

# Brief Operating Instructions Nivotester FTL325N, 3-channel

Vibronic

Level detector with NAMUR input for connecting  
any NAMUR sensor



These Instructions are Brief Operating Instructions; they are not a substitute for the Operating Instructions pertaining to the device.

Detailed information about the device can be found in the Operating Instructions and the other documentation:  
Available for all device versions via:

- Internet: [www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)
- Smart phone/tablet: *Endress+Hauser Operations App*



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## 1 About this document

### 1.1 Symbols

#### 1.1.1 Safety symbols



This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.



This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.


**⚠ CAUTION**

This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.


**NOTICE**

This symbol contains information on procedures and other facts which do not result in personal injury.

**1.1.2 Electrical symbols**


 Ground connection

Grounded clamp, which is grounded via a grounding system.


 Protective earth (PE)

Ground terminals, which must be grounded prior to establishing any other connections. The ground terminals are located on the inside and outside of the device.

 Output

 Input

 Fault


 No fault

 Limit signal

**Light emitting diodes (LED)**

 LED not lit


 LED lit


 LED flashing

**1.1.3 Symbols for certain types of information and graphics**

 Tip

Indicates additional information


 Reference to documentation

 Reference to another section

**1**, **2**, **3** Series of steps

**A, B, C ...** View

 Hazardous area

 Safe area (non-hazardous area)

## 2 Basic safety instructions

### 2.1 Requirements for the personnel

The personnel must fulfill the following requirements to carry out their tasks, e. g. commissioning and maintenance:

- ▶ Trained specialists must have a qualification that is relevant to the specific function and task.
- ▶ Must be authorized by the plant owner/operator.
- ▶ Must be familiar with national regulations.
- ▶ Must have read and understood the instructions in the manual and supplementary documentation.
- ▶ Personnel must follow instructions and comply with general policies.

### 2.2 Designated use

- The Nivotester FTL325N with intrinsically safe NAMUR inputs (IEC/EN 60947-5-6) must be connected only to appropriate sensors.
- The device may be dangerous if used incorrectly.
- Use only tools that have been insulated against ground
- Use only original parts

#### 2.2.1 Incorrect use

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

Deviating application conditions may affect the level of protection. The correct functioning of the device cannot be guaranteed.

### 2.3 Workplace safety

For work on and with the device:

- ▶ Wear the required protective equipment according to federal/national regulations.

### 2.4 Operational safety

Risk of injury!

- ▶ Operate the device only if it is in proper technical condition, free from errors and faults.
- ▶ The operator is responsible for ensuring failure-free operation of the device.

#### 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.

#### Repair

To ensure continued operational safety and reliability:

- ▶ Only perform repair work on the device if this is expressly permitted.
- ▶ 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 has been constructed and tested to state-of-the-art operational safety standards and in accordance with good engineering practice. The device left the factory in a safe operating condition.

### 2.5.1 CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

### 2.5.2 EAC conformity

The device meets the legal requirements of the applicable EAC Directives. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

## 3 Incoming acceptance and product identification

### 3.1 Incoming acceptance

Check the following during goods acceptance:

- Are the order codes on the delivery note and the product sticker identical?
- Are the goods undamaged?
- Do the nameplate data match the ordering information on the delivery note?
- If necessary (see nameplate), are the Safety Instructions, e. g. XA, provided?



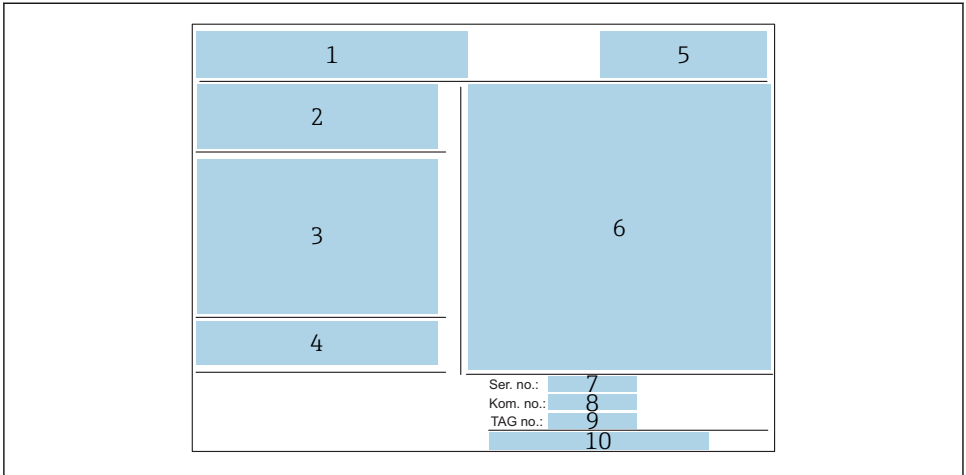
If one of these conditions is not satisfied, contact your Sales Center.

### 3.2 Product identification

Nameplate data on the device

- ▶ Enter the serial number from the nameplates in the *W@M Device Viewer* ([www.endress.com/deviceviewer](http://www.endress.com/deviceviewer))
  - ↳ All the information about the measuring device and all associated Technical Documentation are displayed.
- ▶ Enter the serial number from the nameplate in the *Endress+Hauser Operations app*.
  - ↳ All the information about the measuring device and all associated Technical Documentation are displayed.

### 3.2.1 Nameplate



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#### 1 Nameplate

- 1 *Manufacturer's logo, product name*
- 2 *Supply voltage*
- 3 *Electrical connection*
- 4 *Temperature specifications and reference to additional safety-related documentation (only for certified device versions)*
- 5 *Reference to certifications*
- 6 *Identification in accordance with Directive 94/9/EC and identification of type of explosion protection (only for certified device versions)*
- 7 *Serial number*
- 8 *Kom. number*
- 9 *TAG number*
- 10 *Manufacturer's address*

### 3.2.2 Manufacturer address

Endress+Hauser SE+Co. KG  
 Hauptstraße 1  
 79689 Maulburg, Germany

Address of the manufacturing plant: See nameplate.

## 3.3 Storage, transport

- Pack the device so that it is protected against impact  
 The original packaging offers the best protection
- Permitted storage temperature: -20 to +85 °C (-4 to +185 °F)

### **3.3.1 Transporting the product to the measuring point**

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

## **4 Installation**

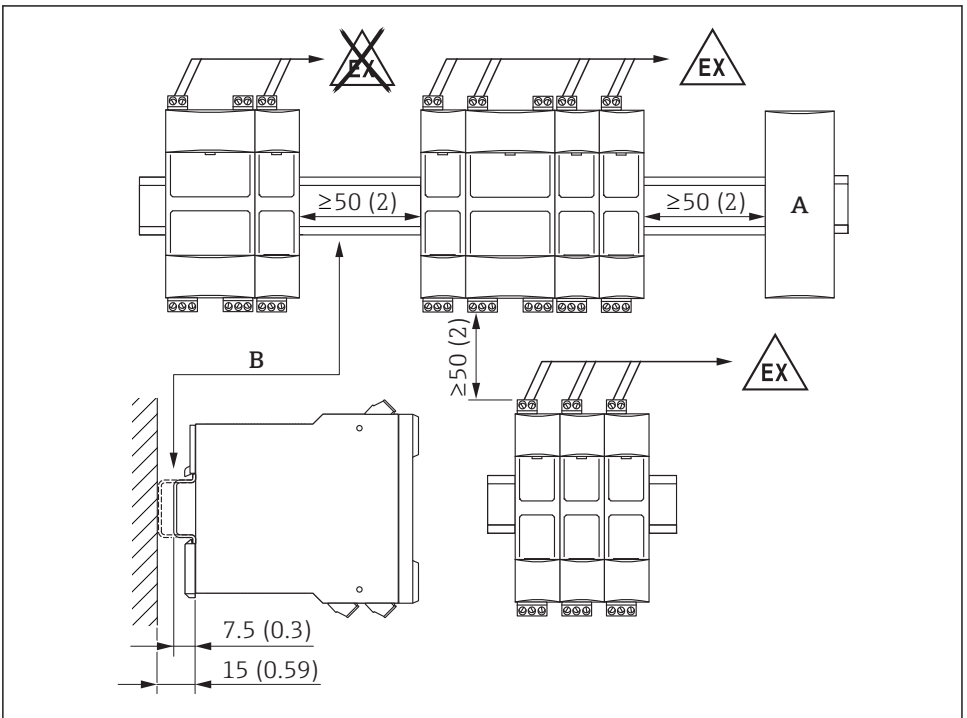
### **4.1 Mounting conditions**

- If using outside the hazardous area, mount the device in a cabinet.
- Mount the device so that it is protected against weather and impact.  
If operating outdoors and in warmer climates, avoid direct sunlight.  
Protective housing (IP65) is available for up to four single-channel Nivotester devices or two 3-channel Nivotester devices.



## 4.2 Mounting the measuring device

### 4.2.1 Horizontal orientation



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2 Minimum spacing, horizontal orientation. Unit of measurement mm (in)

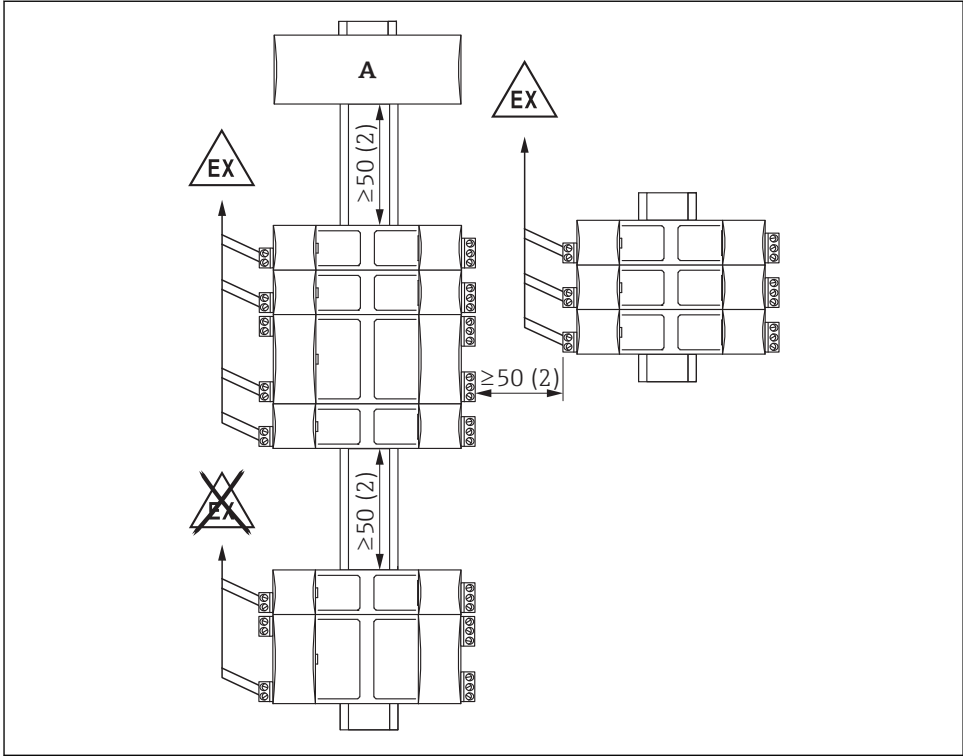
A Connection of another device type

B DIN rail in accordance with EN 60715 TH35-7.5/15



A horizontal installation ensures better dissipation of heat than a vertical orientation.

### 4.2.2 Vertical orientation

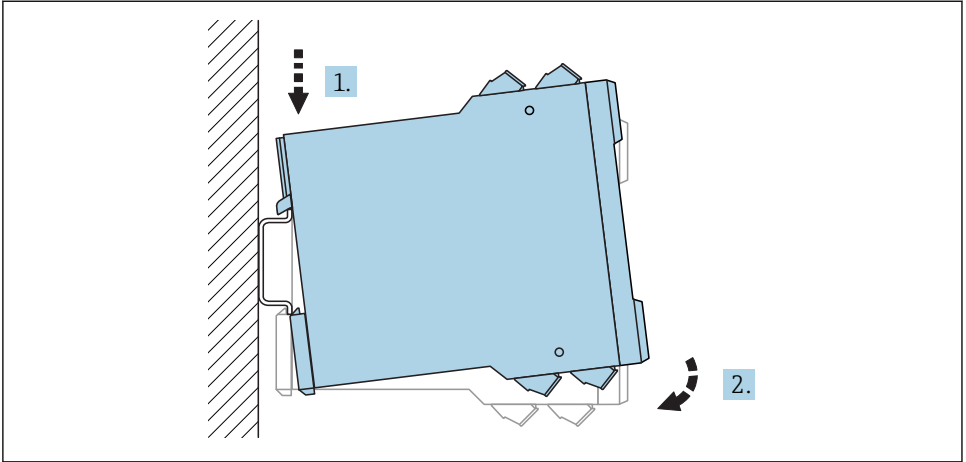


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3 Minimum spacing, vertical orientation. Unit of measurement mm (in)

A Connection of another device type

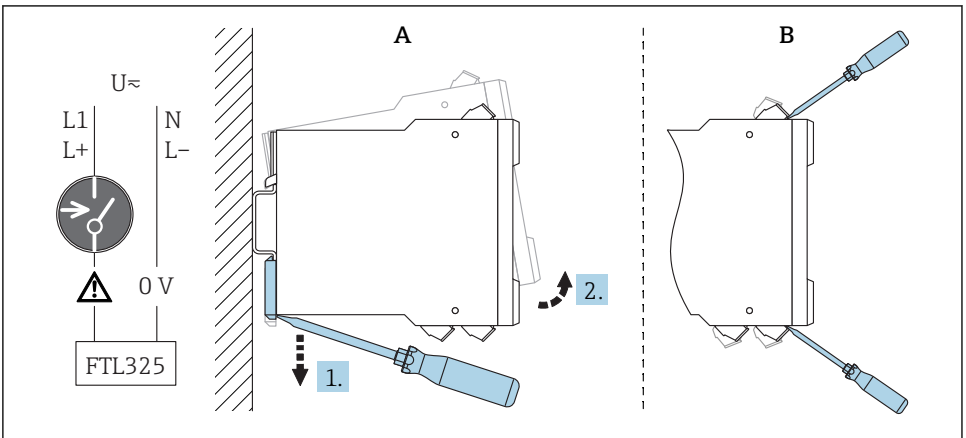
### 4.2.3 Mounting the device



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4 Mounting; DIN rail as per EN 60715 TH35-7.5/EN 60715 TH35-15

### 4.2.4 Removing the device



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5 Removing

A Remove from DIN rail.

B For quick replacement of devices without a cable, remove the terminal strips.

### 4.3 Post-installation check

Is the measuring device undamaged (visual inspection)?

Does the measuring device conform to the measuring point specifications?

For example:

- Supply voltage
- Ambient temperature range

Are the measuring point number and labeling correct (visual inspection)?

Is the measuring device adequately protected against precipitation and direct sunlight?

## 5 Electrical connection


### 5.1 Connection conditions

#### WARNING


**Risk of explosion due to faulty connection.**

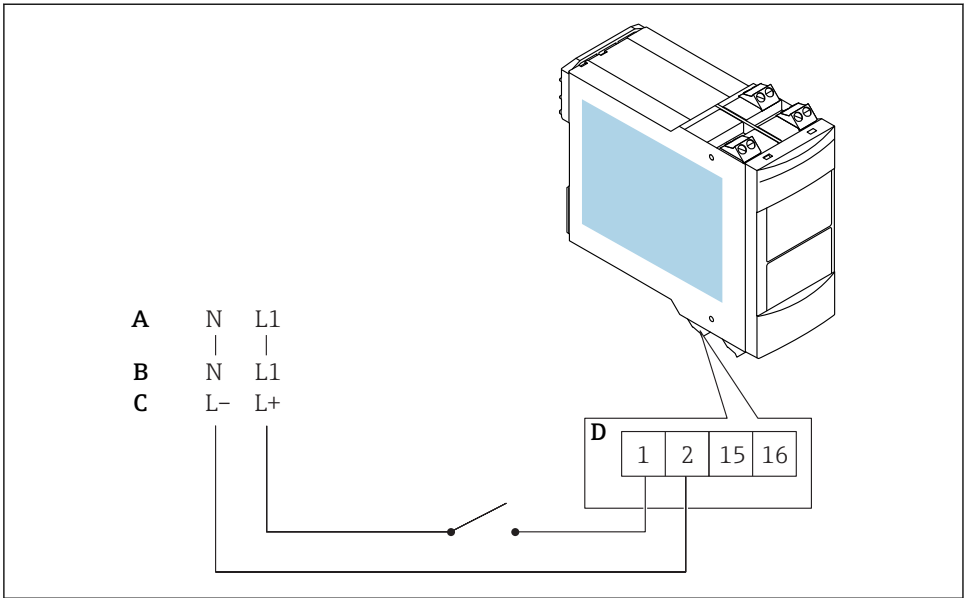
- ▶ Observe applicable national standards.
- ▶ Comply with the specifications in the Safety Instructions (XA).
- ▶ Check to ensure that the power supply matches the information on the nameplate.
- ▶ Switch off the supply voltage before connecting.
- ▶ When connecting to the public mains, install a mains switch for the device such that it is within easy reach of the device. Mark the power switch as a disconnecter for the device (IEC/EN61010).

### 5.2 Connecting the measuring device

 The removable terminal blocks are color-coded into intrinsically safe and non-intrinsically safe terminals. This difference helps to ensure safe wiring.

#### 5.2.1 Arrangement of terminals

 Observe the specifications on the nameplate of the device.

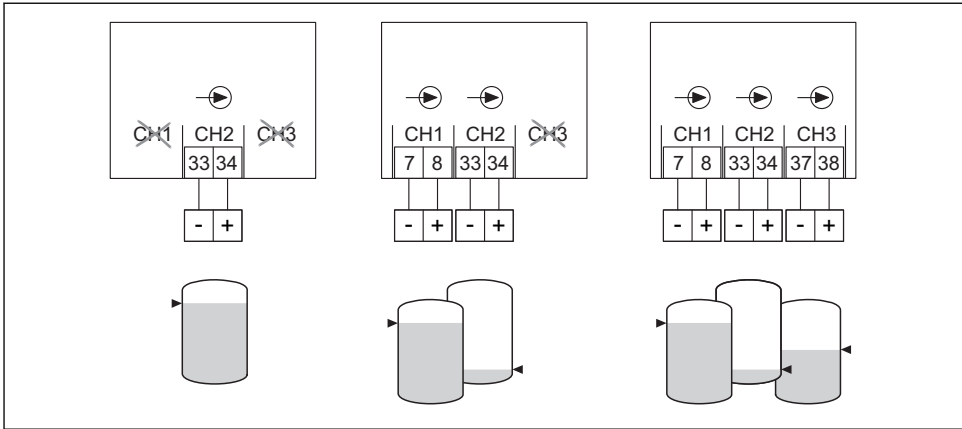


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6 Arrangement of terminals

- A  $U \sim 85$  to  $253 V_{AC}$ , 50/60 Hz  
 B  $U \sim 20$  to  $30 V_{AC}$ , 50/60 Hz  
 C  $U = 20$  to  $60 V_{DC}$   
 D Max.  $1.5 \text{ mm}^2$  (max. AWG 16)

## 5.2.2 Connecting the sensor



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### 7 Connecting to any NAMUR sensor for 1 to 3 limit signals

*H* Error current signal *H* (High) > 2.1 to 5.5 mA (FEL56)

*L* Error current signal (Low) = 0.4 to 1.2 mA (FEL48, FEL58, FEL68, FEM58, FEI58)

**i** For applications requiring functional safety in accordance with IEC 61508 (SIL), see the Functional Safety Manual. For WHG applications, see the associated WHG documents.

Blue terminal blocks at top for hazardous area

- Twin-core connecting cable between the Nivotester and sensor, e. g. commercially available instrument cable or cores in a multi-core cable for measurement purposes
- Use a shielded cable in the event of increased electromagnetic interference, e. g. from machines or radio equipment. Only connect the shield to the grounding terminal in the sensor. Do not connect it to the Nivotester.

## 5.2.3 Connecting the signal and control systems

Gray terminal blocks at bottom for the non-hazardous area

Relay function depending on the level and safety mode

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

## 5.2.4 Connecting the supply voltage

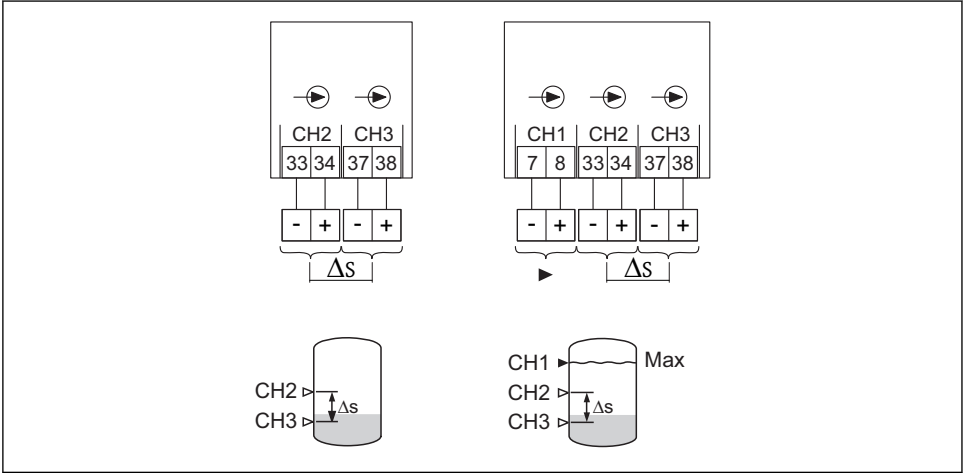
Green terminal block at bottom

A fuse is integrated into the power supply circuit. An additional fine-wire fuse is not necessary. The Nivotester is equipped with reverse polarity protection.

### 5.3 Special connection instructions

#### 5.3.1 Connecting the sensors for two-point control $\Delta s$

Connecting the sensors for two-point control  $\Delta s$



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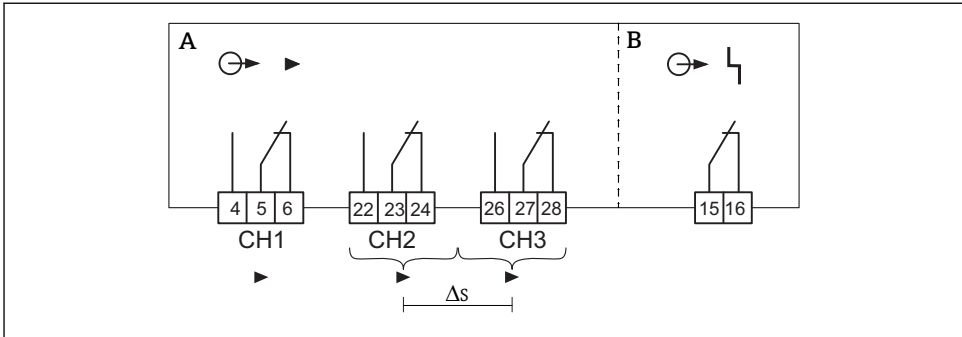
**8** Connecting the sensors for two-point control  $\Delta s$ , any NAMUR sensor

*H* Error current signal H (High) = 2.1 to 5.5 mA (FEL56)

*L* Error current signal L (Low) = 0.4 to 1.2 mA (FEL48, FEL58, FEL68, FEM58, FEI58)

**i** For applications requiring functional safety in accordance with IEC 61508 (SIL), see the Functional Safety Manual. For WHG applications, see the associated WHG documents.

### 5.3.2 Connecting the outputs



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#### 9 Connecting the outputs

A Level, limit signal

B Fault, alarm

## 5.4 Ensuring the degree of protection

- IP20 (as per IEC/EN 60529)
- IK06 (as per IEC/EN 62262)

## 5.5 Post-connection check

- Is the device or cable undamaged (visual inspection)?
- Do the mounted cables have adequate strain relief?
- Does the supply voltage match the specifications on the nameplate?
- No reverse polarity, is terminal assignment correct?
- Do the cables used comply with the requirements?
- If necessary, has a protective ground connection been established?
- If supply voltage is present, is the device operational and does a screen appear?

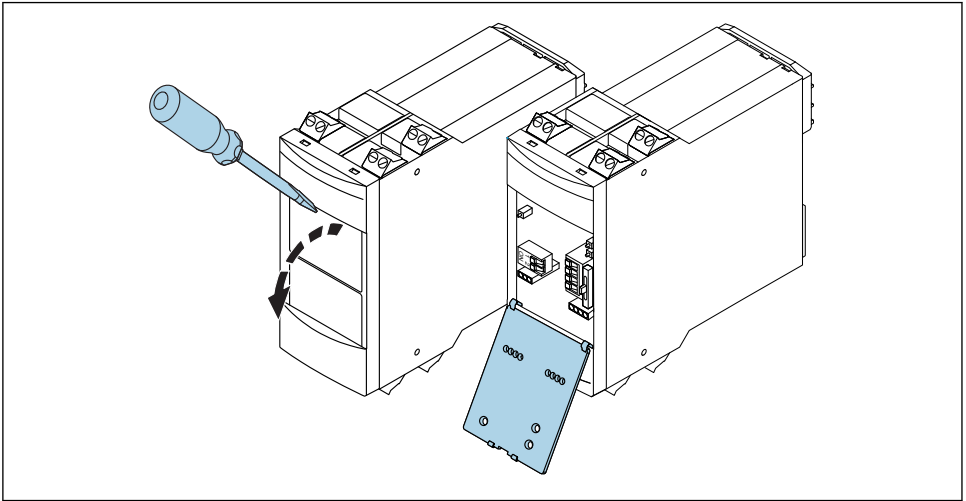
# 6 Operation options

## 6.1 Operation concept

Onsite configuration with DIL switches behind fold-down front panel.



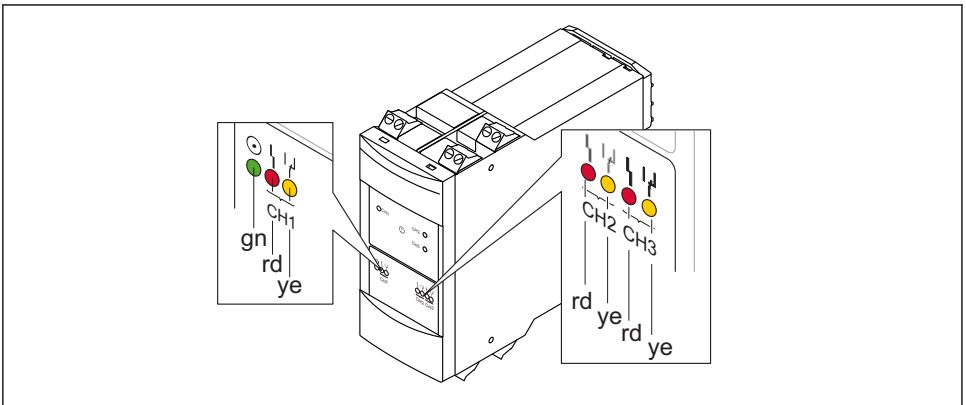
## 6.2 Opening the front panel



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10 Opening the front panel

## 6.3 Display elements



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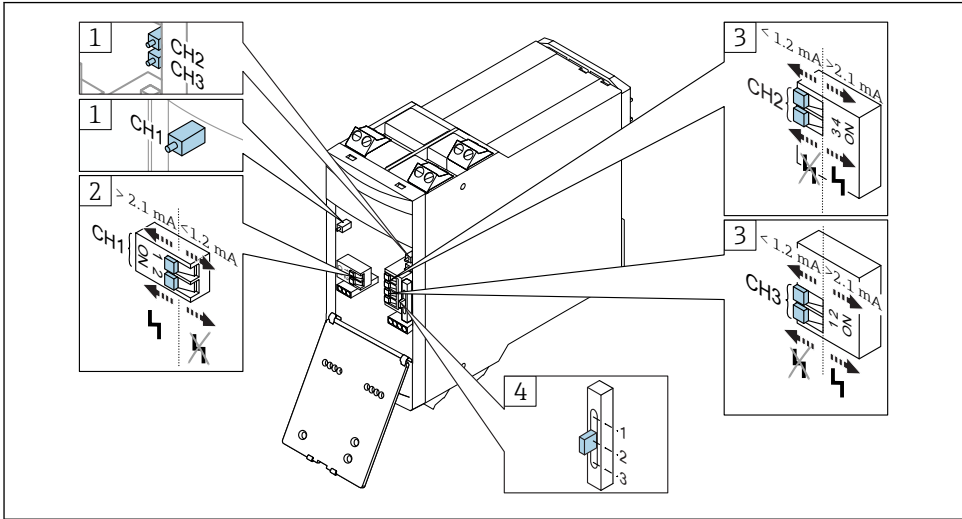
11 Nivotester, light emitting diodes (LEDs)

*gn* Green LED; ready for operation

*rd* One red LED per channel: fault signal

*ye* One yellow LED per channel: level relay picked up

## 6.4 Operating elements



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### 12 Operating elements

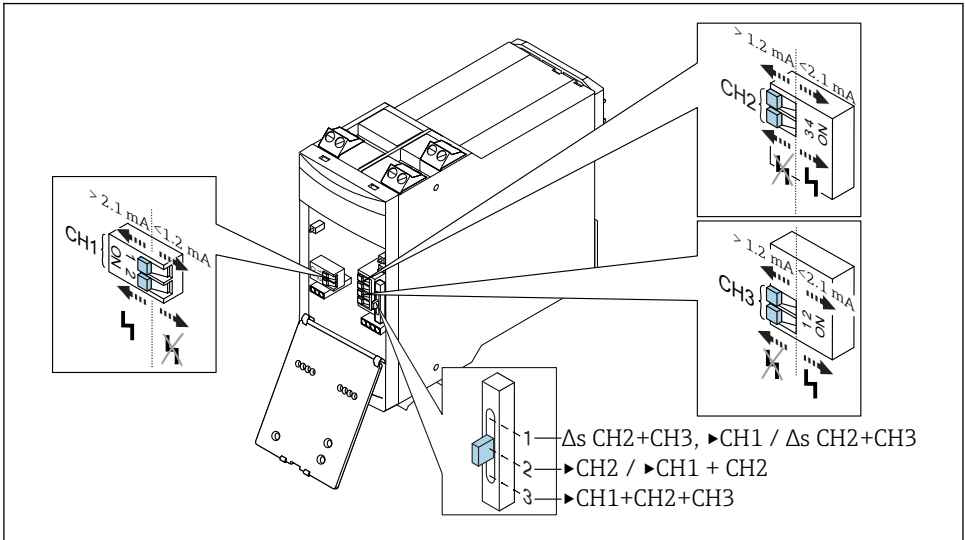
- 1 Test button, can also be operated when the front panel is closed
- 2 Setting for transmitter error current signal H or L (input channel 1) and fault signaling ON/OFF
- 3 Setting for transmitter error current signal H or L (input channels 2 and 3) and fault signaling ON/OFF
- 4 MODE switch:  $\Delta s$ , e. g. Pump control (1), two level relays (2), single channels (3)

## 7 Commissioning

### 7.1 Function check

- Perform installation check.
- Perform function check.

## 7.2 Setting the functions



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13 Switches for setting the functions

### Input signal

- Error current signal H/L
- Fault message

### CH1, CH2, CH3

- Error current signal H (High) = 2.1 to 5.5 mA (FEL56)
- Error current signal L (Low) = 0.4 to 1.2 mA (FEL48, FEL58, FEL68, FEM58, FEI58)

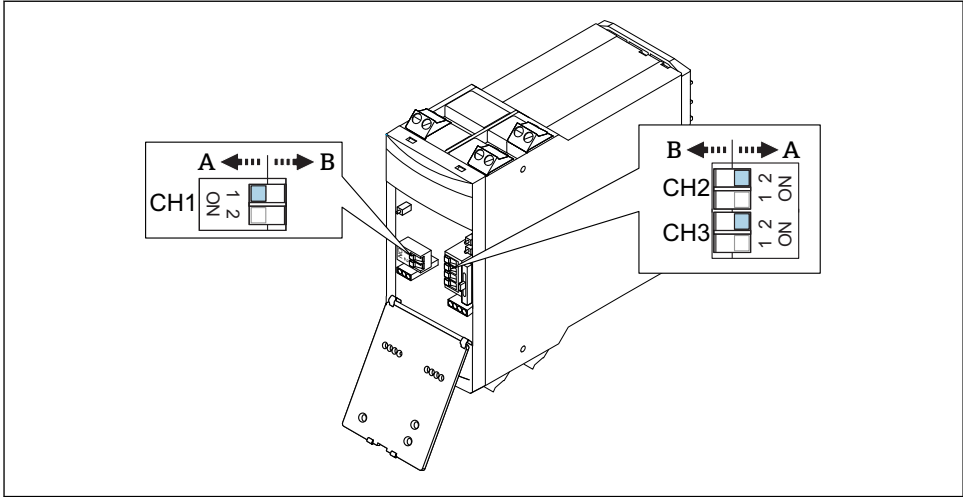
### Switch for MODE settings

- (1)  $\Delta s$ , e. g. Pump control
- (2) Two level relays
- (3) Single channels




For applications requiring functional safety in accordance with IEC 61508 (SIL), see the Functional Safety Manual. For WHG applications, see the associated WHG documents.

### 7.2.1 Pay attention to the switch position



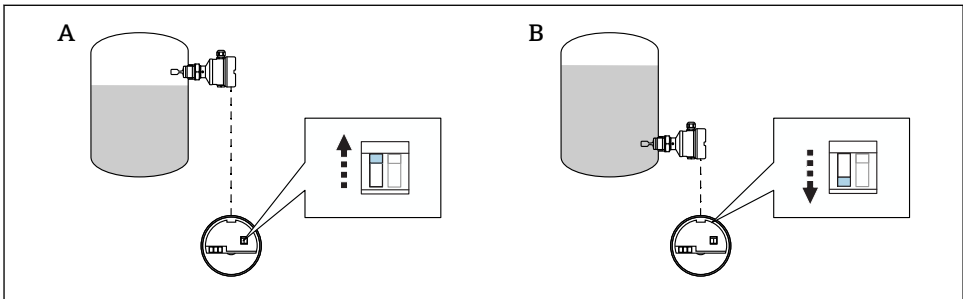
A0039582

 14 Switch positions


A Error current signal H (High) = 2.1 to 5.5 mA (FEL56)

B Error current signal L (Low) = 0.4 to 1.2 mA (FEL48, FEL58, FEL68, FEM58, FEI58)

### Switch position on electronic insert



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 15 Switch position on Liquiphant electronic insert (FEL56, FEL58, FEL48, FEL68, FEM58, FEI58)


A MAX

B MIN

 The switch position depends on the electronic insert.

## Description of DIL switches

Limit signal function



Outputs for limit signals  ►

Different switch settings are permitted.

Also valid for CH2 and CH1 + CH2 when input CH2 affects both CH2 and CH3 outputs.

In the case of multiple inputs, different limit signals are permitted for the individual channels, e. g. for CH1 H ►, for CH2 L ►

Two-point control, Δs 2 function

- Outputs for limit signals  ►: Different switch settings for CH2 and CH3 are permitted.
- Inputs : The limit signals for CH2 and CH3 must be the same; for CH2 H ► and for CH3 H ► or for CH2 L ► and for CH3 L ►

Fault message

- Choice between "alarm signal"  $l_1$  and "no alarm signal"  $l_2$  is only possible between different input channels.
- With fault signaling  $l_1$   
In the event of a fault at an input, the output relay associated with this input and the fault signaling relay are deenergized.  
If there is a channel with no input connected, switch off fault signaling.

Graphic representation of functions

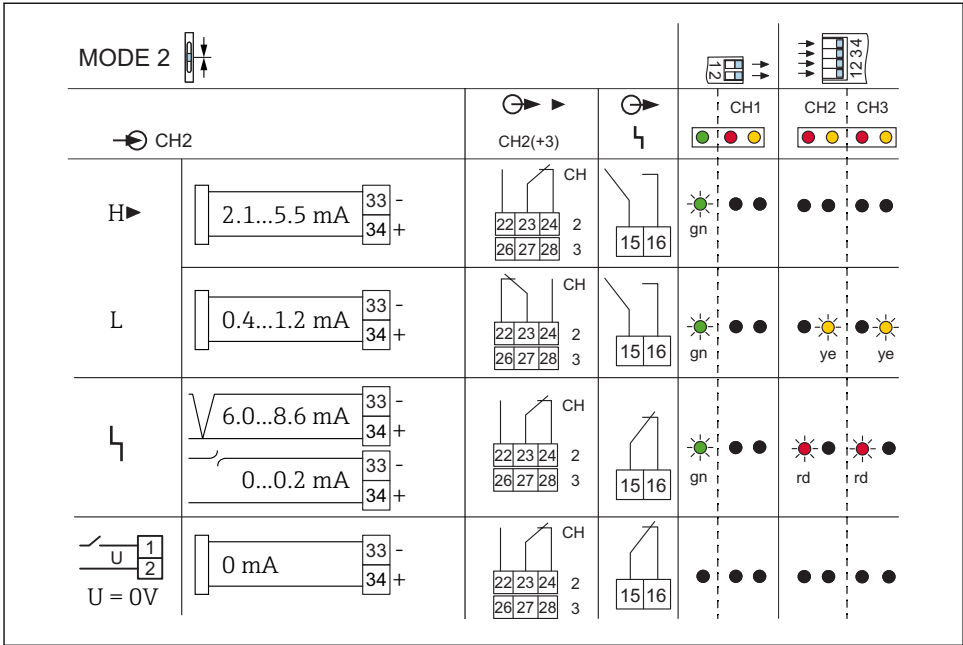
- The switch positions shown in the diagrams cause the output relays to deenergize in the event of a limit signal (H ► or L ►).  
This means that, in the event of a limit signal, the same contact position applies as in the case of a fault or power failure (= safety-oriented).
- The switch positions and input signals are depicted in the same way for all channels.

### 7.2.2 Switching behaviour and signaling for all functions without fault signaling



See Operating Instructions.

### 7.2.3 CH2, limit signal H with fault signaling



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16 Switching behaviour and signaling with error current  $H > 2.1$  mA (FEL56)

Point level at one tank

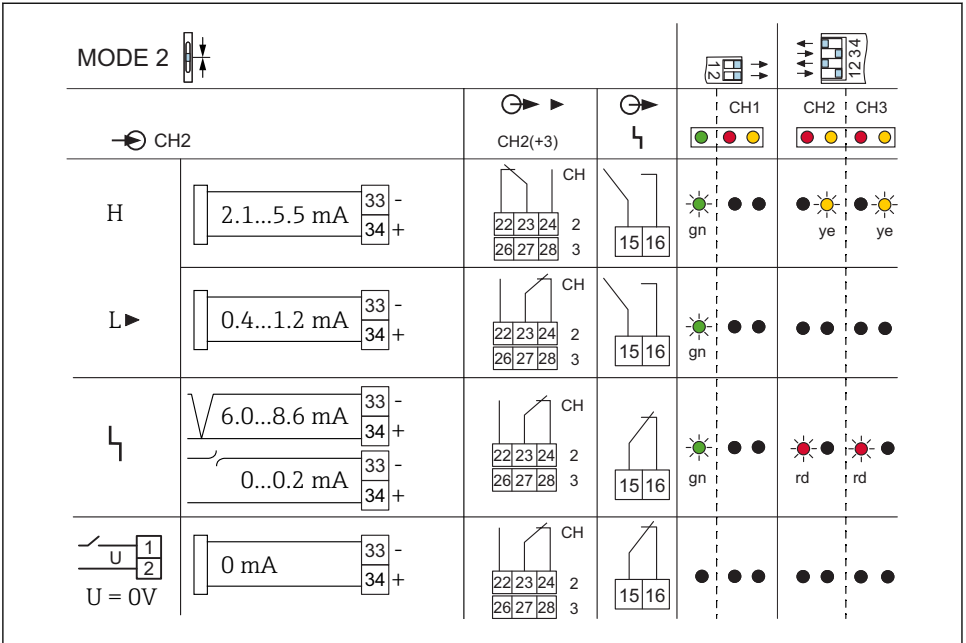
1 sensor connected at input channel 2 (terminals 33 and 34)

Relay outputs of output channels 2 and 3 switch simultaneously

Fault signaling for input channel 1 is switched off.

Fault signaling for input channels 2 and 3 is switched on.

### 7.2.4 CH2, limit signal L with fault signaling



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17 Switching behaviour and signaling with error current  $L < 1.2 \text{ mA}$  (FEL48, FEL58, FEL68, FEM58, FEI58)

Point level at one tank

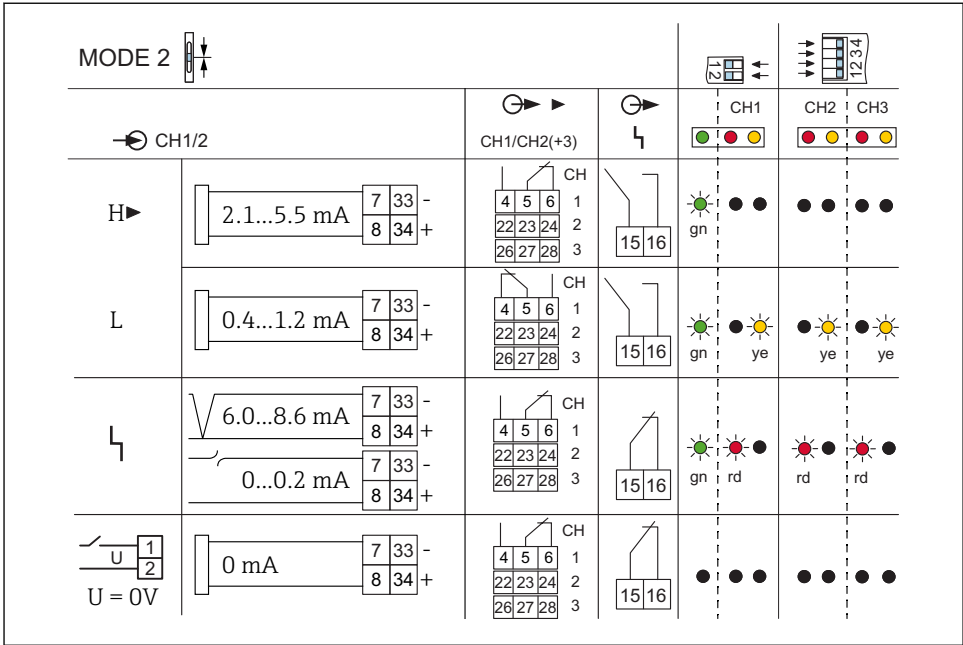
1 sensor connected at input channel 2 (terminals 33 and 34)

Relay outputs of output channels 2 and 3 switch simultaneously

Fault signaling for input channel 1 is switched off.

Fault signaling for input channels 2 and 3 is switched on.

### 7.2.5 CH1 + CH2, limit signal H with fault signaling



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18 Switching behaviour and signaling with error current  $H > 2.1$  mA (FEL56)

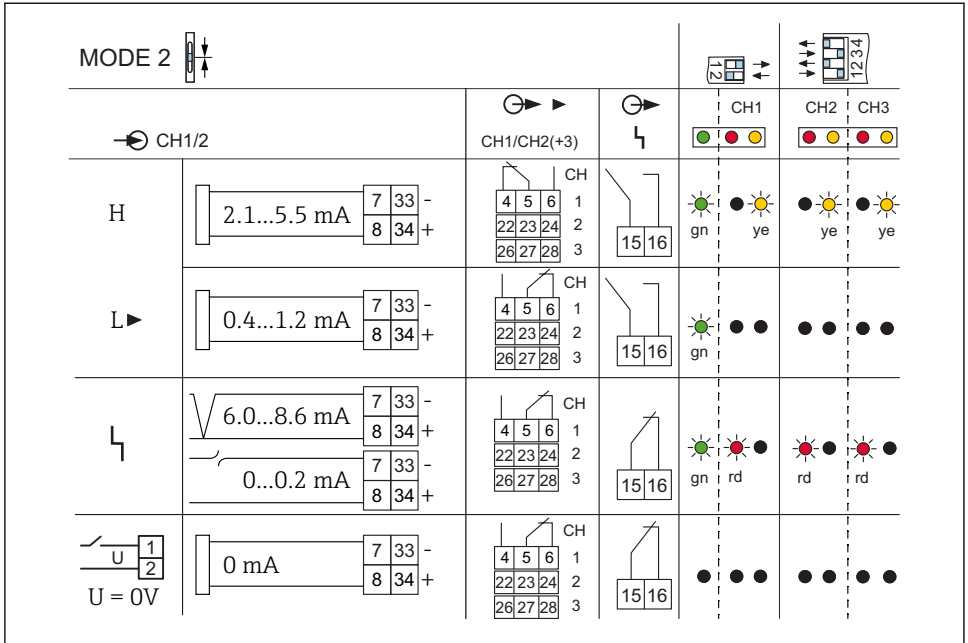
Point level at two tanks

- 1 sensor connected at input channel 1 (terminals 7 and 8)  
Relay output of channel 1 switches in accordance with input channel 1
- 1 sensor connected at input channel 2 (terminals 33 and 34)  
Relay outputs of output channels 2 and 3 switch simultaneously in accordance with input channel 2

Fault signaling for input channels 1, 2 and 3 is switched on.



### 7.2.6 CH1 + CH2, limit signal L with fault signaling



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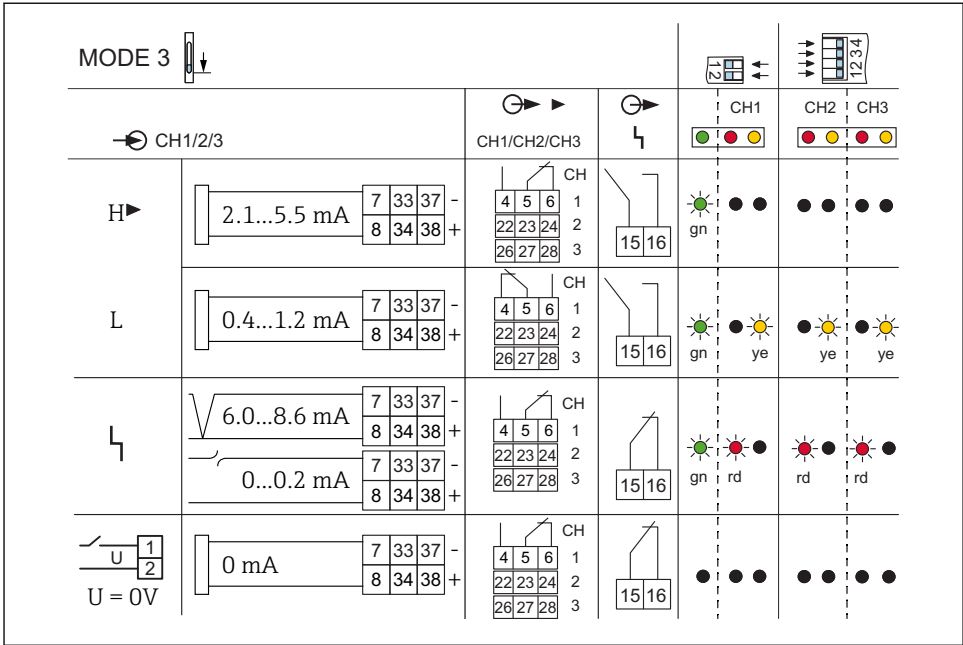
19 Switching behaviour and signaling with error current  $L < 1.2 \text{ mA}$  (FEL48, FEL58, FEL68, FEM58, FEI58)

Point level at two tanks

- 1 sensor connected at input channel 1 (terminals 7 and 8)  
Relay output of channel 1 switches in accordance with input channel 1
- 1 sensor connected at input channel 2 (terminals 33 and 34)  
Relay outputs of output channels 2 and 3 switch simultaneously in accordance with input channel 2

Fault signaling for input channels 1, 2 and 3 is switched on.

### 7.2.7 CH1 + CH2 + CH3, limit signal H with fault signaling



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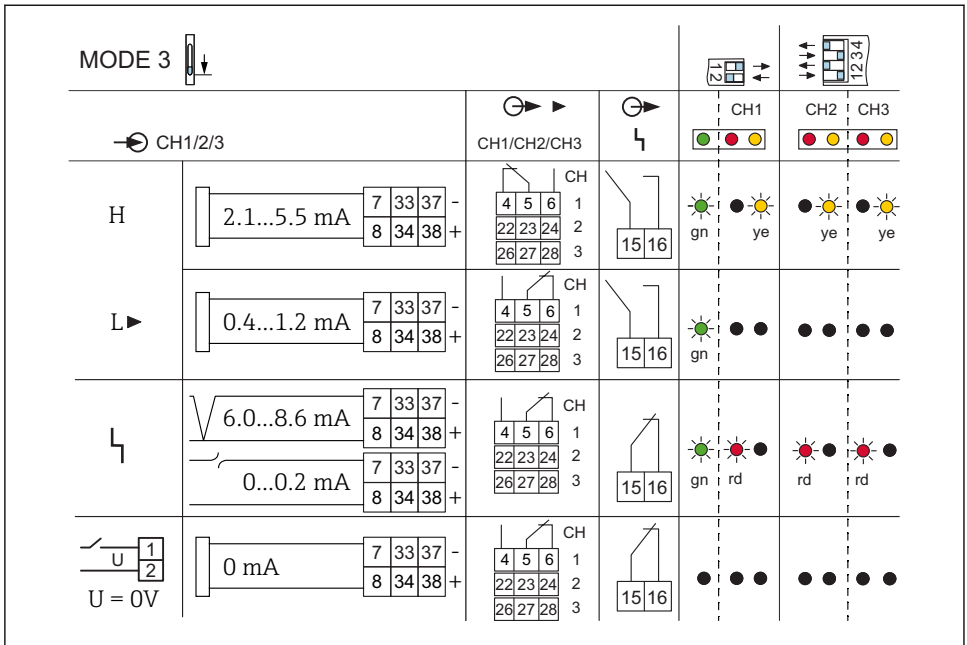
20 Switching behaviour and signaling with error current  $H > 2.1$  mA (FEL56)

Point level at three tanks

- 1 sensor connected at input channel 1 (terminals 7 and 8)  
Relay output of channel 1 switches in accordance with input channel 1
- 1 sensor connected at input channel 2 (terminals 33 and 34)  
Relay output of channel 2 switches in accordance with input channel 2
- 1 sensor connected at input channel 3 (terminals 37 and 38)  
Relay output of channel 3 switches in accordance with input channel 3

Fault signaling for input channels 1, 2 and 3 is switched on.

### 7.2.8 CH1 + CH2 + CH3, limit signal L with fault signaling



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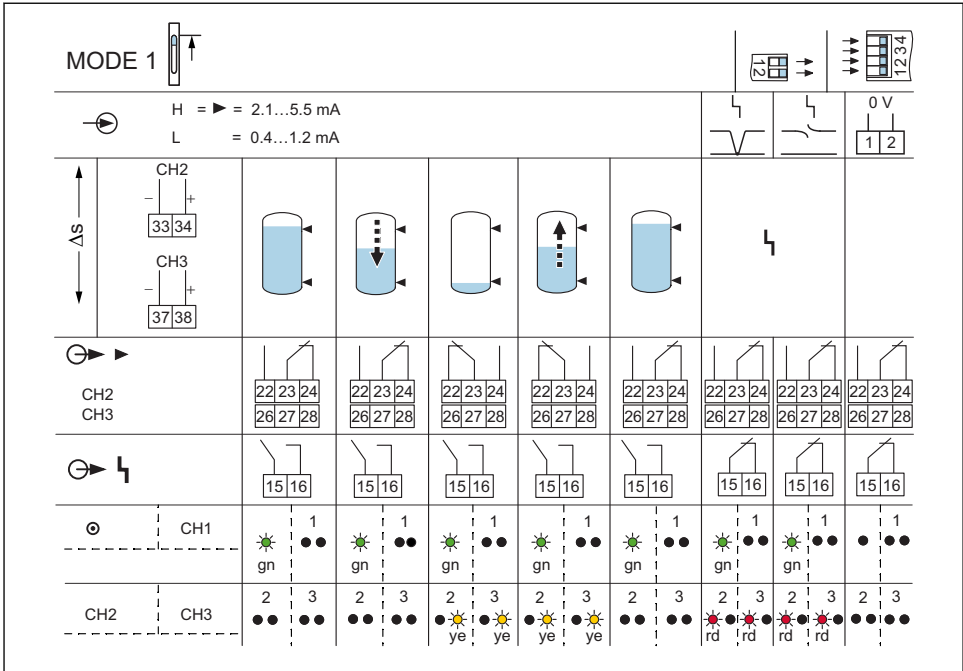
21 Switching behaviour and signaling with error current  $L < 1.2 \text{ mA}$  (FEL48, FEL58, FEL68, FEM58, FEI58)

Point level at three tanks

- 1 sensor connected at input channel 1 (terminals 7 and 8)  
Relay output of channel 1 switches in accordance with input channel 1
- 1 sensor connected at input channel 2 (terminals 33 and 34)  
Relay output of channel 2 switches in accordance with input channel 2
- 1 sensor connected at input channel 3 (terminals 37 and 38)  
Relay output of channel 3 switches in accordance with input channel 3

Fault signaling for input channels 1, 2 and 3 is switched on.

### 7.2.9 CH2 - CH3 ( $\Delta s$ ) limit signal H with fault signaling



22 Switching behaviour and signaling with error current  $H > 2.1$  mA (FEL56)

$\Delta s$ , e. g. pump control at one tank

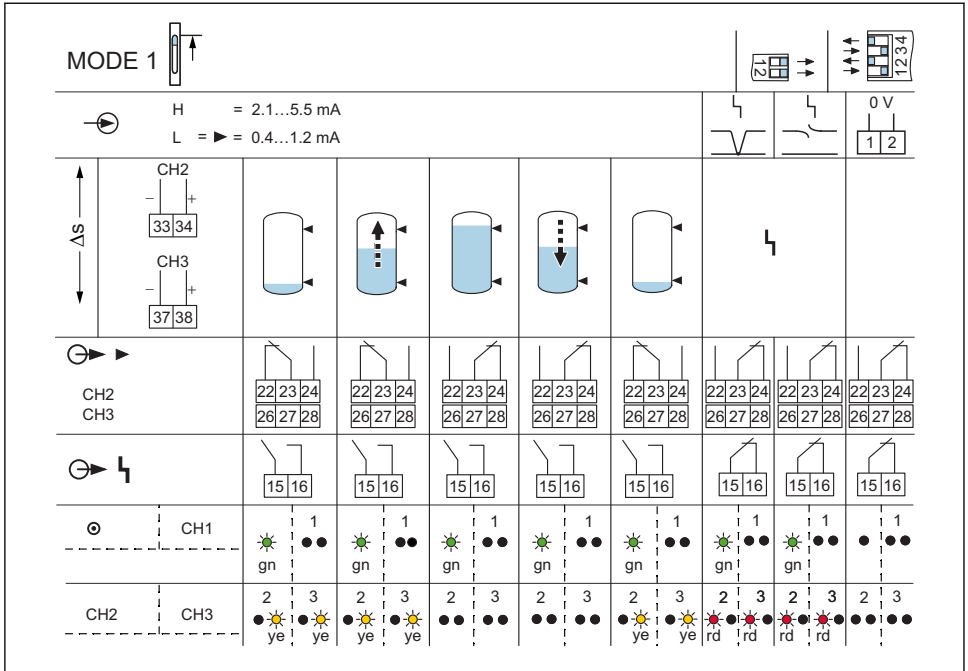
- 1 sensor (H level) connected at input channel 2 (terminals 33 and 34)
  - 1 sensor (L level) connected at input channel 3 (terminals 37 and 38) .
- Relay outputs of output channels 2 and 3 switch simultaneously.

This ensures, for example, that a pump can be switched on at L level and switched off at H level.

Fault signaling for input channel 1 is switched off.

Fault signaling for input channels 2 and 3 is switched on.

### 7.2.10 CH2 - CH3 ( $\Delta s$ ) limit signal L with fault signaling



A0039612

23 Switching behaviour and signaling with error current  $L < 1.2$  mA (FEL48, FEL58, FEL68, FEM58, FEI58)

$\Delta s$ , e. g. pump control at one tank

- 1 sensor (H level) connected at input channel 2 (terminals 33 and 34)
- 1 sensor (L level) connected at input channel 3 (terminals 37 and 38)

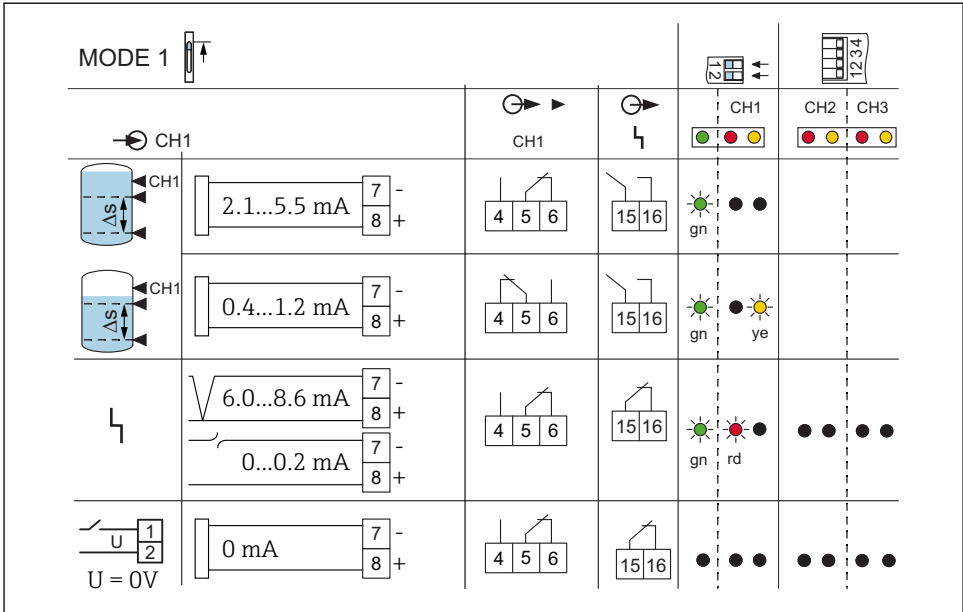
Relay outputs of output channels 2 and 3 switch simultaneously.

This ensures, for example, that a pump can be switched on at L level and switched off at H level.

Fault signaling for input channel 1 is switched off.

Fault signaling for input channels 2 and 3 is switched on.

### 7.2.11 CH2 - CH3 ( $\Delta s$ ) + CH1 limit signal H with fault signaling



A0039679

24 Switching behavior and signaling with error current  $H > 2.1 \text{ mA}$  (FEL56)

$\Delta s$ , e. g. pump control at one tank and additional overfill prevention (HH level)

- 1 sensor for overfill prevention (HH level) connected at input channel 1 (terminals 7 and 8)
- 1 sensor (H-level pump control) connected at input channel 2 (terminals 33 and 34)
- 1 sensor (L-level pump control) connected at input channel 3 (terminals 37 and 38)

Relay outputs of output channels 2 and 3 switch simultaneously → 24, 30.

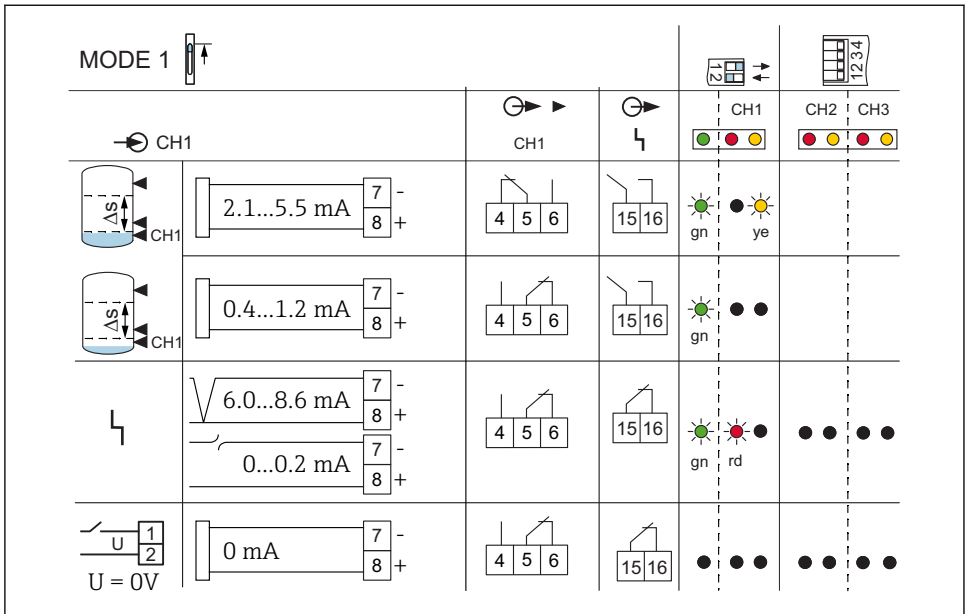
This ensures, for example, that a pump can be switched on at L level and switched off at H level.

Relay output 1 does not switch until the HH level at input channel 1 has been reached.

This ensures, for example, that a pump can be switched on at L level and switched off at H level.

Fault signaling for input channels 1, 2 and 3 is switched on.

### 7.2.12 CH2 - CH3 ( $\Delta s$ ) + CH1 limit signal L with fault signaling

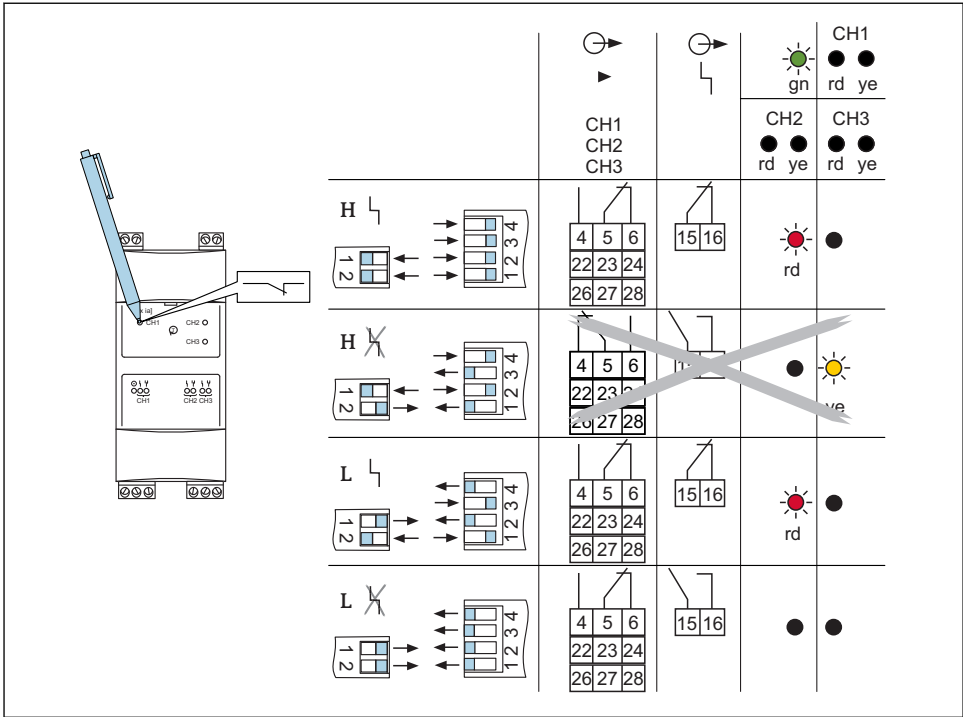


25 Switching behavior and signaling with error current  $L < 1.2$  mA (FEL48, FEL58, FEL68, FEM58, FEI58)

- Δs, e. g. pump control at one tank and additional overfill prevention (HH level)
    - 1 sensor for overfill prevention (HH level) connected at input channel 1 (terminals 7 and 8)
    - 1 sensor (H-level pump control) connected at input channel 2 (terminals 33 and 34)
    - 1 sensor (L-level pump control) connected at input channel 3 (terminals 37 and 38)
- Relay outputs of output channels 2 and 3 switch simultaneously → 25, 31.  
 This ensures, for example, that a pump can be switched on at L level and switched off at H level.  
 Relay output 1 does not switch until the HH level at input channel 1 has been reached.  
 This ensures, for example, that a pump can be switched on at L level and switched off at H level.

Fault signaling for input channels 1, 2 and 3 is switched on.

### 7.2.13 Function testing of secondary equipment



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26 Function testing of secondary equipment











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