically deleted from the list.

Pressing the button also switches off the acoustic signals (field signalization and stack light modules).

The system recognizes whether the acknowledge signal is permanently active (e.g. due to a button short-circuit) and displays the warning **Acknowledge signal short-circuit**.

9.1.2 Reset safety device

Once an alarm has been acknowledged and the alarm event has been deleted from the system, the system must be reset via the **Reset Safety device** button.

The system recognizes whether the acknowledge signal is permanently active (e.g. due to a button short-circuit) and displays the warning **Reset signal short-circuit**.

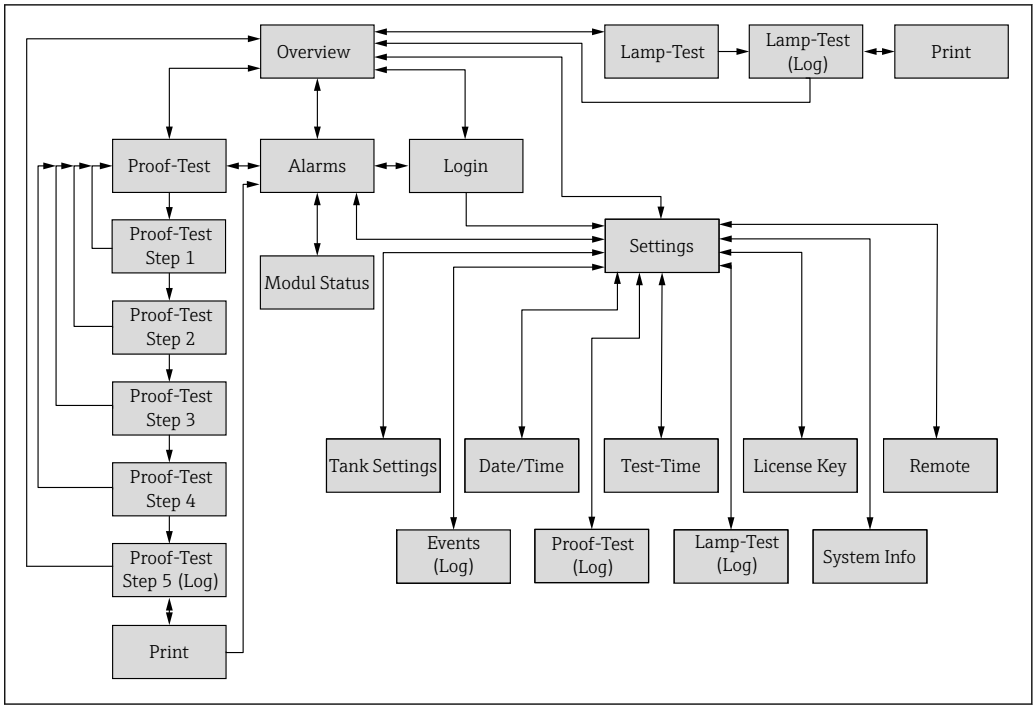
9.2 Text display unit (optional)

The text display unit for warnings and alarms measures 12 x 2". The messages are sorted in descending order, with the latest unacknowledged alarm being the first message to be displayed.

9.3 Touch panel

A 10" touch panel is integrated in the cabinet door. This is the operator terminal.

9.3.1 HMI - overview



18 *The graphic shows the HMI screens and the navigation principle*

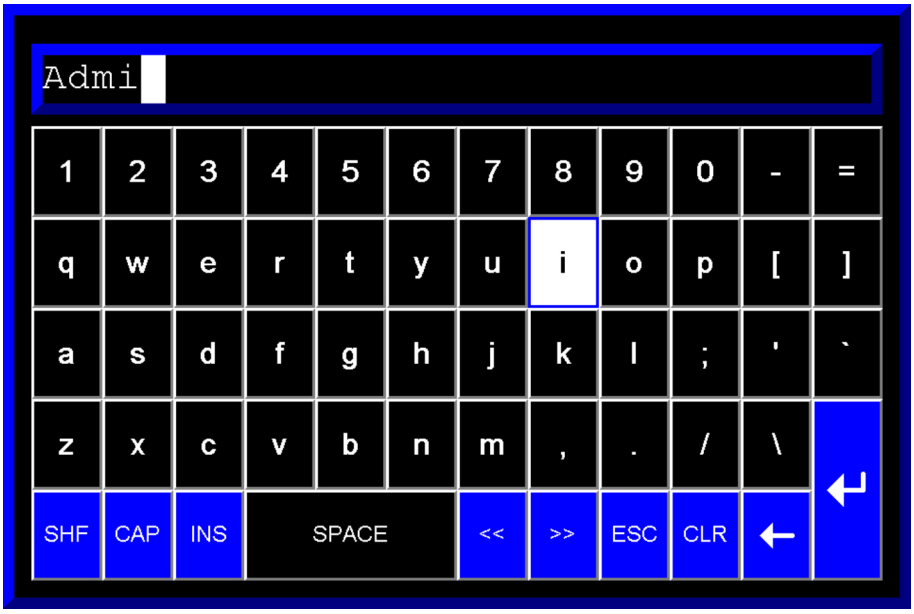
9.3.2 Login dialog box

The **Login** dialog box can be opened using the **Login** button in the navigation bar. In this dialog box, users can log in, log out, change their password or click **Close** to close the box.

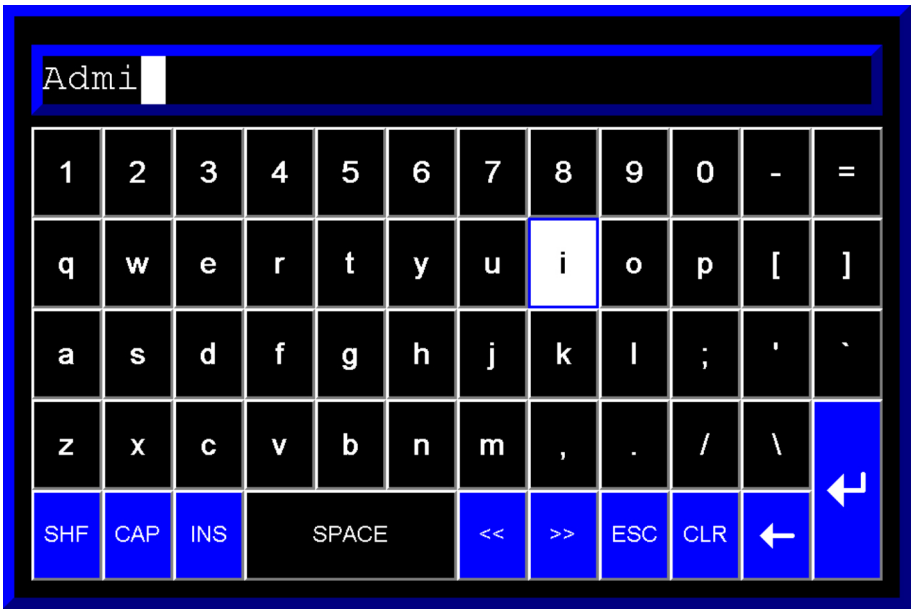
Logging in

1. Tap on the **Login** button.
   ↳ The following default login screen appears:

2. Tap on the **User** button in the default login screen.
   ↳ The default screen for text entry opens.



3. Enter the user name and select **Enter**.
   ↳ The default login screen opens again.
4. Tap on **Password**.
   ↳ The default screen for text entry opens.



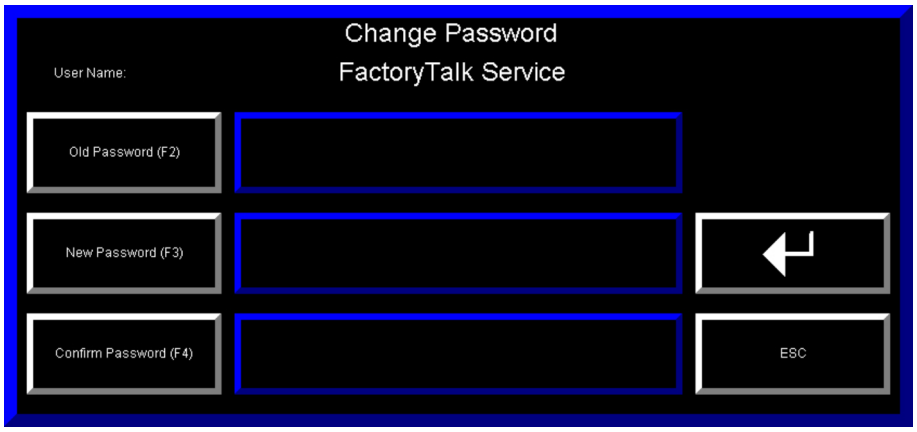
5. Enter the password and select **Enter**.
6. Back in the default login screen press **Enter** again to confirm the **Login** or select **ESC** to cancel.

Logging out

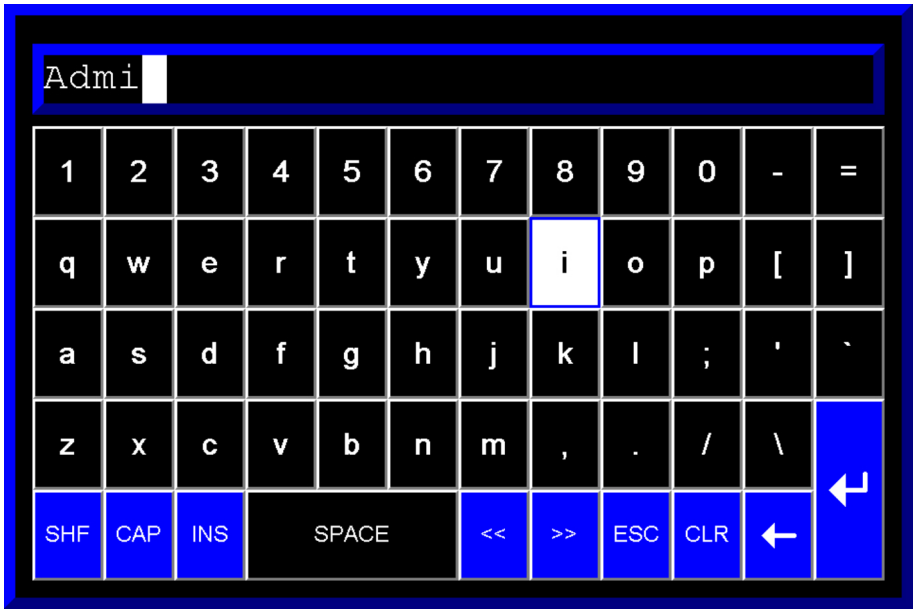
- Tap on the **Logout** button.
  ↳ The user currently logged in is logged out and the DEFAULT user is logged in automatically.

Changing the password

1. Tap on the **Password** button.
   ↳ The Change Password default screen opens.



2. Tap on the desired password button (**Old Password**, **New Password** or **Confirm Password**).
   ↳ The default screen for text entry opens.



3. Enter the password and press **Enter** to confirm.
4. Once all three passwords have been entered, tap on **Enter** to confirm the change or select **ESC** to cancel.

- The passwords can contain between 1 and 14 characters and are case-sensitive.
- You must press **Enter** to confirm the entry in the login screen and the screen for password entry in order to accept the changes.

9.3.3 Automatic logoff

If there is no interaction between the user and the system for a period of 10 minutes or more (no entry made via the display or a key/button), the system returns to the **Overview** screen, logs off the user automatically and logs in the DEFAULT user. This applies for all users and all screens.

9.3.4 Access authorization

The system features a user administration function comprising different user roles and access authorizations. Access to the various functions is limited by the rights assigned to the specific user role. User login is password-protected for all user roles. The password must be unique for every user (may not be assigned twice). By default, the solution is supplied with three preconfigured user types: **DEFAULT**, **OPERATOR** and **ADMINISTRATOR**. No password is assigned to these users upon delivery. The end user is responsible for defining his own specific passwords for these user roles.

The password for the **DEFAULT** user should not be changed because this user is logged in automatically during system startup or when another user is logged out.

The customer must enter passwords for every administrator account in order to prevent unauthorized persons from tampering with the safety-relevant touch panel screens.

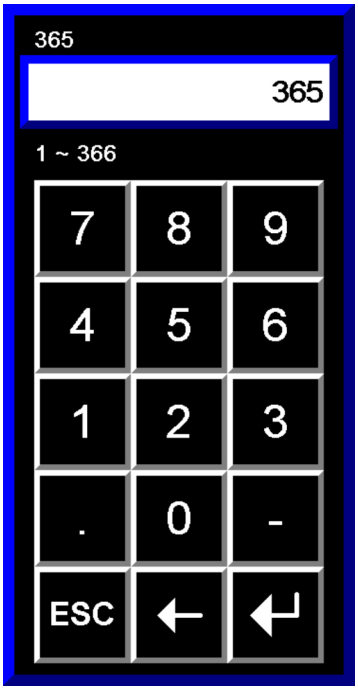
User	Password	Description
DEFAULT		Authorization to monitor and acknowledge statuses and alarms.
OPERATOR		Authorization as for **DEFAULT** user role plus authorization to perform proof tests.
ADMINISTRATOR		Authorization as for **OPERATOR** user role plus authorization to change additional settings.

The **DEFAULT** user is logged in automatically after system startup.

9.3.5 Default entry screen

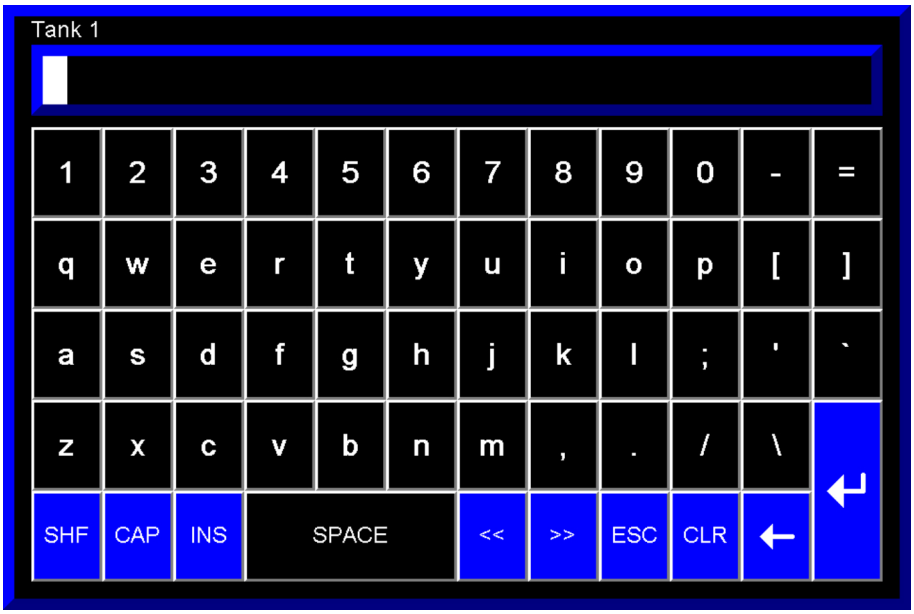
The entry fields in the touch panel screens are shaded pale gray (almost white). As soon as a user touches an entry field, the default input window opens. Once entries have been made, you must press **Enter** by way of confirmation in order to accept (activate) the changes. If you press **ESC** instead, the entry is canceled and the data entered are not adopted. Pressing **Enter** or **ESC** closes the default entry screen.

There are numerical and text-based default entry screens. The permitted input range is displayed above the first row of digits (here 1 to 366).



19 *Numerical default entry screen*

Enter	Accepts the data entered and closes the window
Arrow to left	Deletes a character
ESC	Cancels data entry and closes the window



20 *Text-based default entry screen*

Enter	Accepts the data entered and closes the window
Arrow to left	Deletes a character
CLR	Clears all entered characters
ESC	Cancels data entry and closes the window
>>	Moves the cursor to the right

<<	Moves the cursor to the left
SPACE	Enters a blank space
INS	Overwrites existing characters
CAP	Switch to upper case
SHF	Switch to special characters

9.3.6 Title bar

There is a title bar at the top of every screen. The title bar contains the title (name) of the current screen, the Endress+Hauser logo and the date and time.

21 Title bar

9.3.7 Message bar

A message bar for alarms and warnings is located under the title bar at the top of every screen. This bar is green and does not contain any text information if no warnings or alarms are active. If a new warning or a new alarm occurs, this bar displays the corresponding message and flashes amber (warning) or red (alarm). Acknowledged warnings/alarms do not flash. Instead they are displayed continuously in amber or red.

22 Message bar: no warning or alarm active

23 Message bar: warnings are active, the latest warning is displayed

24 Message bar: alarms are active, the latest alarm is displayed

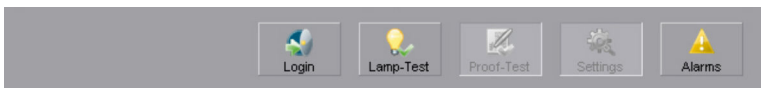
9.3.8 Status bar

The status bar is located under the message bar at the top of every screen. The status bar displays the user currently logged on and the time remaining until the next proof test is necessary.

25 Status bar

9.3.9 Navigation bar

The navigation bar is located at the bottom of every screen and contains the navigation and action buttons. The buttons that are visible or hidden depend on the access authorization of the individual user or on the current screen.



26 Navigation bar

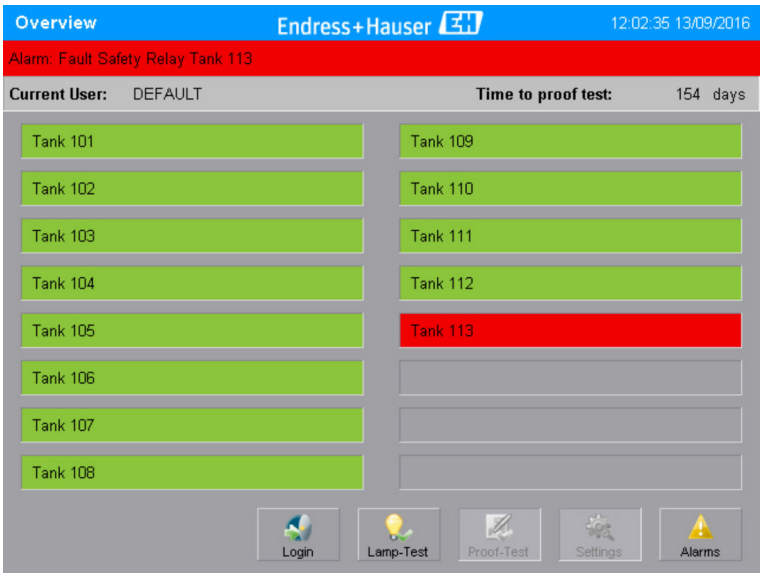
9.3.10 Overview (main screen)

The **Overview** screen is the first screen displayed once the system has booted. The **Overview** screen can also be accessed via the **Overview** button in the navigation bar.

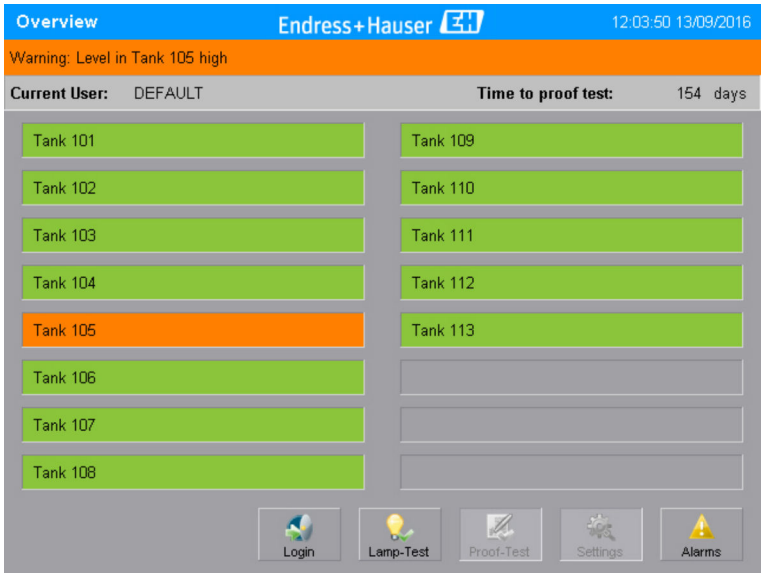
User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	Yes	Yes	Yes	Yes

The **Overview** screen contains an overview of the status of all the tanks. Tanks with the status **OK** are displayed in green. If a new warning or alarm occurs, the tank affected flashes amber or red respectively until the warning/alarm is acknowledged. After the message is acknowledged, the tank is highlighted continuously in the corresponding color (amber or red) and remains in the warning/alarm state. Tanks that are disabled (e.g. for maintenance purposes) are displayed in yellow with diagonal black lines. The Overfill Prevention System has been designed for 16 tanks. Tanks that are not used are displayed in gray. The tanks are called Tank 1-16 in the default configuration. You can change the name of the tank via the **Settings** screen.

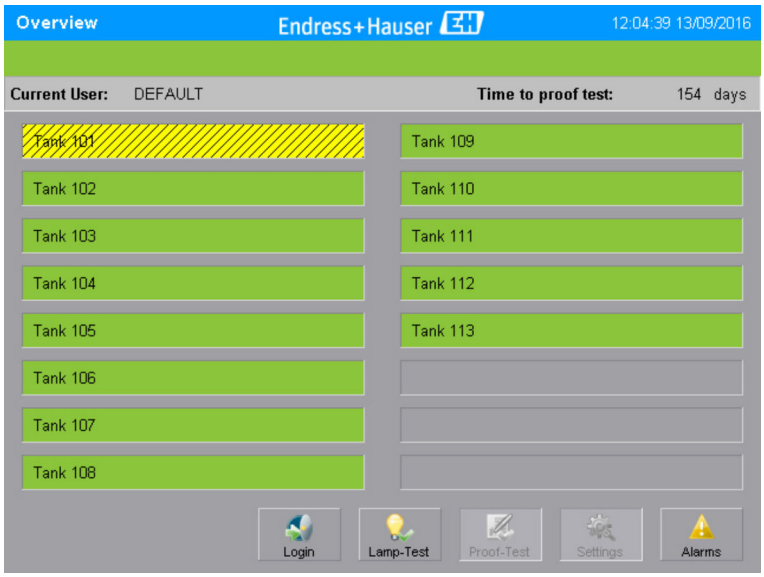
27 *Overview screen: tank status OK*



28 *Overview screen: alarm tank 13*



29 *Overview screen: warning tank 5*



30 *Overview screen: alarm tank 1 disabled*

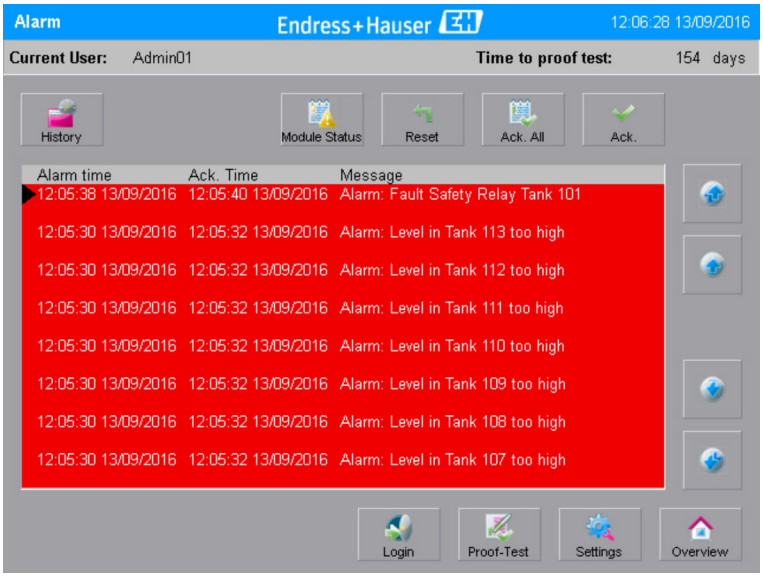
9.3.11 Alarm screen

The **Alarm** screen can be accessed via the **Alarms** button in the navigation bar or in the **Alarm History** screen.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	Yes	Yes	Yes	Yes

The **Alarm** screen displays warnings and alarms. As soon as a new warning or a new alarm is activated, a message to this effect appears in the alarm window. New warnings are indicated by a flashing amber background and new alarms by a flashing red background. If a warning or an alarm has been acknowledged but the condition that activated the warning or alarm persists, the background of the warning/alarm message no longer flashes and instead is lit steadily in the corresponding color (amber or red). If a warning is no longer active and has been acknowledged, it is deleted from the **Alarm** screen and listed in the **Alarm History** screen. If an alarm is no longer active and has been

acknowledged and reset, it is deleted from the **Alarm** screen and listed in the **Alarm History** screen.



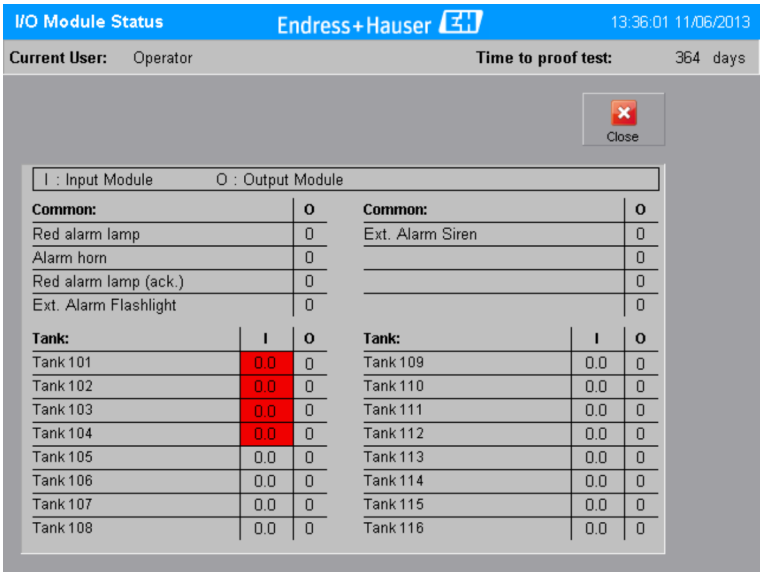
31 *Alarm screen*

9.3.12 I/O Module Status screen

The **I/O Module Status** screen can be accessed via the **Module Status** button in the **Alarms** screen.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	Yes	Yes	Yes	Yes

The **I/O Module Status** screen displays errors associated with the safety input/output module.



32 *I/O Module Status screen*

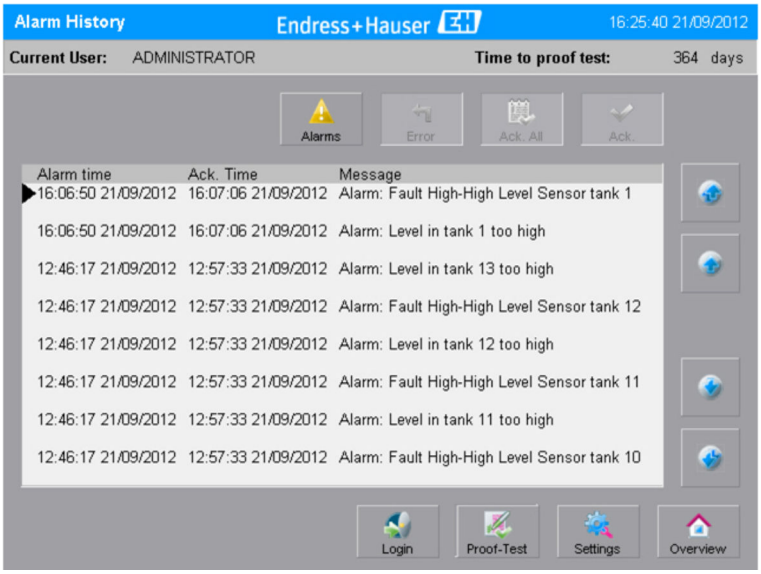
Common	Safety output module common to all tanks (output for signalization)
Tank	Tank safety input/output modules (2 channels per tank/4 tanks per module)

O (0)	Error in the safety output module (all channels lit red) or channel error in the safety output module (one or more channels lit red). The numbers (0) are designed for future use.
I (0.0)	Error in the safety input module (all channels lit red) or channel error in the safety input module (one or more channels lit red). The numbers (0.0) are designed for future use.

9.3.13 Alarm History screen

The **Alarm History** screen can be accessed via the **History** button in the **Alarms** screen.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	Yes	Yes	Yes



33 *Alarm History screen*

9.3.14 Lamp/Horn-Test screen

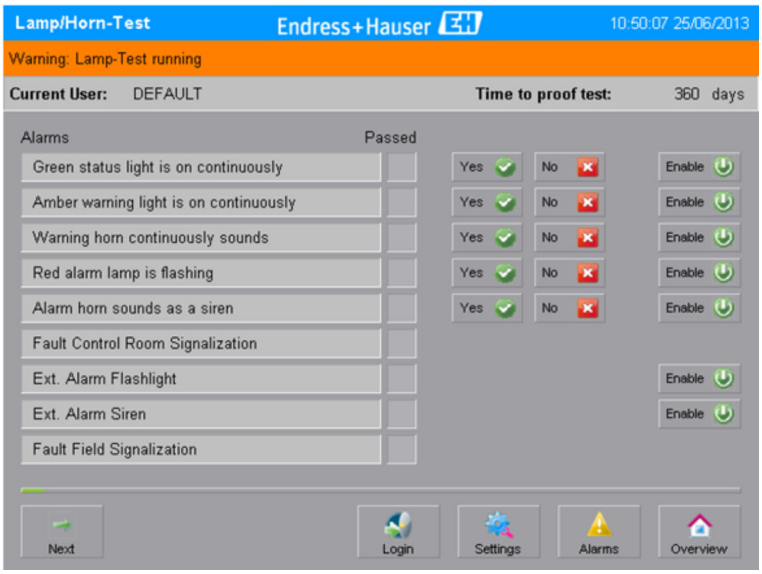
The **Lamp/Horn-Test** screen can be accessed via the **Lamp Test** button in the navigation bar.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	Yes	Yes	Yes	Yes

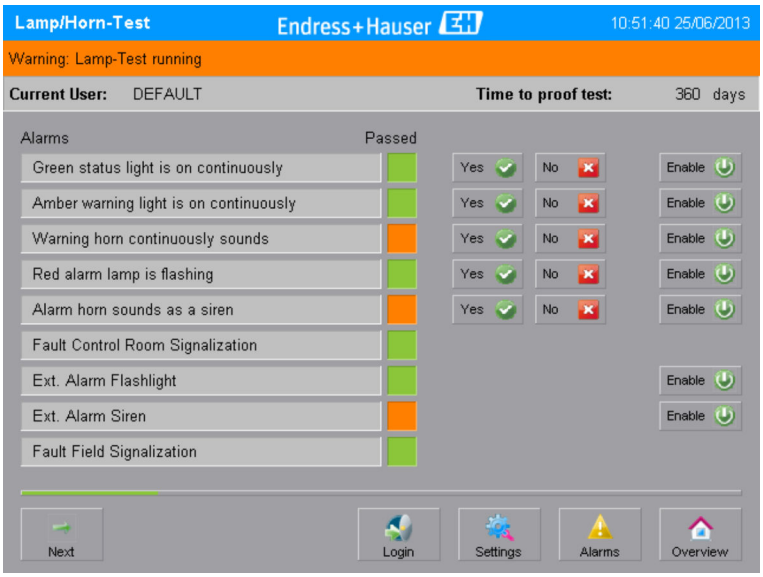
The **Lamp/Horn-Test** screen shows all the signalization elements in the control room (stack lights and field signalization (if provided)). Each element can be enabled individually by pressing the **Enable** button. If the visual inspection or the acoustic test is successful, this can be confirmed by pressing the **Yes** button. A malfunction can be documented by pressing the **No** button. The field signalization components (strobe light and siren) have a monitoring system that does not require the function to be confirmed manually. Press and hold the **Enable** button until **successful** (green) or **passed with warning** (amber) is displayed as the result. The **Warning: Lamp-Test running** message is displayed as long as the **Lamp/Horn-Test** screen is displayed. All warnings and alarms are disabled during the signalization test. The signalization test must be completed within 10 minutes. A status bar shows the progress of the test. If the time limit of 10 minutes is exceeded the test is aborted automatically and the warnings and alarms are activated again. The signalization test can be aborted any time by pressing a corresponding button in the navigation bar.

⚠ CAUTION

Noise from alarm siren (105 dB up to one meter)
can cause temporary hearing impairment and stress.
- ▶ Notify staff of the impending activities.



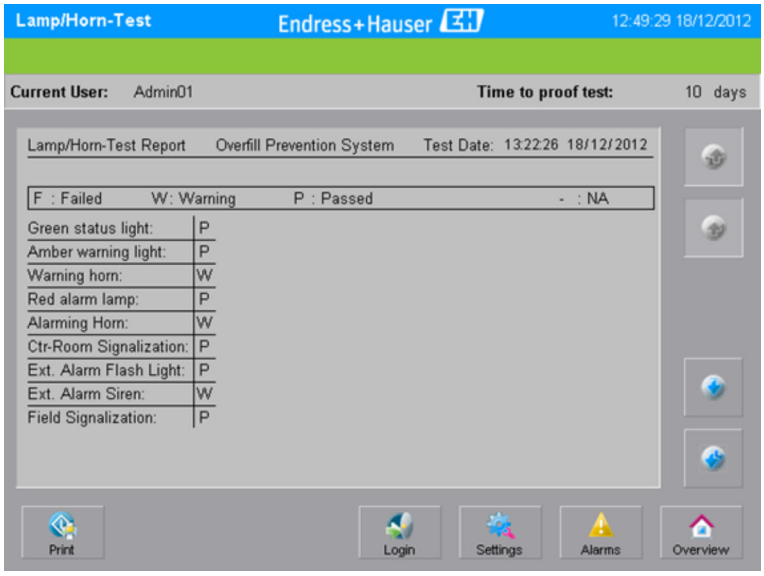
34 *Lamp/Horn-Test screen*



35 *Lamp/Horn-Test screen: test completed*

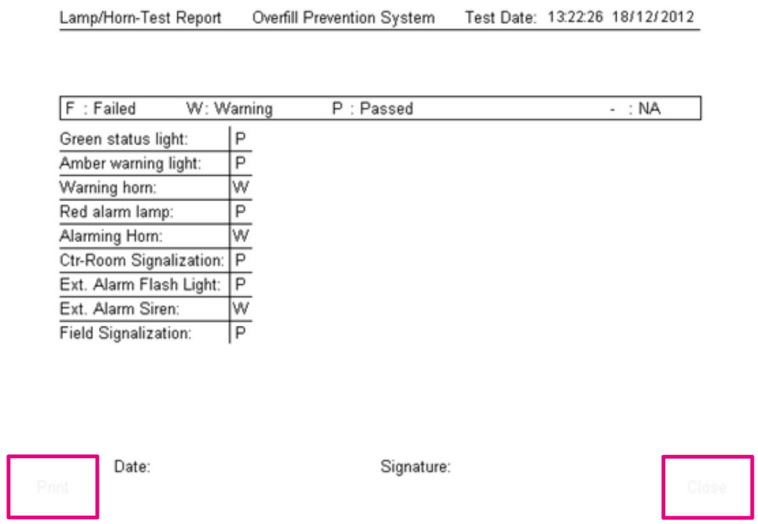
Color	Description
Gray	Test not completed or element not available.
Green	Test passed
Amber	Test passed with warning.
Red	Test failed Is generated automatically for: ▪ Signalization in control room (if **siren module alarm** and **strobe module alarm** have failed). ▪ Field signalization (if strobe and siren have failed).

Once the signalization test is completed, the signalization test report can be accessed via the **Next** button.



36 *Lamp/Horn-Test screen: signalization test report*

If a printer is connected to the system, the screen to print out the report can be invoked via the **Print** button.



37 *Lamp/Horn-Test screen: signalization test report (for printout)*

The **Print** button (bottom left, almost not visible) must be pressed to print out the test report at the connected printer. The screen is closed again by tapping the Close button (bottom right, almost not visible).

9.3.15 Proof-Test screen

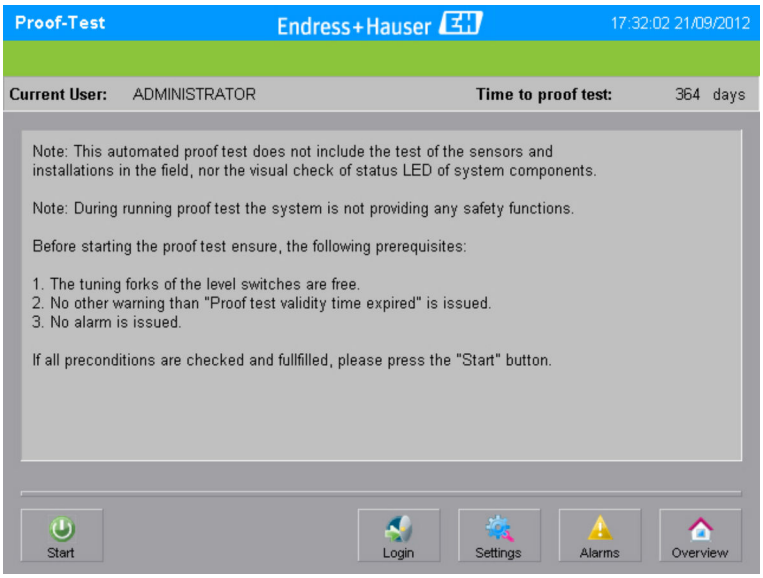
The **Proof-Test** screen can be accessed via the **Proof-Test** button in the navigation bar.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	Yes	Yes	Yes

The **Proof-Test** screen is the start page for the automatic proof test that must be performed on the system regularly. Rather than checking the physical state of sensors and actuators, the proof test checks the correct functioning of the corresponding components. The physical state of the components must be checked separately. Information and notices which the user must observe are shown on the display before the test commences. All other navigation buttons are disabled while the proof test is in progress. The **Cancel** button cancels the proof test and the user returns to the **Proof-Test** start view.

If the proof test is canceled, the Nivotester needs some time to end the test (FTL825 ~ 20 s / FTL325P ~ 40 s) and issues warnings/alarms to this effect.

The **Warning: Proof-Test running** message appears while the proof test is active. All warnings and alarms are disabled during the proof test. The multi-step proof test performs the necessary checks during each step of the test. Every step of the proof test is started by pressing the **Next** button and can be repeated by pressing the **Repeat** button. The proof test must be completed within 10 minutes. A status bar shows the progress of the test. The test is canceled automatically after a time limit of 10 minutes. The warnings and alarms are reactivated automatically afterwards. On completion of the proof test, the system creates a report with the results. The proof test can be passed successfully with or without warnings. If there are safety-related problems, the test is failed and an alarm to this effect is displayed. Safe operation can no longer be guaranteed in this case. The user must take appropriate measures to address the situation. The proof test can be performed again once the cause of the error has been eliminated. The time until the next test (**Proof-Test Time**) is only reset once the proof test has been performed successfully. The proof test report can be printed out if a printer is connected to the system. The results of the proof test are recorded in a log file.



38 *Proof Test start screen*

This automated proof test does not involve an installation check on the sensors, actuators or field signalization units, nor the visual inspection of status LEDs on system components.

No safety functions are processed during the proof test.

The following conditions must be guaranteed before the proof test is started:
- A filling process may not be active
- The tuning forks of the point level switches are **not** covered by medium
- No warning active with the exception of **Proof test validity time expired**
- No alarm active

⚠ CAUTION

Noise from alarm siren (105 dB up to one meter)
can cause temporary hearing impairment and stress.
► Notify staff of the impending activities.

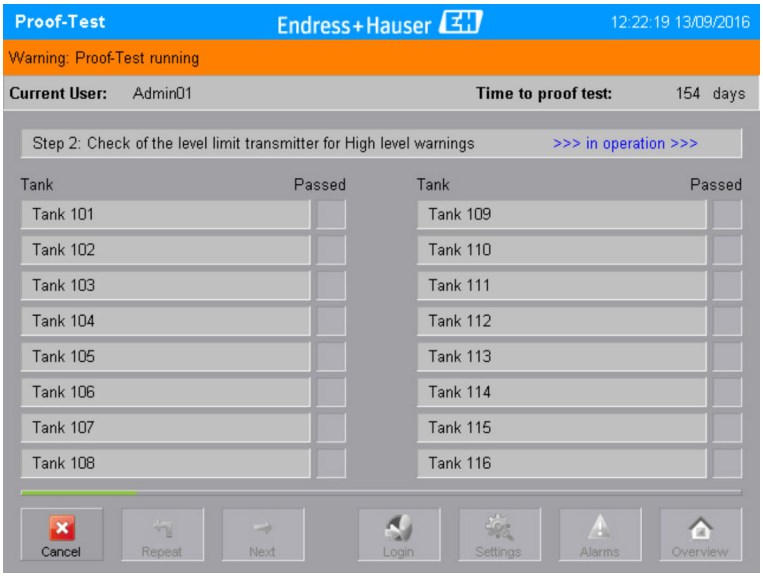
⚠ WARNING

The alarms are disabled during a proof test.
Therefore the system does not alert the user if overfilling occurs.
► No fill processes may be active during the proof test.

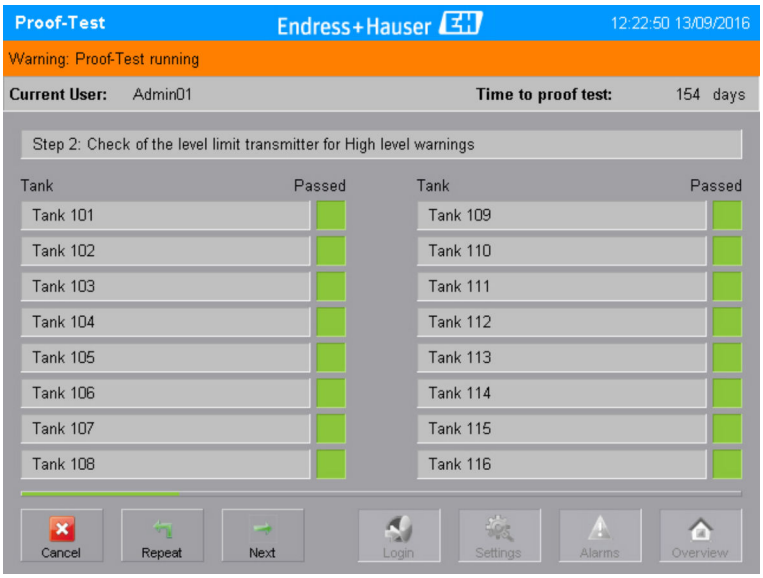
Step 1: High-High Level transmitter test

The proof test is performed in accordance with **Test sequence I B** of the FTL825 Functional Safety Manual SD00350FEN or in accordance with the **Test Procedure** of the FTL325P User Manual KA167FA6.

- Press **Start**.
  - The proof test starts.
    The **Repeat** and **Next** buttons are hidden and the test is active.



Once the test is completed, the **Passed** indicator changes color and displays the results per tank.
The **Repeat** and **Next** buttons are displayed.



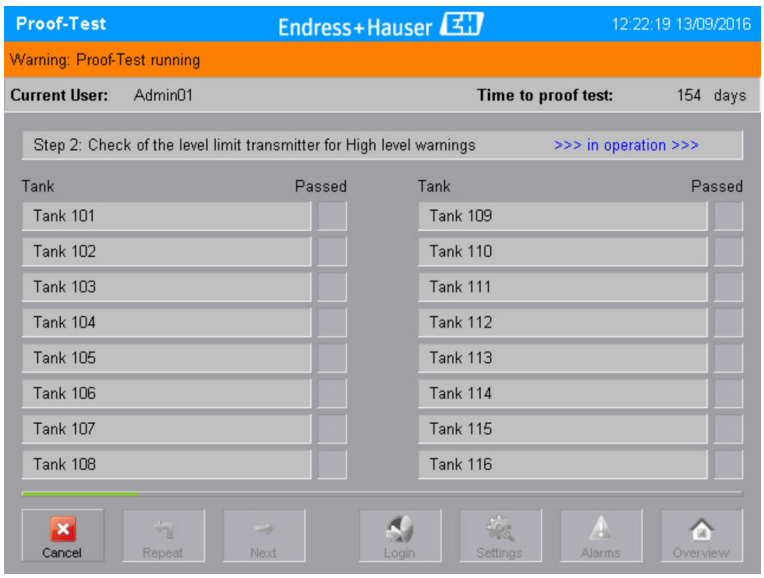
Color	Description
Gray	Test not completed or element not available
Green	Test passed
Amber	Test passed with warning
Red	Test failed

Step 2: High Level transmitter (optional)

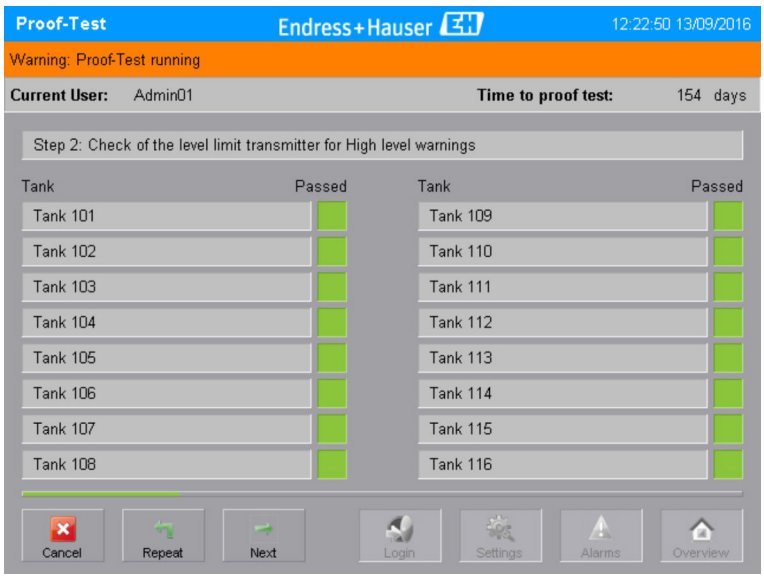
The proof test is performed in accordance with **Test sequence I B** of the FTL825 Functional Safety Manual SD00350FEN or in accordance with the **Test Procedure** of the FTL325P User Manual KA167FA6.

Perform the proof test if a High Level transmitter is present. Do not perform the test if an external High Level signal is used.

- Click **Next**.
  - The proof test starts.
    The **Repeat** and **Next** buttons are hidden.



Once the test is completed, the **Passed** indicator changes color and displays the results per tank.
The **Repeat** and **Next** buttons are displayed.

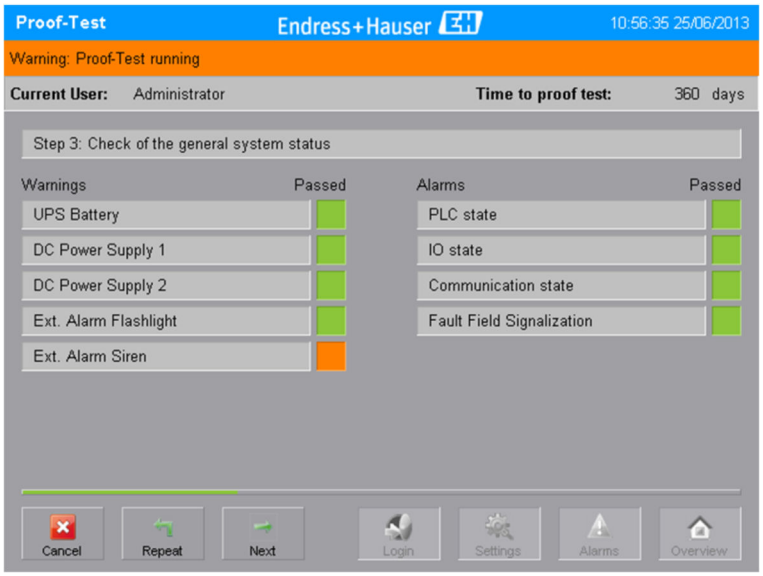


Color	Description
Gray	Test not completed or element not available
Green	Test passed
Amber	Test passed with warning

Step 3: General system status

Ext. Alarm Flash Light, **Ext. Alarm Siren** and **Fault Field Signalization** appear if field signalization is available.

- Click **Next**.
  - The proof test starts.
    The **Repeat** and **Next** buttons are hidden.
    Once the test is completed, the **Passed** indicator changes color and displays the components.
    The **Repeat** and **Next** buttons are displayed.

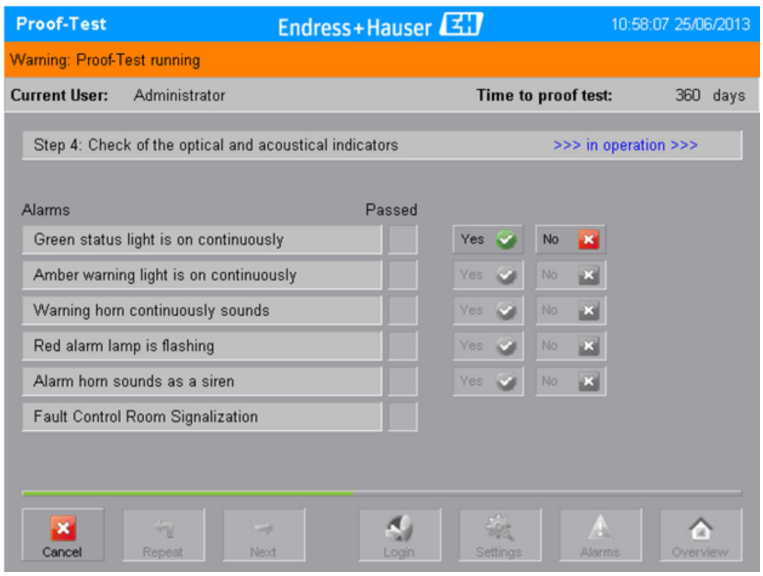


Color	Description
Gray	Test not completed or element not available
Green	Test passed
Amber	Test passed with warning
Red	Test failed

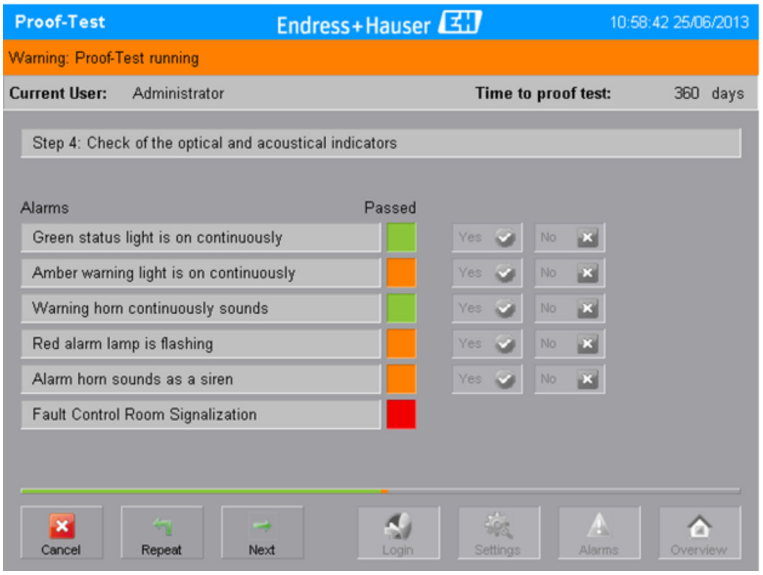
Step 4: Test visual and acoustic indicators

Each test performed in step 4 must be confirmed by selecting **Yes** or **No** once the visual or acoustic functional test has been performed.

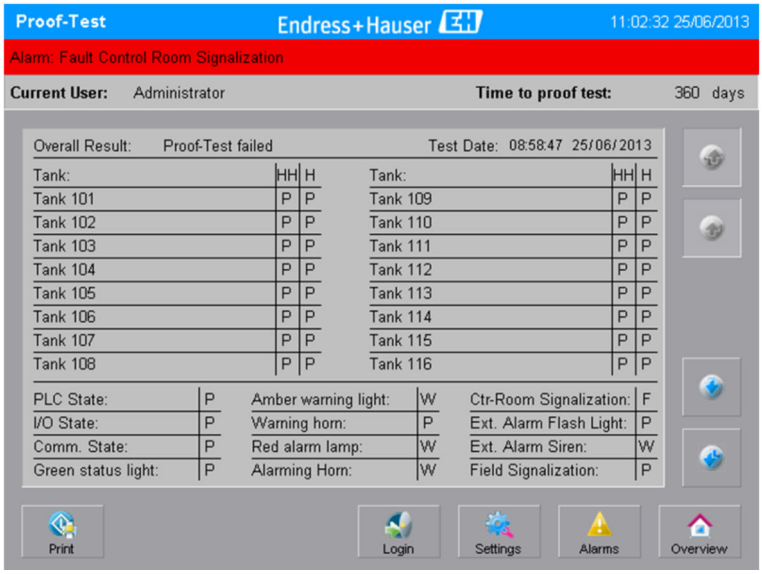
1. Click **Next**.
   ↳ The proof test for the first signalization (steady light OK status) starts.
   The **Repeat** and **Next** buttons are hidden.
   The **Yes** and **No** buttons for active signalization are active.



2. Is the green steady light of the control room stack light on:
   Tap on the **Yes** button, otherwise tap **No**.
   ↳ The Passed indicator changes color and shows the corresponding result.
3. Perform the test for all the remaining signalizations.
   ↳ The **Repeat** and **Next** buttons are displayed.



4. Click **Next**.
   ↳ The proof test ends and the alarms and warnings are active again and displayed (if present).



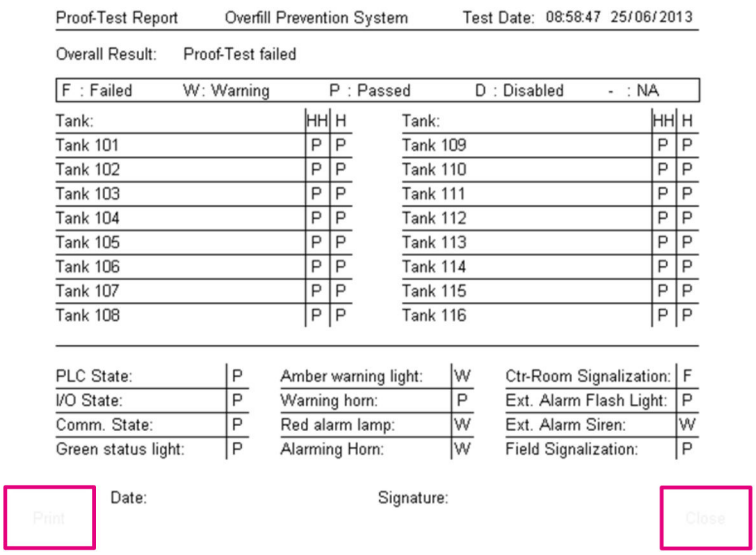
Previous proof tests can be accessed via the scroll button on the right of the screen.

Color	Description
Gray	Test not completed or element not available
Green	Test passed
Amber	Test passed with warning
Red	Test failed

The result of each test is indicated by a letter:

F	Failed
W	Warning
P	Passed
D	Disabled

1. Tap on **Print**.
   ↳ The test report to be printed out is displayed.



Proof-Test Report Overfill Prevention System Test Date: 08:58:47 25/06/2013

Overall Result: Proof-Test failed

F : Failed W: Warning P : Passed D : Disabled - : NA

Tank:	HH	H	Tank:	HH	H
Tank 101	P	P	Tank 109	P	P
Tank 102	P	P	Tank 110	P	P
Tank 103	P	P	Tank 111	P	P
Tank 104	P	P	Tank 112	P	P
Tank 105	P	P	Tank 113	P	P
Tank 106	P	P	Tank 114	P	P
Tank 107	P	P	Tank 115	P	P
Tank 108	P	P	Tank 116	P	P

PLC State:	P	Amber warning light:	W	Ctr-Room Signalization:	F
I/O State:	P	Warning horn:	P	Ext. Alarm Flash Light:	P
Comm. State:	P	Red alarm lamp:	W	Ext. Alarm Siren:	W
Green status light:	P	Alarming Horn:	W	Field Signalization:	P

Print Date: Signature: Close

2. Tap on **Print** (bottom left).

The test report is printed out.

Tap **Close** to close the print screen.

9.3.16 Settings screen

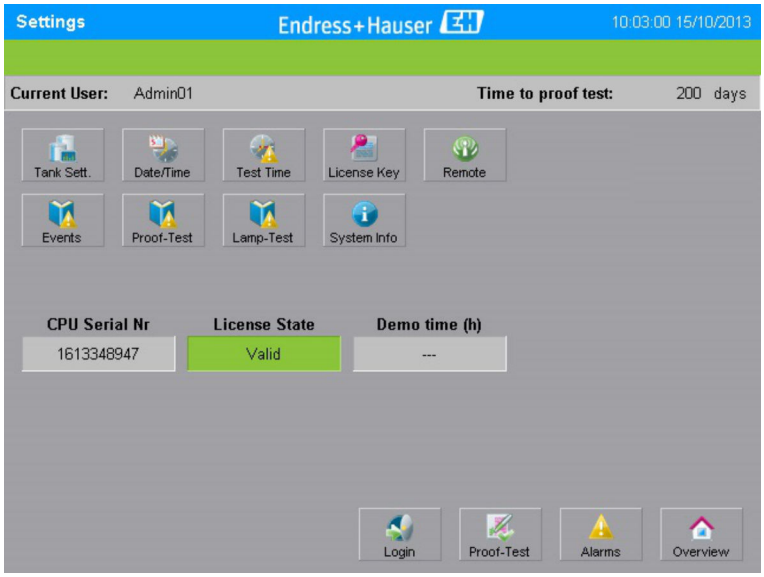
The **Settings** screen can be accessed via the **Settings** button in the navigation bar.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The **Settings** screen is the overview page for all the relevant system-specific settings.

The following settings can be accessed or edited via corresponding buttons in this screen:
- Date/time
- Tank settings (Tanks Sett.)
- Log files (Events, Proof-Test and Lamp-Test)
- Remote access (Remote)
- License key (License Key)
- Time to next proof test (Test Time)
- System information (System Info)

In addition the latest information concerning the license status is displayed. If a valid license is not available, the system displays the **Warning: No valid license key** message and runs in demo mode. The demo mode is limited to 14 days (336 hours). After this time, the system stops operating and displays a safety alarm. As soon as a valid license key is entered the system is enabled again and the corresponding warning is reset.



39 *Settings screen*

9.3.17 Tank Settings screen

The **Tank Settings** screen can be accessed via the **Tank Sett.** button in the **Settings** screen.

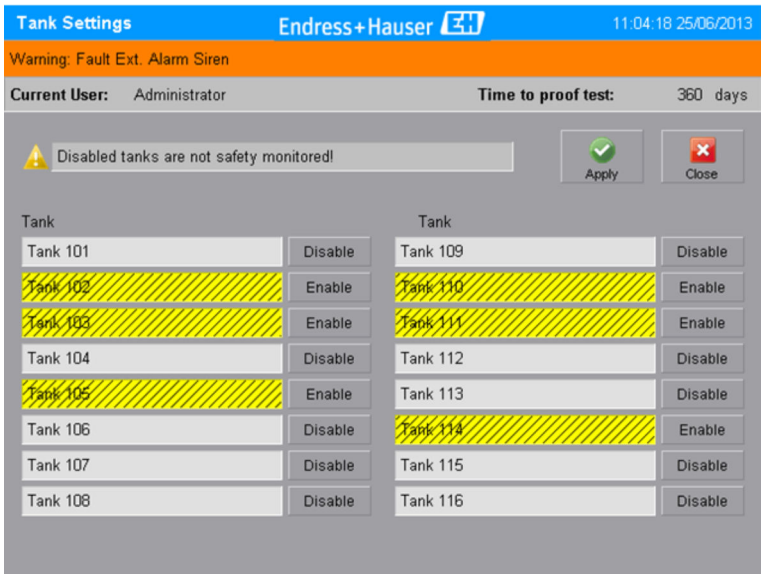
User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The various tanks can be enabled and disabled and assigned tank names via the **Tank Settings** screen. The tank names can contain a maximum of 15 characters.

⚠ WARNING

If a tank is disabled,
it is no longer monitored for safety alarms, failures or overly high levels of product.
- ► Disabled tanks may not be filled without additional safety measures.

Disabled tanks are indicated by a specific color in the **Overview** screen. In addition, disabled tanks are also listed in the log file. All changes made on this screen only take effect once the **Apply** button is pressed. Disabled tanks are flagged as such **D (= Disabled)** in the proof test.



40 Tank Settings screen

Changing the tank name

1. Tap on a tank.
2. Enter a name and tap on **Apply**.
   ↳ The changes take effect.

Disabling a tank

1. Tap on the **Disable** button for the tank you wish to disable.
   ↳ The tank is disabled.
2. Make changes and tap on **Apply**.
   ↳ The changes take effect.

Enabling a tank

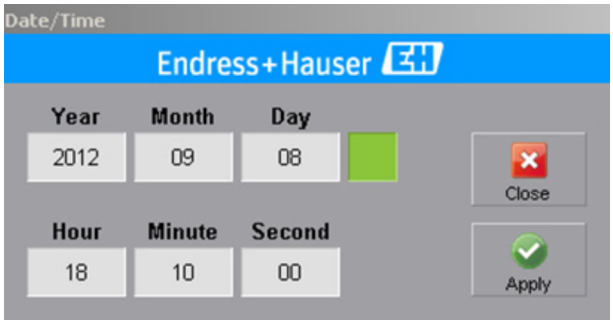
1. Tap on the **Enable** button for the tank you wish to enable.
   ↳ The tank is disabled.
2. Make changes and tap on **Apply**.
   ↳ The changes take effect.

The field is displayed in yellow with diagonal black lines if the tank is disabled.

Date/Time dialog box

The **Date/Time** dialog box can be accessed via the **Date/Time** button in the **Settings** screen.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes



41 *Date/Time dialog box*

Setting the date and time.

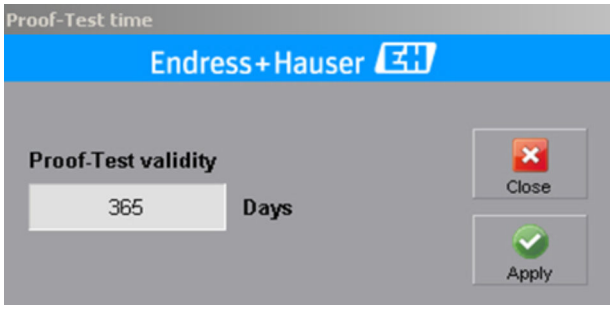
- Set the date and time if the system time is different from the local time.
  Enter the date and time and tap on **Apply**.
  - A green field indicates that the settings are ok.
    A red field indicates that the date or time is not valid.

Proof-Test time dialog box

The **Proof-Test time** dialog box can be accessed via the **Test time** button in the **Settings** screen.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The time between the required proof tests can be defined in this dialog box. In addition, the status bar also displays the time remaining until the next proof test. The time between two proof tests can range between 1 and 365 days. 365 days is the standard setting. If the time for proof tests is exceeded, the **Warning: Proof-Test validity time expired** message is displayed. The timer starts counting down the days from the last successful proof test. Changing the time between two proof tests does not affect the current time remaining until the next test. All changes to the time to next test made here only take effect after the next successfully completed proof test. Perform a new proof test if the new time has to be activated immediately.



42 *Proof-Test time dialog box*

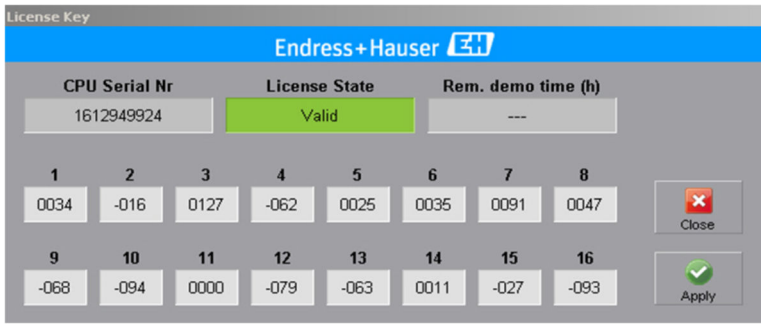
License Key dialog box

The **License Key** dialog box can be accessed via the **License Key** button in the **Settings** screen.

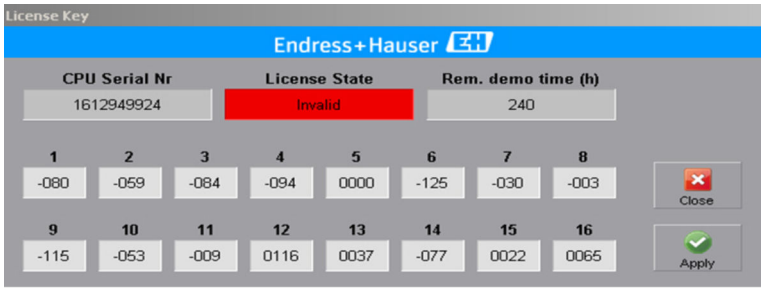
User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The status of the current license is displayed in the **Settings** screen. The license key is linked to the serial number of the CPU. If the CPU of the PLC is exchanged, a new license key can be requested. The remaining demo time is indicated in hours under **Rem. Demo Time (h)** (max. 14 days or 336 hours).

- ▶ Enter the license key and tap on **Apply**.
  - ↳ If the license key is valid, **Valid** appears with a green background.



If the license key is invalid, **Invalid** appears with a red background.

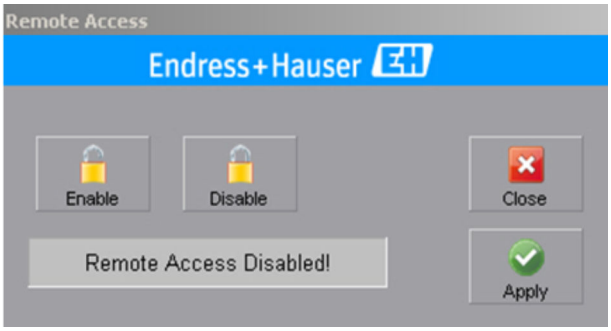


Remote Access dialog box (optional)

The **Remote Access** dialog box can be accessed via the **Remote** button in the **Settings** screen.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The remote maintenance modem is enabled via a digital output if the user initiates this process via the touch panel. The status of the remote maintenance modem (switch on/off) is communicated to the system. If the remote maintenance modem is switched on and a VPN connection is active, the message **Warning: Remote Access active** is displayed.



43 *Remote Access dialog box*

Enabling/disabling the remote maintenance modem

1. Tap on the **Enable** or **Disable** button.
2. Tap on the Apply button.
   ↳ The changes take effect and the remote maintenance modem is enabled or disabled accordingly.

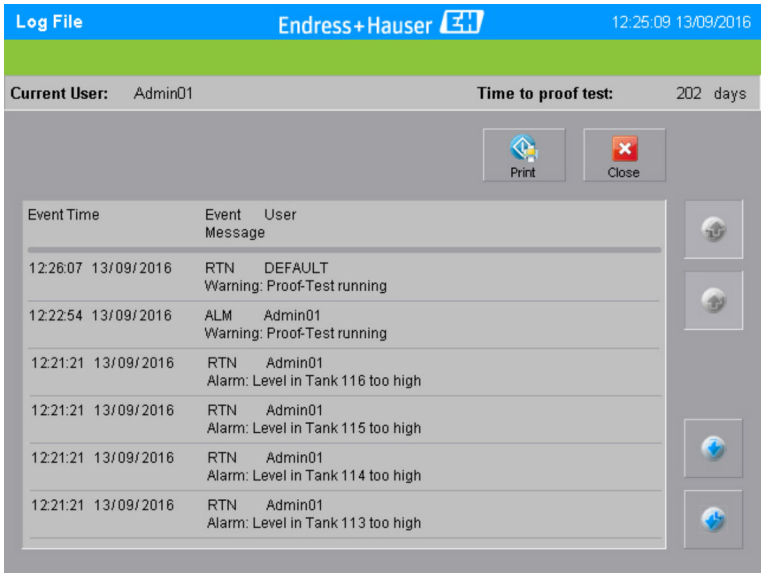
If the touch panel is not executable, it is possible to enable the remote maintenance modem via a key switch in the cabinet.

Log File (Events) screen

The **Log File** screen can be accessed via the **Events** button in the **Settings** screen.

User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The log file contains a list of all the events and user interactions with the system. After 3,000 records, the oldest data record is overwritten (first in-first out principle). The recorded data records can be printed out if an optional printer is connected to the system.



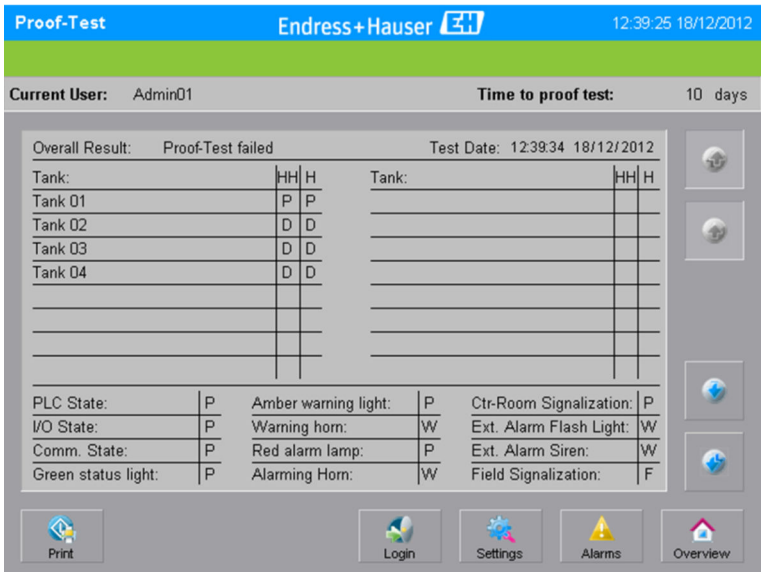
44 *Log File screen*

Proof Test screen (test reports)

The **Proof-Test** screen (test reports) can be accessed via the **Proof-Test (Events)** button in the **Settings** screen.

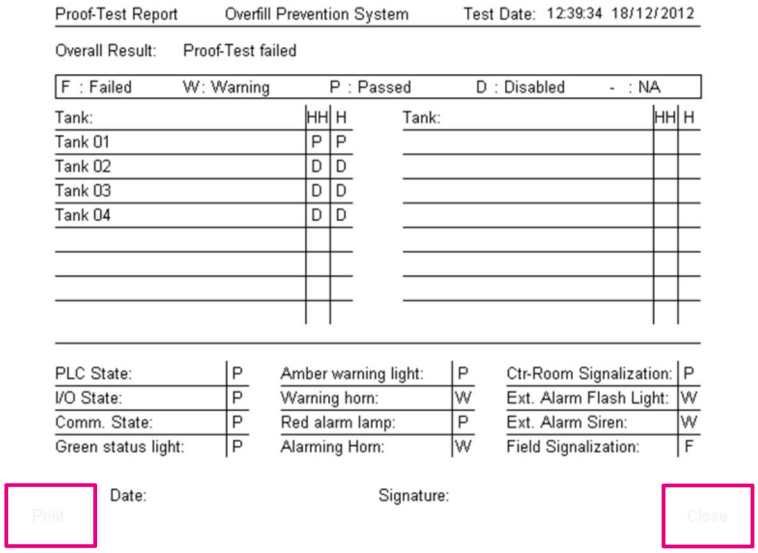
User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The test report for the last proof test to be performed is displayed. Previous reports can be accessed using the scroll buttons on the right-hand side. 300 test reports can be saved. Afterwards, the oldest report is overwritten (ring buffer).



45 *Proof-Test (test report) screen*

Press the **Print** button to open the **Proof Test Report** screen where you can print out the selected proof test report.



46 *Proof Test Report screen*

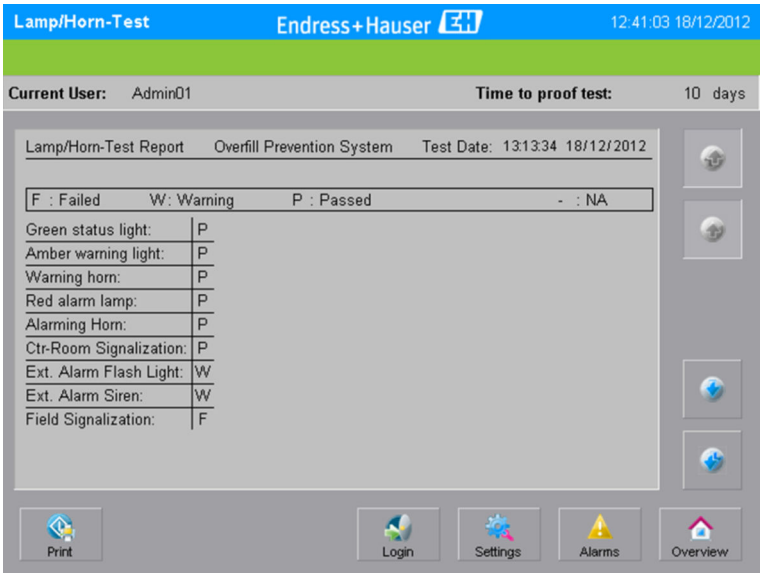
The **Print** button (bottom left) must be pressed to print out the test report at the connected printer. The screen is closed again by tapping the **Close** button (bottom right).

Lamp/Horn-Test screen (test reports)

The **Lamp/Horn-Test** screen (test reports) can be accessed via the **Lamp-Test (Events)** button in the **Settings** screen.

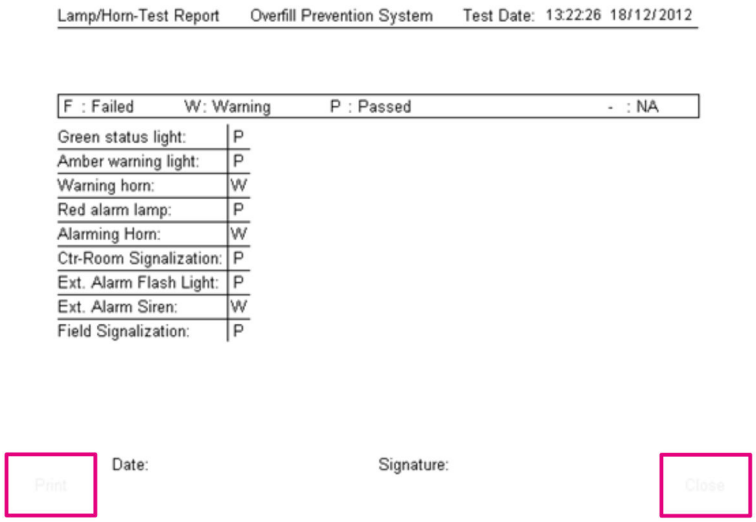
User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

The test report for the last signalization test that was performed appears on the screen. Previous reports can be accessed using the scroll buttons on the right-hand side. 500 test reports can be saved. Afterwards, the oldest report is overwritten (ring buffer).



47 *Lamp/Horn-Test (test report) screen*

Press the **Print** button to open the **Lamp/Horn-Test Report** screen where you can print out the selected signalization test report.



48 *Lamp/Horn-Test Report screen*

The **Print** button (bottom left) must be pressed to print out the test report at the connected printer. The screen is closed again by tapping the **Close** button (bottom right).

System Info screen

The **System Info** screen can be accessed via the **System Info** button in the **Settings** screen.

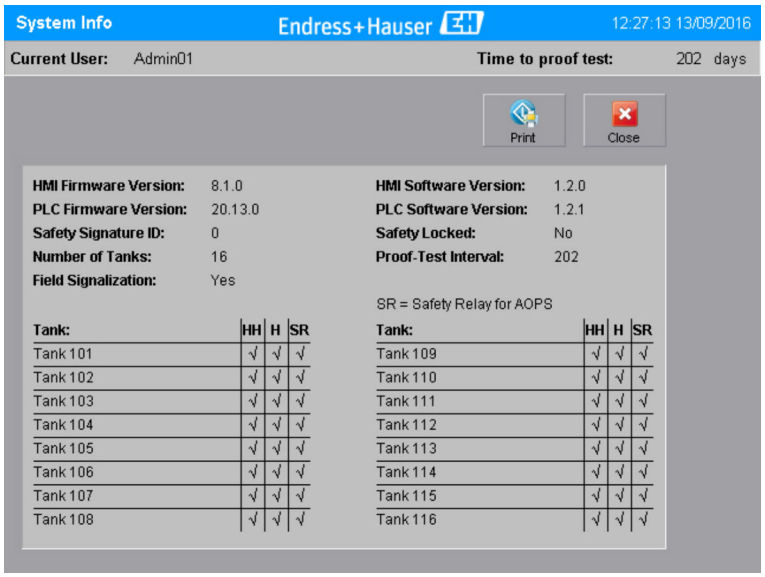
User	Default	Operator	Administrator	Endress+Hauser Service
Access authorization	No	No	Yes	Yes

This screen contains relevant information concerning the installed project, such as the software and firmware versions of the PLC, HMI etc., and also the system configuration

data. If required, this information can be sent to Endress+Hauser (print out to connected printer, or photo).

If the system is active as a safety system the **Safety Locked** item must read **Yes**.

Contact your Endress+Hauser Sales Center if this is not the case.



49 *System Info screen*

10 Diagnostics and troubleshooting

10.1 Diagnostic information

The following warning messages are available by default. All messages start with the prefix **Warning**:

Warning	Control room stack light [1]	Field signalization [2]	SR [3]	Log	Optional
Fault DC Power Supply 1	Yes	No	No	Yes	
Fault DC Power Supply 2	Yes	No	No	Yes	[4]
Fault AC Power – UPS in battery mode	Yes	No	No	Yes	[5]
Fault AC Power – UPS battery critical low	Yes	No	No	Yes	[5]
UPS not ready	Yes	No	No	Yes	[5]
USP battery must be replaced	Yes	No	No	Yes	[5]
Proof-Test validity time expired	Yes	No	No	Yes	
Proof-Test running	Yes	No	No	Yes	
Lamp-Test running	Yes	No	No	Yes	
Remote Access active	Yes	No	No	Yes	[4]
Cabinet temperature high	Yes	No	No	Yes	
Cabinet temperature low	Yes	No	No	Yes	
Reset signal shortcut	Yes	No	No	Yes	
Acknowledge signal shortcut	Yes	No	No	Yes	
No valid license key	Yes	No	No	Yes	
Fault Control Room Alarm Lamp	Yes	No	No	Yes	
Fault Control Room Alarm Horn	Yes	No	No	Yes	
Fault Ext. Alarm Flashlight	Yes	No	No	Yes	[5]
Fault Ext. Alarm Siren	Yes	No	No	Yes	[5]
Fault High Level Sensor tank n (1-16)	Yes	No	No	Yes	[4]
Level in tank n high (1-16)	Yes	No	No	Yes	[4]

1) Activation of corresponding warning stack light modules
2) Activation of field signalization unit
3) Deactivation of the safety relay
4) Optional
5) Optional for AOPS

The following table lists the warnings and also contains any measures to rectify the problem. If the measures listed do not deliver the required result, please contact your Endress+Hauser Sales Center.

Diagnostics description	Cause:	Measures:
Fault DC Power Supply 1 Green LED **Input 1** on the 1606-XLERED is OFF	▪ Circuit breaker 1 off ▪ Power supply 1 defective	▪ Switch on circuit breaker ▪ Check input voltage to power supply 1. If the input voltage does not match the specification (nameplate), make appropriate voltage available
Fault DC Power Supply 2 Green LED **Input 2** on the 1606-XLERED is OFF	▪ Circuit breaker 2 off ▪ Power supply 2 defective	▪ Switch on circuit breaker ▪ Check input voltage to power supply 2. If the input voltage does not match the specification (nameplate), make appropriate voltage available
Fault AC Power – UPS in battery mode Green **Status** LED flashing on the 1606-XLS240-UPS	No supply voltage available	Check the power supply to the system. If the input voltage does not match the specification (nameplate), make appropriate voltage available, otherwise perform checks as per **Fault DC Power Supply 1 & 2**.
Fault AC Power – UPS battery critical low	Remaining voltage buffer time: approx. 10 minutes	Check measures as per **Fault AC Power – UPS in battery mode**.
UPS not ready Green **Status** LED flashing on the 1606-XLS240-UPSC	▪ Battery less than 85% charged ▪ No power supply available	▪ If the battery was discharged in advance, or was not fully charged, wait until the battery is sufficiently charged ▪ Check supply voltage as per Fault **DC Power Supply 1 & 2** or **Fault AC Power – UPS in battery mode**
UPS battery must be replaced Yellow **Diagnosis** LED flashing on the 1606-XLS240-UPSC	▪ Poor battery condition. The battery must be replaced. ▪ Battery power too low. The battery must be replaced.	⚠ CAUTION **Leaking battery fluid** can cause skin lesions and poisoning. ▶ Avoid any contact with leaked battery fluid and the inhalation of vapors. Replace the battery
Proof-Test validity time expired	Proof test required	Perform proof test
Proof-Test running	Message is displayed during a proof test.	Complete the proof test
Lamp-Test running	Message is displayed during a signalization test.	Complete the signalization test
Remote Access active	VPN connection established with remote maintenance modem	Terminate VPN connection
Cabinet temperature high Yellow LED on thermoplant TTR31 is OFF	▪ Cabinet temperature exceeds 40 °C ▪ Ambient temperature too high	▪ Check function of cabinet fan, **Section 3.1.8** → 🖹 21 ▪ Adjust ambient temperature
Cabinet temperature low Yellow LED on thermoplant TTR31 is OFF	▪ Cabinet temperature less than 5 °C. ▪ Ambient temperature too low	▪ Check function of cabinet fan, **Section 3.1.8** → 🖹 21 ▪ Adjust ambient temperature
Reset signal short-circuit	Message is displayed if the door button has short-circuited or has been pressed for longer than 5 seconds.	Check the button function or wiring
Acknowledge signal short-circuit	Message is displayed if the door button has short-circuited or has been pressed for longer than 5 seconds.	Check the button function or wiring

Diagnostics description	Cause:	Measures:
No valid license key	System runs in demo mode (max. 336 h).	Contact Endress+Hauser for the new license key
Fault Control Room Alarm Lamp	▪ Safety relay for the strobe light module of the alarm stack light is defective ▪ Strobe light module or corresponding LED defective	▪ Check fuse in safety relay and replace if necessary ▪ Replace defective LED or defective module
Fault Control Room Alarm Horn	▪ Safety relay for the siren module of the alarm stack light is defective ▪ Alarm signal horn defective	▪ Check fuse in safety relay and replace if necessary ▪ Replace module
Fault Ext. Alarm Flash Light	▪ Safety relay for the strobe light (field signalization) is defective. ▪ Fuse terminal is defective ▪ Incorrectly wired ▪ Strobe light is defective	▪ Check fuse in safety relay and replace if necessary ▪ Check fuse in terminal and replace if necessary ▪ Check wiring and correct if necessary ▪ Replace the strobe light
Fault Ext. Alarm Siren	▪ Safety relay for the siren (field signalization) is defective ▪ Fuse terminal is defective ▪ Incorrectly wired ▪ Siren is defective	▪ Check fuse in safety relay and replace if necessary ▪ Check fuse in terminal and replace if necessary ▪ Check wiring and correct if necessary ▪ Replace siren
Fault High Level Sensor tank (1-16) (optional)	FTL825 / FTL8x: ▪ Incorrectly wired ▪ Liquiphant FTL8x is defective ▪ Nivotester FTL825 is defective FTL325P / FTL5x (FTL7x): ▪ Nivotester FTL325P without power supply (**Power** LED OFF) ▪ Incorrectly wired ▪ Liquiphant FTL5x (FTL7x) is defective ▪ Nivotester FTL325P is defective	FTL825 / FTL8x: ▪ Check wiring and correct if necessary ▪ See **Operating Instructions BA01038F/00/EN** ▪ See **Operating Instructions BA01038F/00/EN** FTL325P / FTL5x (FTL7x): ▪ Check the digital output for switching on the Nivotester ▪ Check wiring and correct if necessary ▪ See **Brief Operating Instructions KA00167F/00/A6** ▪ See **Brief Operating Instructions KA00167F/00/A6**
Level in tank high (1-16) (optional)	Level in tank is too high	Drain product from the tank until the level is below the limit

10.2 Alarms

The following alarms are available by default. All alarms start with the prefix **Alarm**:

Message:	Control room stack light [1]	Field signalization [2]	SR [3]	Log:	Optional:
Fault Safety PLC	Yes	Yes	Yes	Yes	
Fault Safety I/O modules (see Touch Panel screen - Module Status)	Yes	Yes	Yes	Yes	
Fault Communication	Yes	Yes	Yes	Yes	
Fault Field Signalization	Yes	Yes	No	Yes	[4]
Fault Control Room Signalization	Yes	Yes	No	Yes	
Proof-Test failed	Yes	Yes	No	Yes	
No valid license - Demo time expired	Yes	Yes	Yes	Yes	
Level in tank too high (1-16)	Yes	Yes	Yes	Yes	

Message:	Control room stack light [1]	Field signalization [2]	SR [3]	Log:	Optional:
Fault Safety Relay Tank n (1-16)	Yes	Yes	Yes	Yes	
Fault High-High Level Sensor tank n (1-16)	Yes	Yes	Yes	Yes	

1) Activation of corresponding alarm stack light modules
2) Activation of a field signalization unit
3) Deactivation of the safety relay
4) Optional for AOPS

The following table lists the warnings and also contains any measures to rectify the problem. If the measures listed do not deliver the required result, please contact your Endress+Hauser Sales Center.

Description of alarm:	Cause:	Measures:
Fault Safety PLC	▪ PLC is no longer in the **RUN** mode ▪ The PLC has been stopped due to a critical error (red LED).	▪ Turn PLC key switch to **RUN** position ▪ De-energize the system and restart it: – Turn the key switch on the control from **RUN** to **PROG** – Turn the key switch from **PROG** to **RUN** and back to **PROG** to clear the alarm – Turn the key switch from **PROG** to **RUN** to continue normal operation More information can be found in the **Functional Safety Manual SD01599S/04/EN**
Fault Safety I/O modules (see HMI Alarm - Module Status)	▪ A safety I/O module (red modules) is defective ▪ A channel of the safety module is defective	▪ De-energize the module and the switch it back on, or remove the module and reinstall it ▪ De-energize the module and the switch it back on, or remove the module and reinstall it More information can be found in the **Functional Safety Manual SD01599S/04/EN**
Fault Communication	▪ The Ethernet cable between the Ethernet switch, module 1768-ENBT and module 1734- AENT is defective ▪ Safety communication defective ▪ Ethernet switch defective ▪ Ethernet module of PLC or I/O assembly defective	▪ Check Ethernet cable and replace if necessary ▪ De-energize the system and restart it ▪ Replace the switch ▪ Replace the corresponding module
Fault Field Signalization	Alarm strobe light and alarm siren on field signalization unit are defective	Read the section on the diagnostic information **Fault Ext. Alarm Flashlight** and **Fault Ext. Alarm Siren**
Fault Control Room Signalization	Siren and strobe light on alarm stack light defective	Read the section on the diagnostic information **Fault Control Room Alarm Lamp** and **Fault Control Room Alarm Horn**
Proof-Test failed	At least one sequence of the proof test did not pass the test	Repeat the proof test or check the component in question (corresponding alarm/warning after proof test has been performed)
No valid license - Demo time expired	The demo time of 14 days (336 hours) has expired; a new license must be purchased	Contact **Endress+Hauser**

Description of alarm:	Cause:	Measures:
Fault High-High Level Sensor tank (1-16)	FTL825 / FTL8x: ▪ Incorrectly wired ▪ Liquiphant FTL8x is defective ▪ Nivotester FTL825 is defective FTL325P / FTL5x (FTL7x): ▪ Nivotester FTL325P without power supply (**Power** LED OFF) ▪ Incorrectly wired ▪ Liquiphant FTL5x (FTL7x) is defective ▪ Nivotester FTL325P is defective	FTL825 / FTL8x: ▪ Check wiring and correct if necessary ▪ See **Operating Instructions BA01038F/00/EN** ▪ See **Operating Instructions BA01038F/00/EN** FTL325P / FTL5x (FTL7x): ▪ Check the digital output for switching on the Nivotester ▪ Check wiring and correct if necessary ▪ See **Brief Operating Instructions KA00167F/00/A6** ▪ See **Brief Operating Instructions KA00167F/00/A6**
Level in tank too high (1-16)	Level in tank is too high	Drain product from the tank until the level is below the limit
Fault Safety Relay Tank n (1-16) (optional)	▪ Reset failed because the feedback circuit was closed (e.g. wrong state for one of the actuator's main contacts or both contacts, or alternative jumper not used). ▪ Error in safety relay (red LED) ▪ Safety relay defective	▪ Make sure the feedback circuit is closed and reset the safety relay with the **Reset** button ▪ De-energize the safety relay and then activate it again (including subsequent **reset**) ▪ Replace the safety relay

10.3 Firmware history

Version	Description	Comments
1.00.xx	First version with FTL670 Nicotester	-
1.01.xx	FTL670 replaced by FTL325P and FTL825 Various optimizations	-
1.02.xx	Point I/O Safety Module Upgrade (Series A → Series B)	-

11 Maintenance

In addition to the (functional) proof test which must be performed periodically, the components must also be visually inspected periodically. Endress+Hauser also offers its customers Maintenance Agreements and Software Level Agreements for this. For more information, see the next section.

11.1 Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests. Your Endress+Hauser Sales Center can provide detailed information on the services.

12 Repair

12.1 General notes

Device repairs must always be carried out by Endress+Hauser only. Safety functions cannot be guaranteed if repairs are carried out by another party.

Always perform a new proof test if one of the components mentioned has been replaced on a device operating in SIL-certified areas.

For further information on proof testing, see the **Functional Safety Manual SD01599S/04/EN**.

The replaced component must be sent to Endress+Hauser for fault analysis.

In the event of failure of a SIL-labeled Endress+Hauser device, which has been operated in a protection function, the **Declaration of Hazardous Material and Decontamination** with the corresponding note **Used as SIL device in protective system** must be enclosed when the defective device is returned.

We recommend you conclude a Service Level Agreement. For more information, please contact your Endress+Hauser Sales Center.

12.2 Spare parts

Please contact your Endress+Hauser Sales Center at: www.addresses.endress.com

12.3 Endress+Hauser services

Endress+Hauser offers a wide variety of services for maintenance such as recalibration, maintenance service or device tests. Your Endress+Hauser Sales Center can provide detailed information on the services.

12.4 Return

The following measures must be taken before returning a component to Endress+Hauser, e.g. for repair or calibration:

- Remove all stubborn fluid residue, paying particular attention to seal grooves and crevices. This is particularly important in the case of harmful media that are flammable, toxic, caustic or carcinogenic.
- Always enclose a duly completed Declaration of Contamination. Only then is it possible to examine or repair a returned device
- Include special handling instructions, e.g. safety data sheet as per 91/155/EEC
- Also specify:
  - The chemical and physical properties of the medium
  - A description of the application
  - A description of the error which occurred (cite the error code)
  - How long the device has been in operation

12.5 Disposal

Never dispose of SIL components independently. Always return SIL components to Endress+Hauser for disposal.

13 Technical data

All the technical data can be found in the **Technical Information TI01305S**.

www.addresses.endress.com

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