

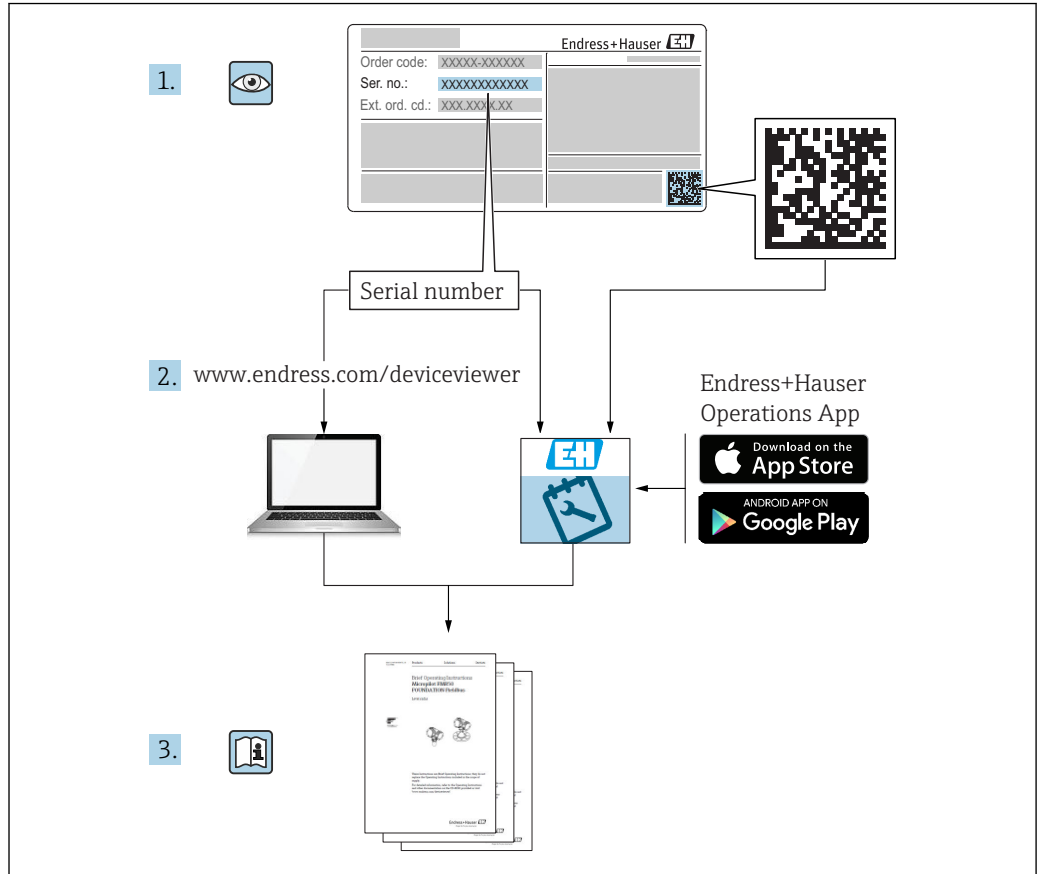
Operating Instructions

Nivotester FTL325N, 3-channel

Vibronic

Level detector with NAMUR input for connecting any NAMUR sensor





A0023555

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1 About this document

1.1 Document function

These Operating Instructions provide all of the information that is required in the various phases of the life cycle of the device.

1.2 Symbols

1.2.1 Safety symbols

DANGER

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

WARNING

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.


1.2.2 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

1.2.3 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
- ↳ Result of an individual step
- 1, 2, 3 ... Item numbers
- A, B, C ... View
- ⚠ Hazardous area
- ⊗ Safe area (non-hazardous area)

1.3 Supplementary documentation

 For an overview of the scope of the associated Technical Documentation, refer to the following:

- *W@M Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate.

1.3.1 Standard documentation

Technical Information (TI)

Planning aid—contains technical data for planning and ordering information.

Operating Instructions (BA)

Installation and initial commissioning—contains all functions in the operating menu that are required for a typical measuring task. Functions beyond this scope are not included.

Brief Operating Instructions (KA)

Quick guide to obtaining the first measured value—includes all essential information from incoming acceptance to electrical connection.

1.3.2 Supplementary device-dependent documentation

Depending on the device version ordered, additional documentation or documents are provided. Always comply strictly with the instructions in the relevant additional documentation. The supplementary documentation is an integral part of the device documentation.

The relevant safety instructions are included with all certified device versions. If using the device in a hazardous area, all the specifications contained in the safety instructions must be complied with.

- Examples: ATEX, NEPSI, INMETRO, control or installations drawings for FM-, CSA- and TIIS-certified device versions
- Functional safety manual (SIL)

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

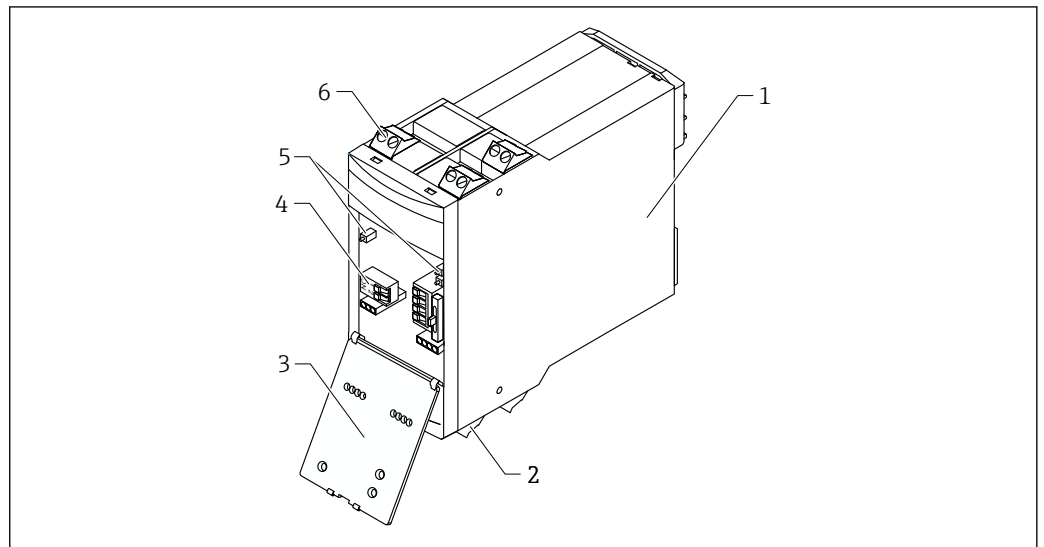
The device meets the legal requirements of the applicable EAC Directives. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.

2.6 IT security

Provide additional protection for the device and data transfer to/from the device

- ▶ IT security measures defined in the plant owner/operator's own security policy must be implemented by plant owners/operators themselves.

3 Product design



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1 Product design


- 1 Housing
- 2 External terminals
- 3 Front panel can be opened out
- 4 Internal terminals
- 5 Test button, can also be operated from the outside
- 6 External terminals

4 Incoming acceptance and product identification

4.1 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?

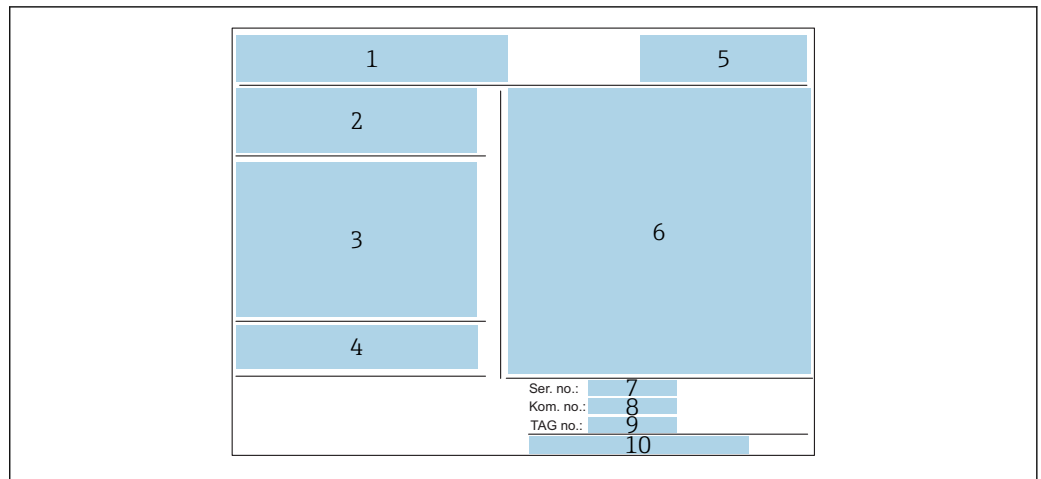
 If one of these conditions is not satisfied, contact your Sales Center.

4.2 Product identification

Nameplate data on the device

- ▶ Enter the serial number from the nameplates in the *W@M Device Viewer* (www.endress.com/deviceviewer)
 - ↳ 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.

4.2.1 Nameplate



2 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*

4.2.2 Manufacturer address

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

Address of the manufacturing plant: See nameplate.

4.3 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)

4.3.1 Transporting the product to the measuring point

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

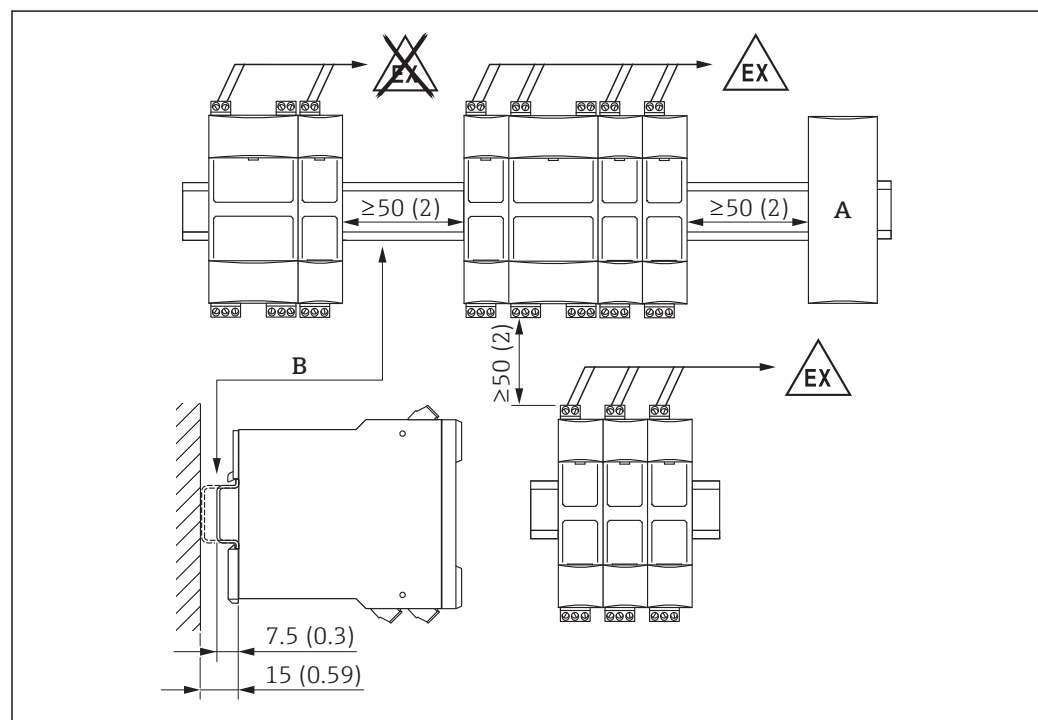
5 Installation


5.1 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.

5.2 Mounting the measuring device


5.2.1 Horizontal orientation



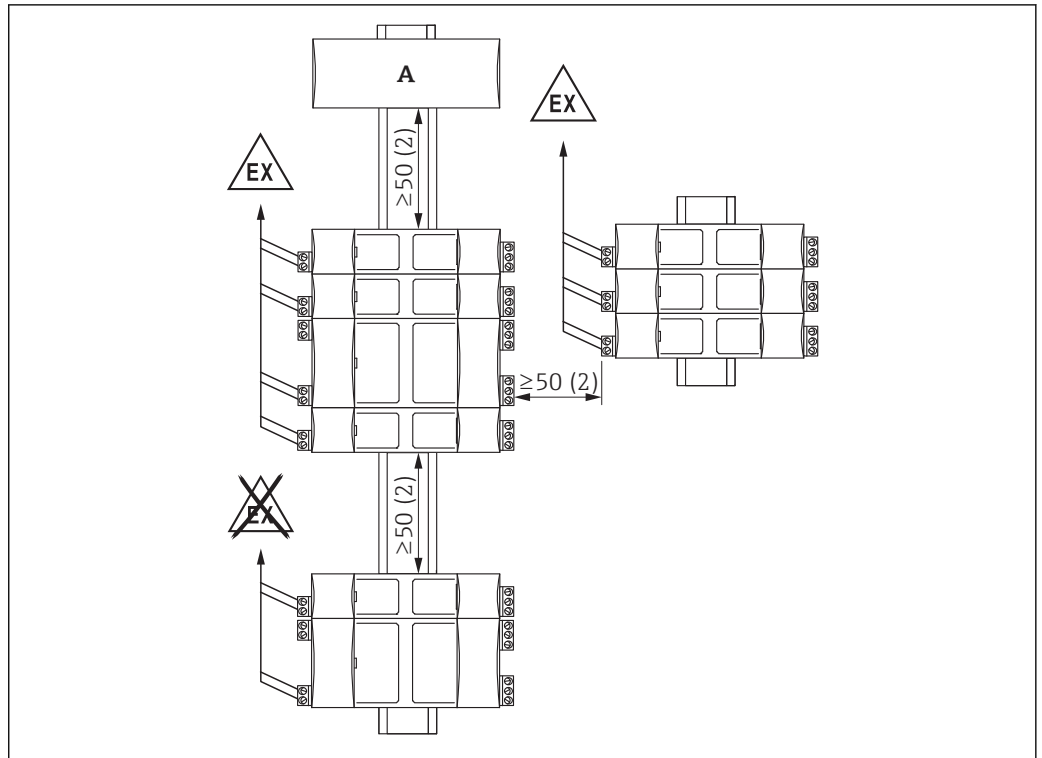
 3 Minimum spacing, horizontal orientation. Unit of measurement mm (in)

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.

5.2.2 Vertical orientation

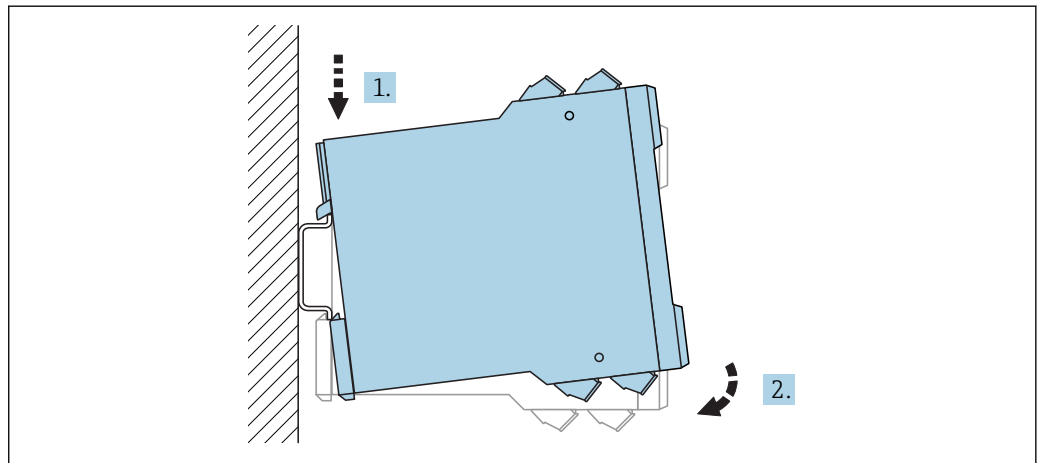


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4 Minimum spacing, vertical orientation. Unit of measurement mm (in)

A Connection of another device type

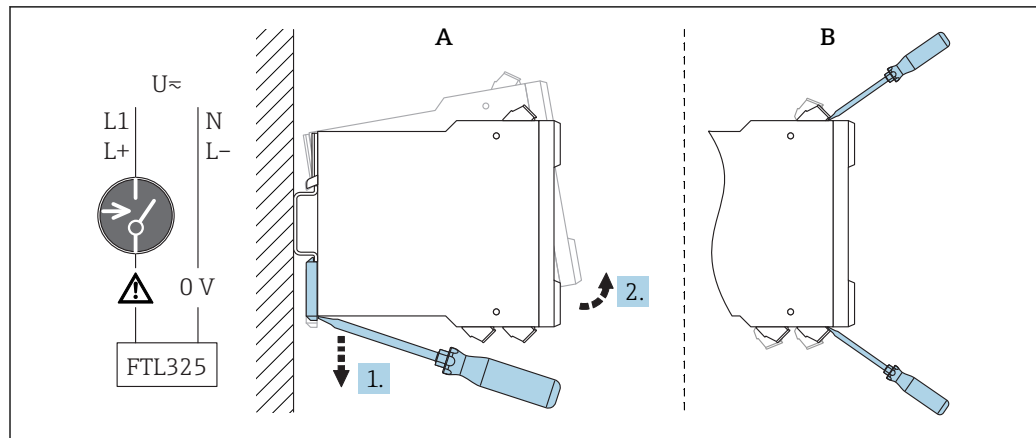
5.2.3 Mounting the device



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

5.2.4 Removing the device



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6 Removing

A Remove from DIN rail.

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

5.3 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?

6 Electrical connection

6.1 Connection conditions

⚠ WARNING

Risk of explosion due to faulty connection.

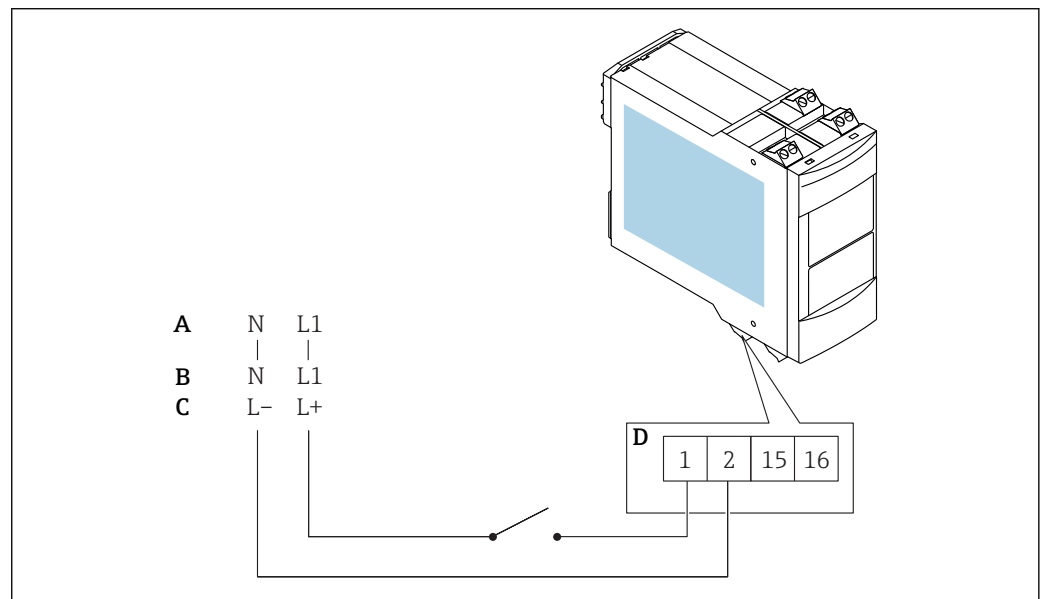
- ▶ Observe applicable national standards.
- ▶ Comply with the specifications in the Safety Instructions (XA).
- ▶ Check to ensure that the power supply matches the information on the nameplate.
- ▶ Switch off the supply voltage before connecting.
- ▶ When connecting to the public mains, install a mains 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).

6.2 Connecting the measuring device

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

6.2.1 Arrangement of terminals

i Observe the specifications on the nameplate of the device.



7 Arrangement of terminals

A $U \sim 85$ to $253 V_{AC}$, 50/60 Hz

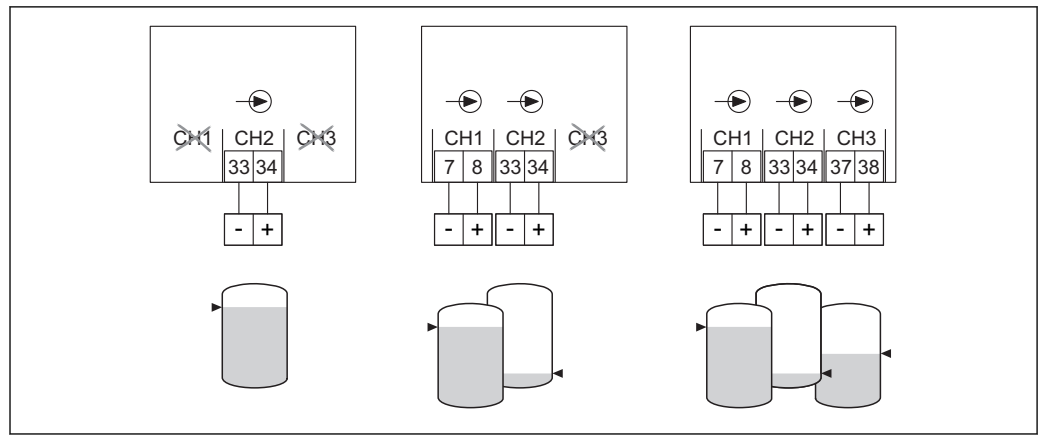
B $U \sim 20$ to $30 V_{AC}$, 50/60 Hz

C $U = 20$ to $60 V_{DC}$

D Max. 1.5 mm^2 (max. AWG 16)

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6.2.2 Connecting the sensor



8 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)

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.

6.2.3 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 arrester must be installed to protect the relay contact .

6.2.4 Connecting the supply voltage

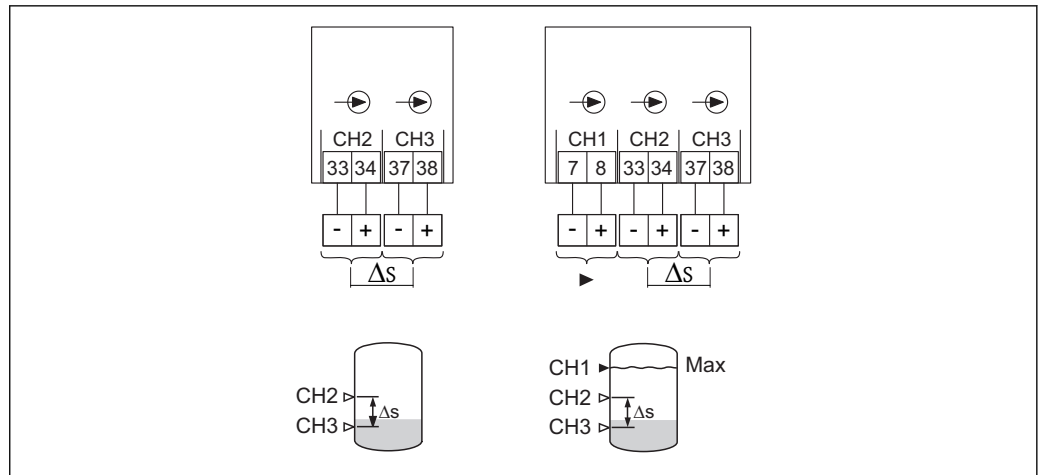
Green terminal block at bottom

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.

6.3 Special connection instructions

6.3.1 Connecting the sensors for two-point control Δ s

Connecting the sensors for two-point control Δ s



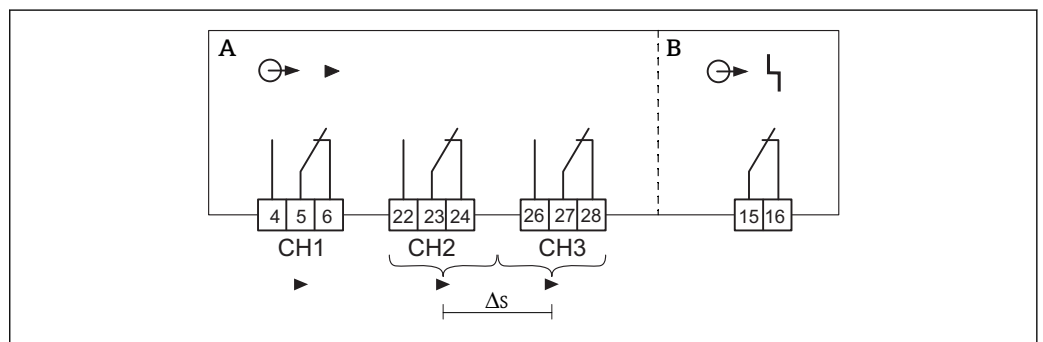
9 Connecting the sensors for two-point control Δs , any NAMUR sensor

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.

6.3.2 Connecting the outputs



10 Connecting the outputs

A Level, limit signal

B Fault, alarm

6.4 Ensuring the degree of protection

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

6.5 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?

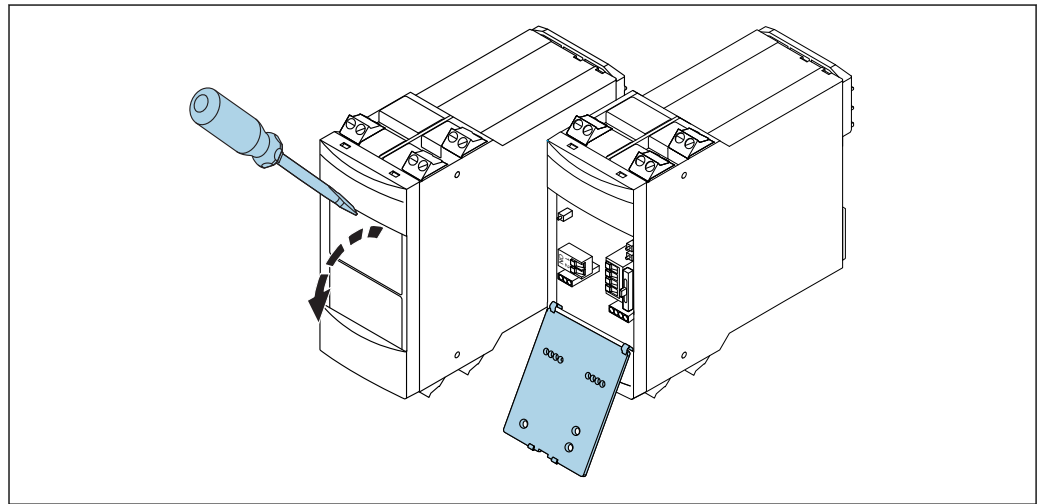
If supply voltage is present, is the device operational and does a screen appear?

7 Operation options

7.1 Operation concept

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

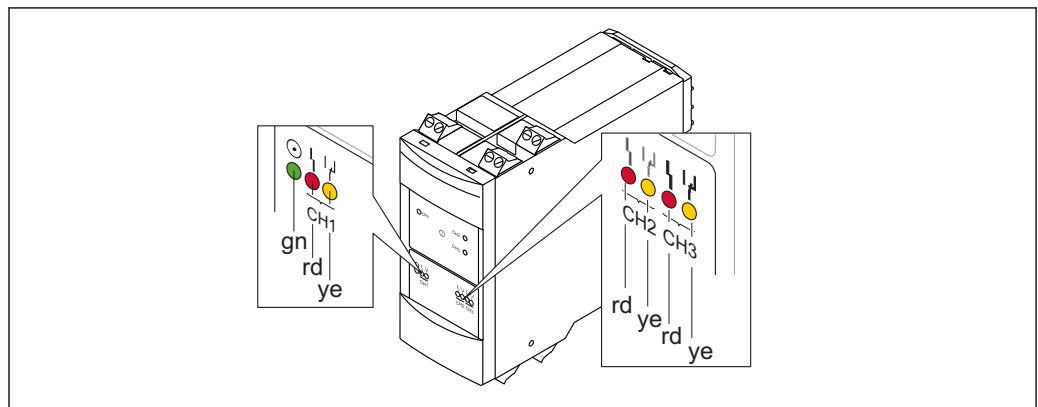
7.2 Opening the front panel



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11 Opening the front panel

7.3 Display elements

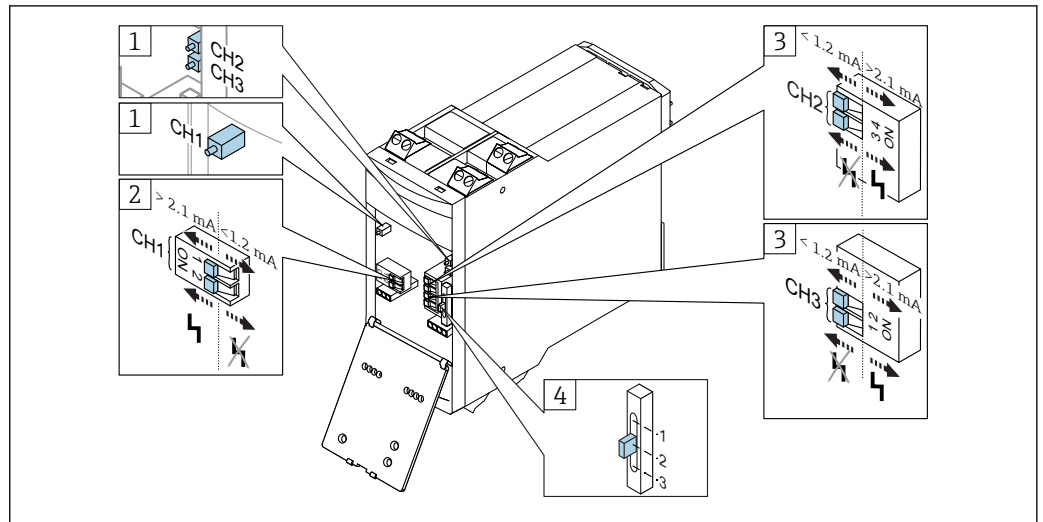


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12 Nivotester, light emitting diodes (LEDs)

- gn Green LED; ready for operation
- rd One red LED per channel: fault signal
- ye One yellow LED per channel: level relay picked up

7.4 Operating elements



13 Operating elements

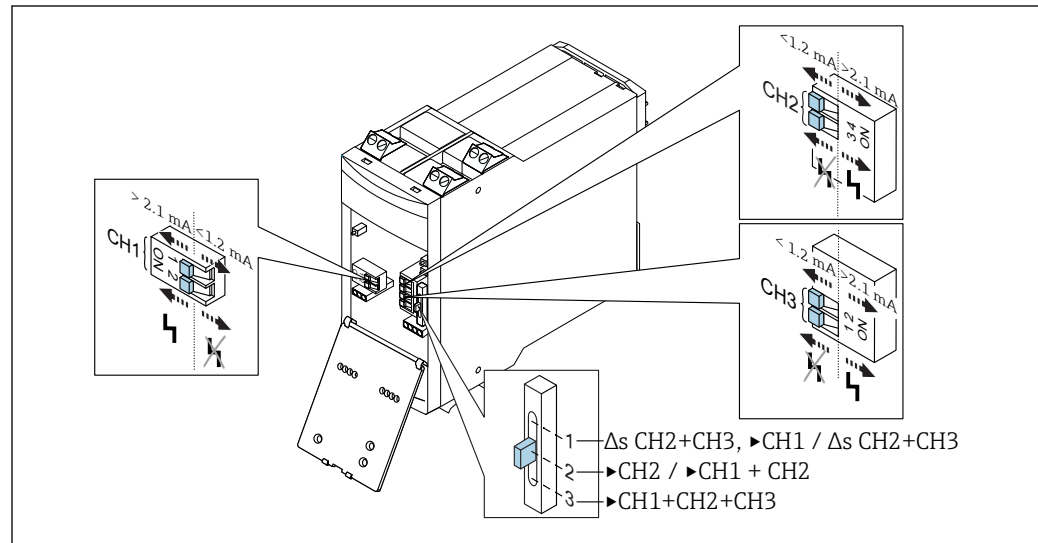
- 1 Test button, can also be operated when the front panel is closed
- 2 Setting for transmitter error current signal H or L (input channel 1) and fault signaling ON/OFF
- 3 Setting for transmitter error current signal H or L (input channels 2 and 3) and fault signaling ON/OFF
- 4 MODE switch: Δs , e.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

8 Commissioning

8.1 Function check

- Perform installation check.
- Perform function check.

8.2 Setting the functions



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14 Switches for setting the functions

Input signal

- Error current signal H/L
- Fault message

CH1, CH2, CH3

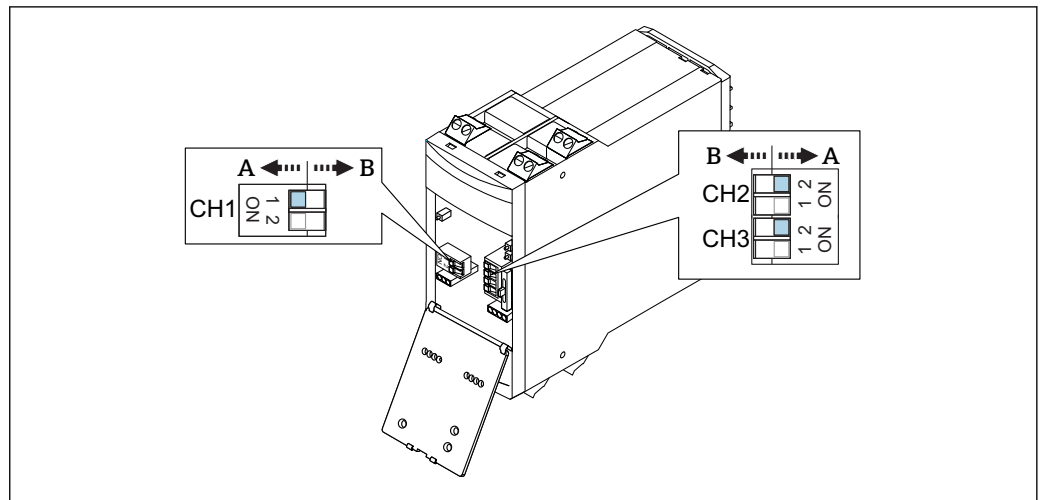
- Error current signal H (High) = 2.1 to 5.5 mA (FEL56)
- Error current signal L (Low) = 0.4 to 1.2 mA (FEL48, FEL58, FEL68, FEM58, FEI58)

Switch for MODE settings

- (1) Δs , e. g. Pump control
- (2) Two level relays
- (3) Single channels

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.

8.2.1 Pay attention to the switch position.

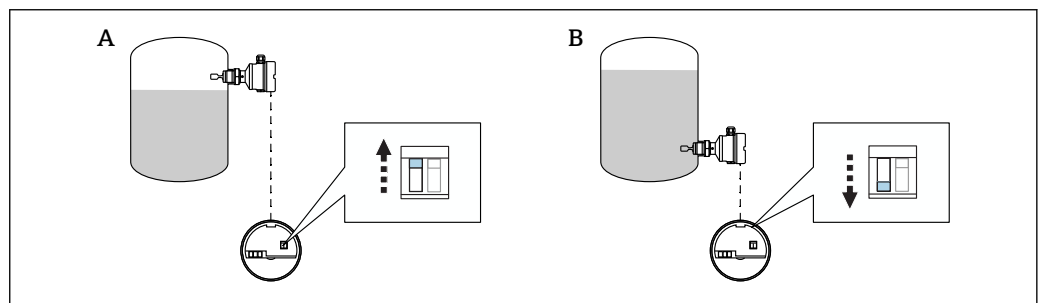


15 Switch positions

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



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

A MAX

B MIN

i The switch position depends on the electronic insert.

Description of DIL switches

Limit signal function

Outputs for limit signals \rightarrow \blacktriangleright

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 \blacktriangleright , for CH2 L \blacktriangleright

Two-point control, Δs 2 function

■ Outputs for limit signals \rightarrow \blacktriangleright : Different switch settings for CH2 and CH3 are permitted.

■ Inputs \rightarrow : The limit signals for CH2 and CH3 must be the same; for CH2 H \blacktriangleright and for CH3 H \blacktriangleright or for CH2 L \blacktriangleright and for CH3 L \blacktriangleright

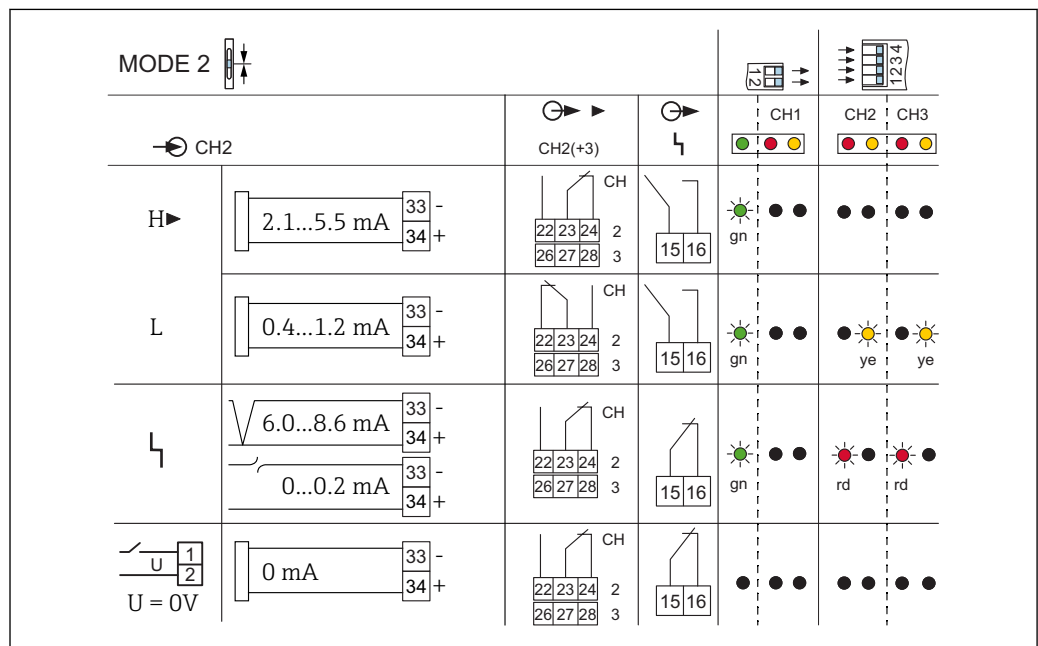
Fault message

- Choice between "alarm signal" \llcorner and no "alarm signal" \llcorner is only possible between different input channels.
- With fault signaling \llcorner
 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 \blacktriangleright or L \blacktriangleright).
 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.

8.2.2 CH2, limit signal H with fault signaling



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

Point level at one tank

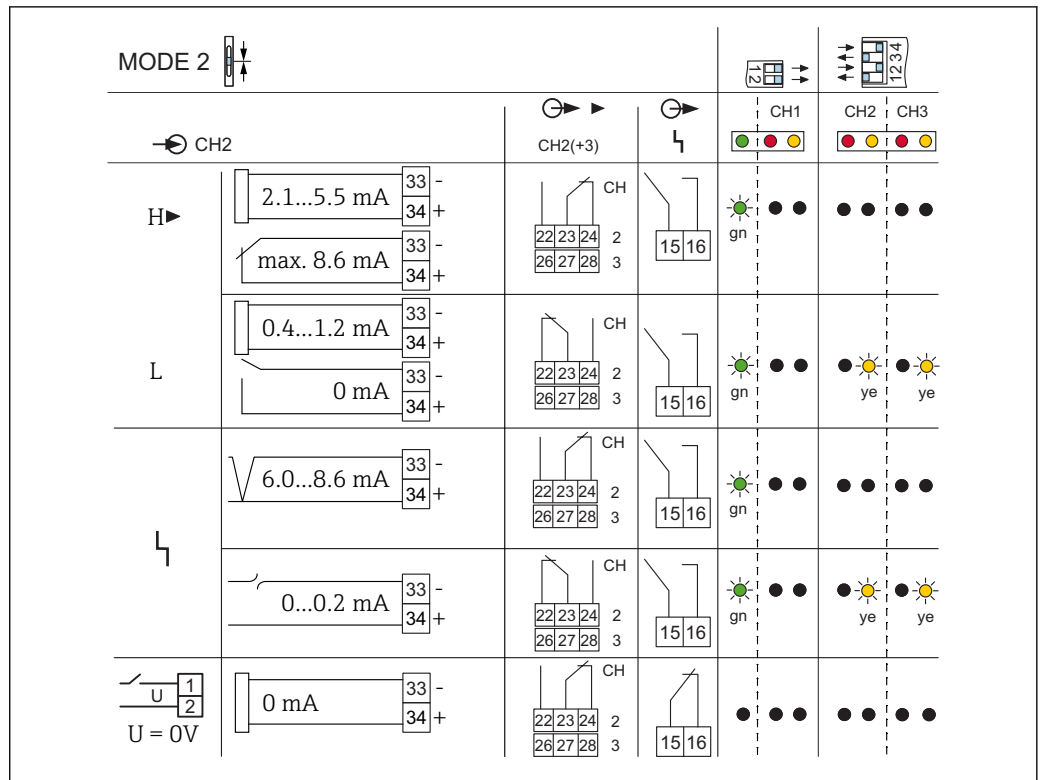
1 sensor connected at input channel 2 (terminals 33 and 34)

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.

8.2.3 CH2, limit signal H without fault signaling



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

Point level at one tank

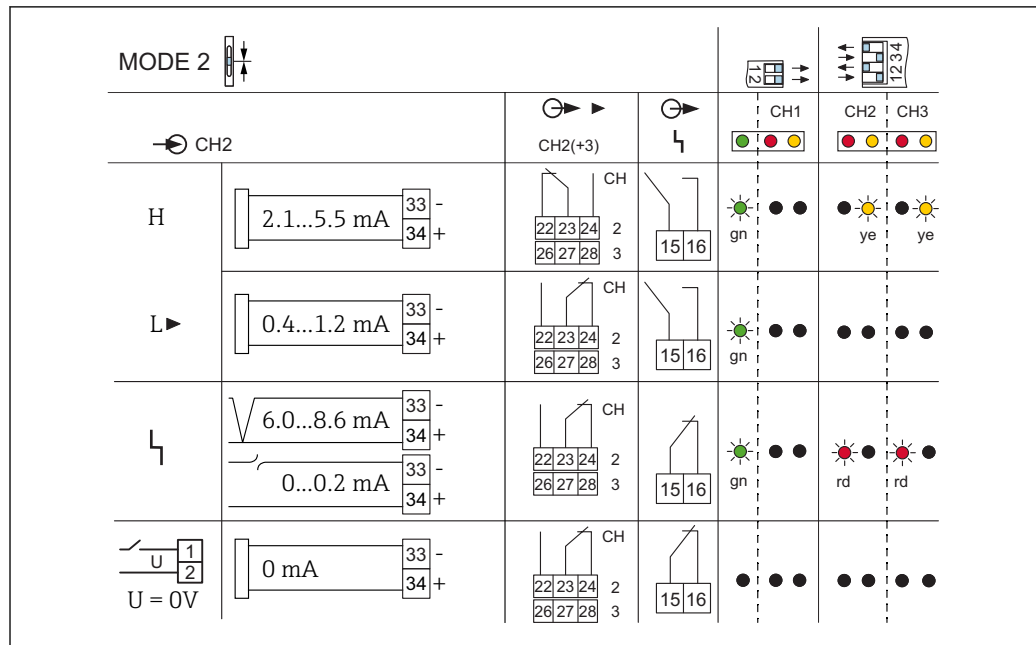
1 sensor connected at input channel 2 (terminals 33 and 34)

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 off.

8.2.4 CH2, limit signal L with fault signaling



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

Point level at one tank

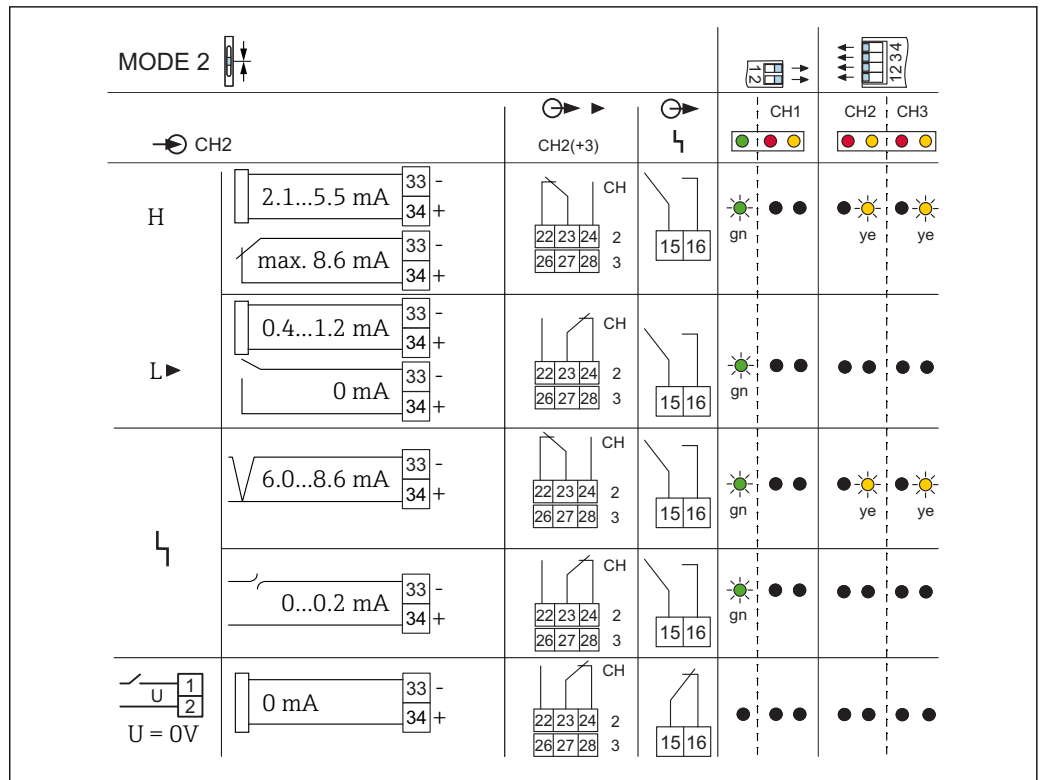
1 sensor connected at input channel 2 (terminals 33 and 34)

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.

8.2.5 CH2, limit signal L without fault signaling



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

Point level at one tank

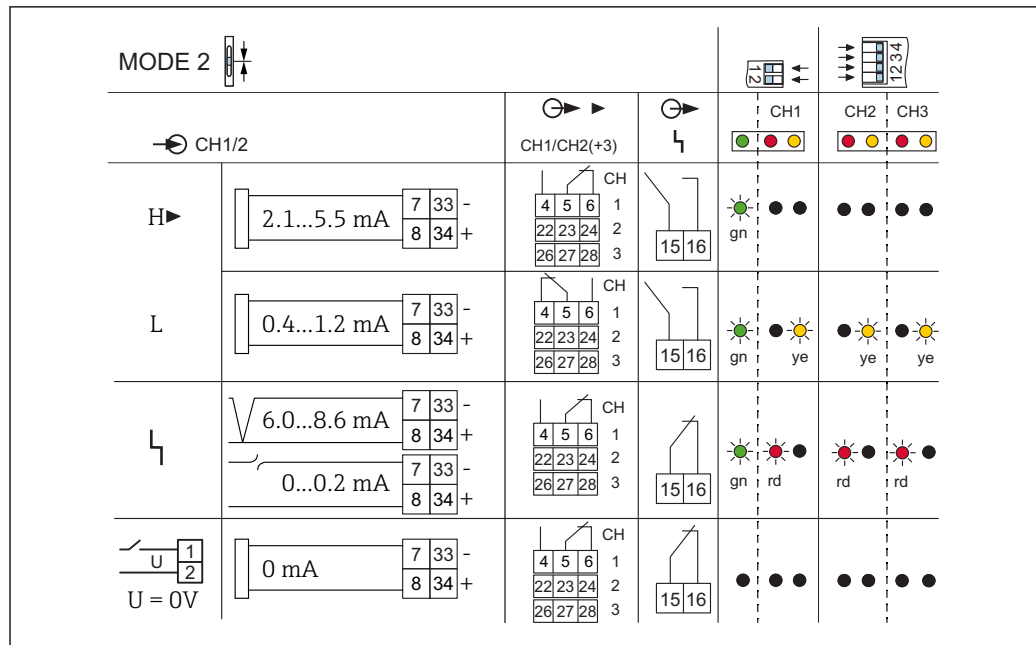
1 sensor connected at input channel 2 (terminals 33 and 34)

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 off.

8.2.6 CH1 + CH2, limit signal H with fault signaling



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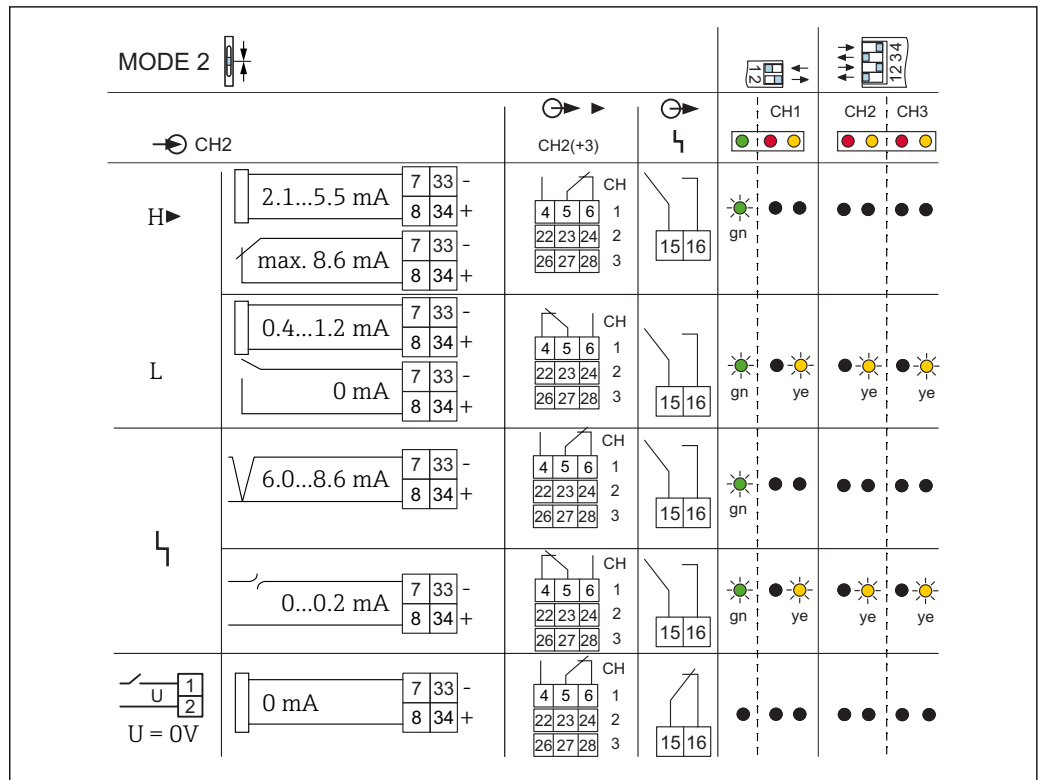
21 Switching behaviour and signaling with error current $H > 2.1 \text{ mA}$ (FEL56)

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.

8.2.7 CH1 + CH2, limit signal H without fault signaling



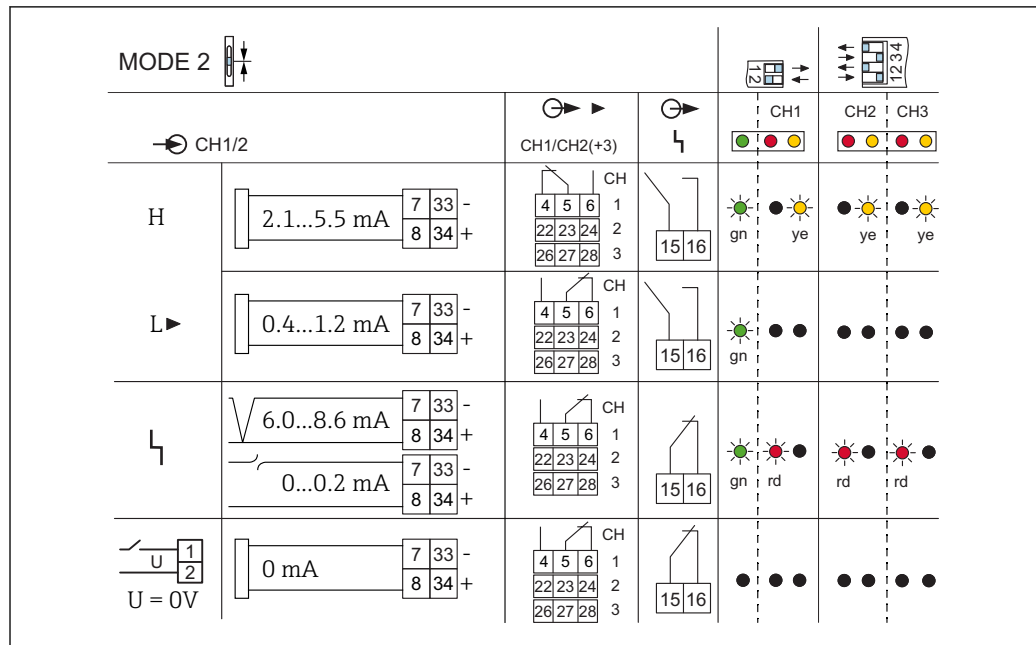
22 Switching behavior and signaling with error current $H > 2.1 \text{ mA}$ (FEL56)

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 off.

8.2.8 CH1 + CH2, limit signal L with fault signaling



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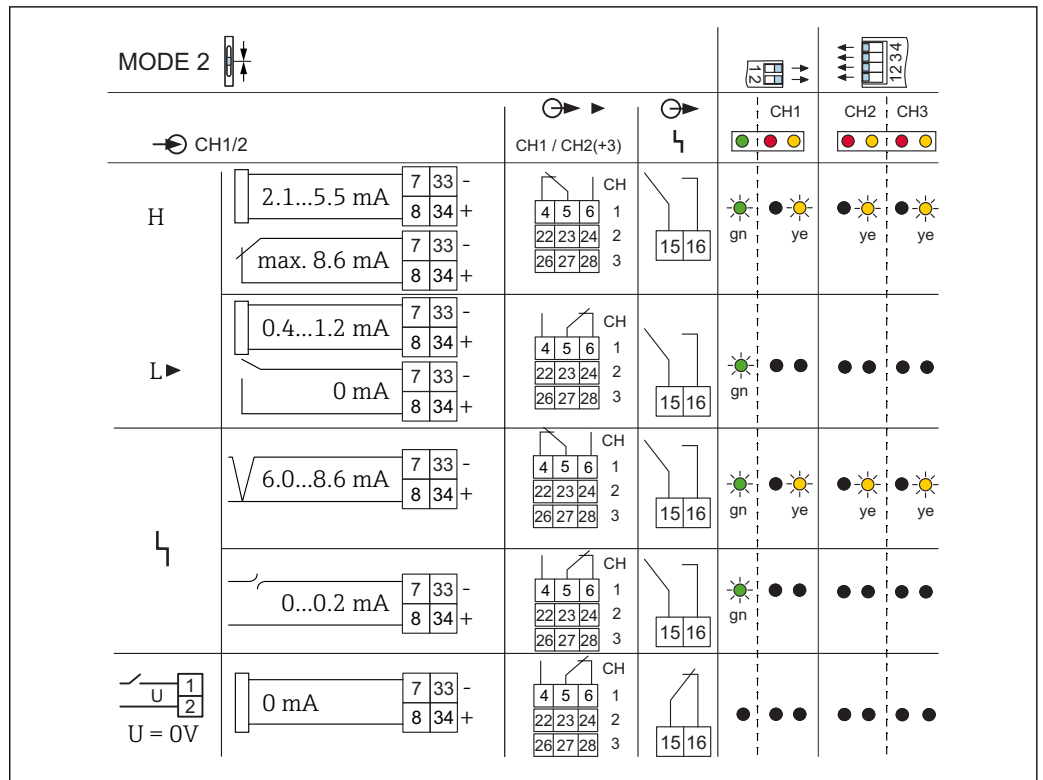
23 Switching behaviour and signaling with error current $L < 1.2$ mA (FEL48, FEL58, FEL68, FEM58, FEI58)

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.

8.2.9 CH1 + CH2, limit signal L without fault signaling



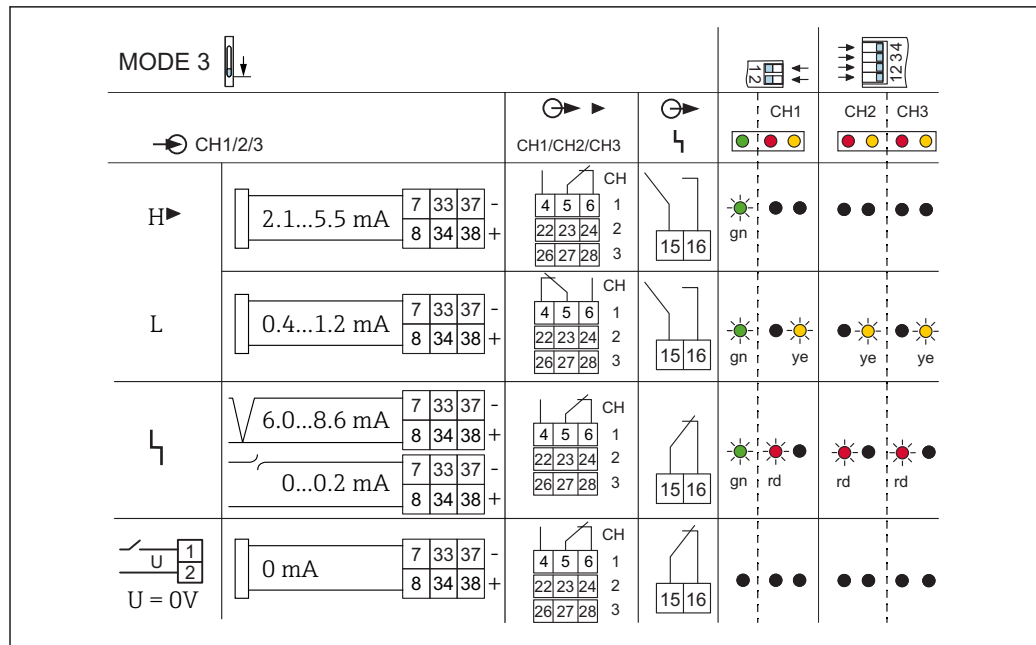
24 Switching behavior and signaling with error current $L < 2.1 \text{ mA}$ (FEL48, FEL58, FEL68, FEM58, FEI58)

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 off.

8.2.10 CH1 + CH2 + CH3, limit signal H with fault signaling



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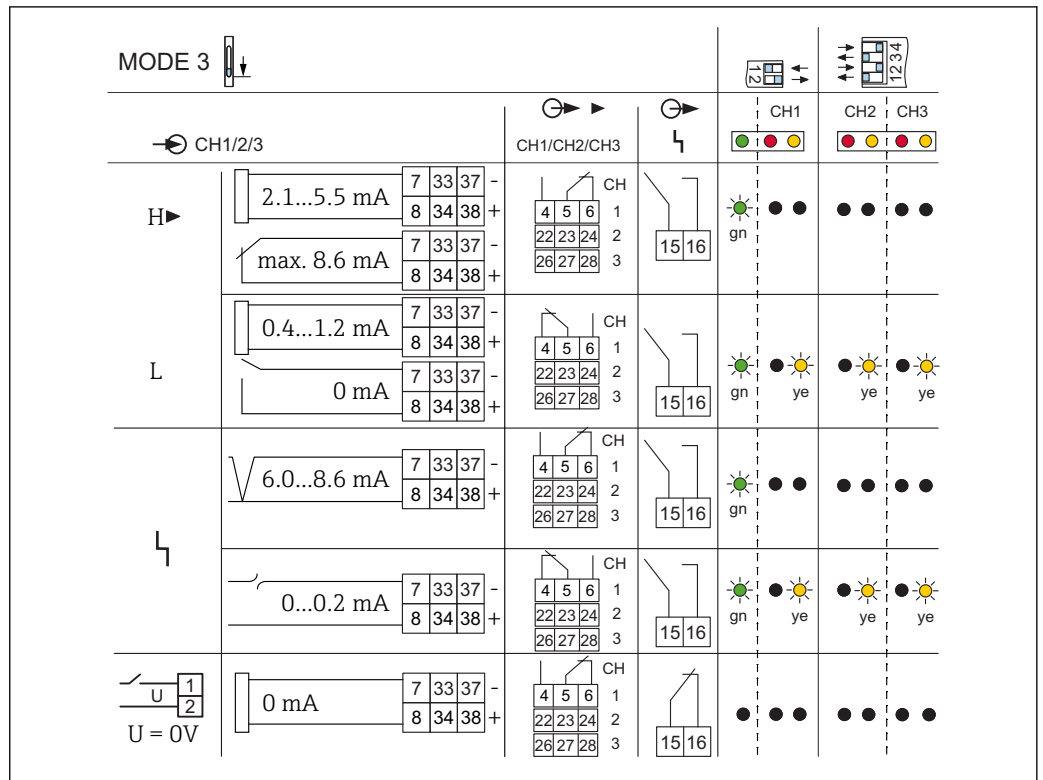
25 Switching behaviour and signaling with error current $H > 2.1 \text{ mA}$ (FEL56)

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.

8.2.11 CH1 + CH2 + CH3, limit signal H without fault signaling



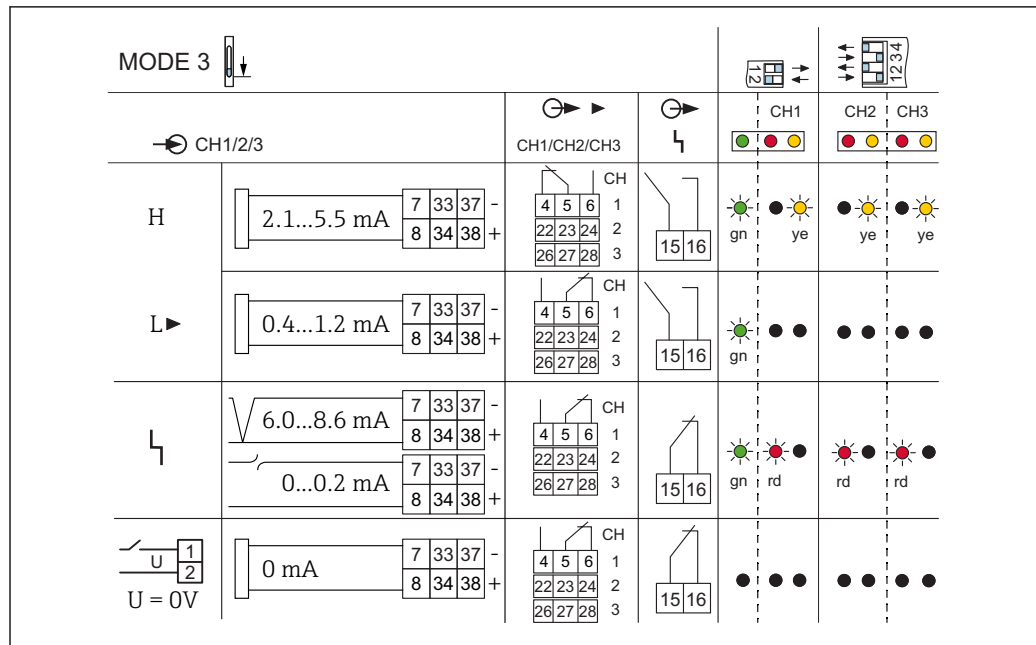
26 Switching behavior and signaling with error current $H > 2.1$ mA (FEL56)

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 off.

8.2.12 CH1 + CH2 + CH3, limit signal L with fault signaling



A0039606

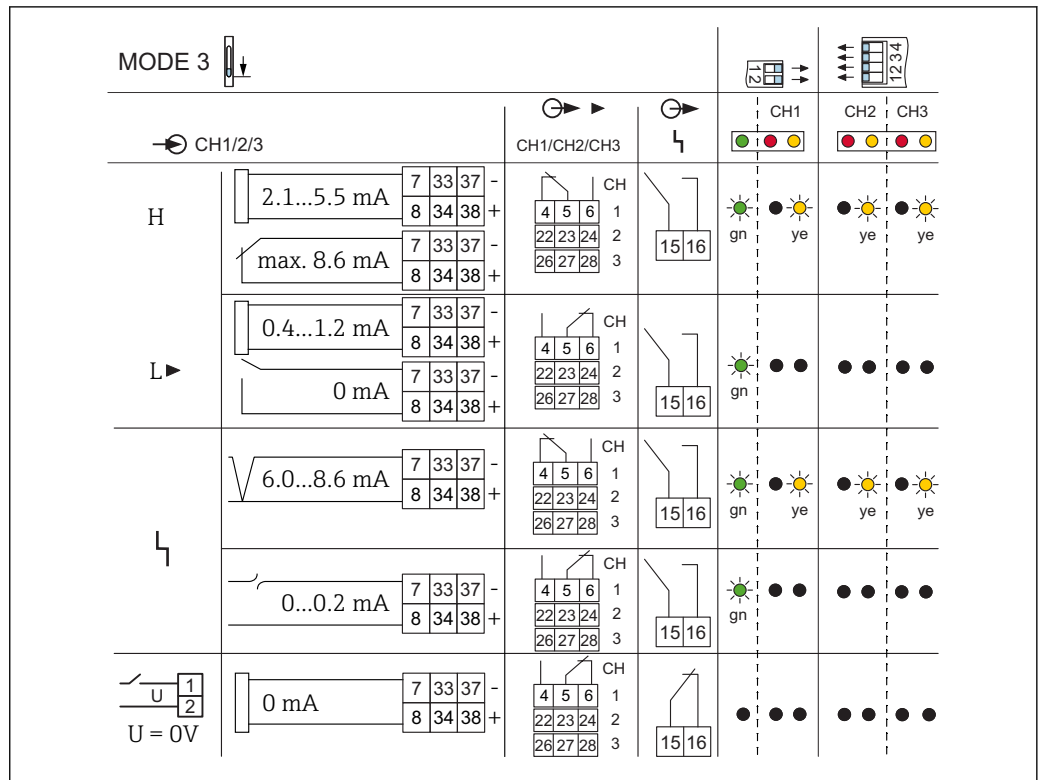
27 Switching behaviour and signaling with error current $L < 1.2 \text{ mA}$ (FEL48, FEL58, FEL68, FEM58, FEI58)

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.

8.2.13 CH1 + CH2 + CH3, limit signal L without fault signaling

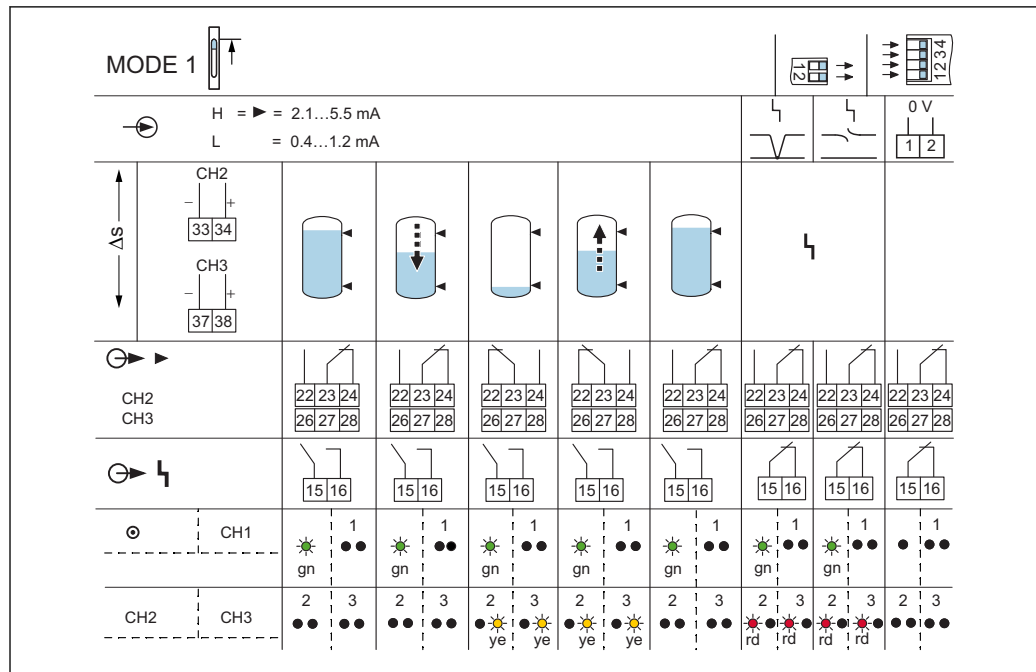


28 Switching behavior and signaling with error current $L < 1.2 \text{ mA}$ (FEL48, FEL58, FEL68, FEM58, FEI58)

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 off.

8.2.14 CH2 - CH3 (Δs) limit signal H with fault signaling

A0039610

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

Δs , 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).

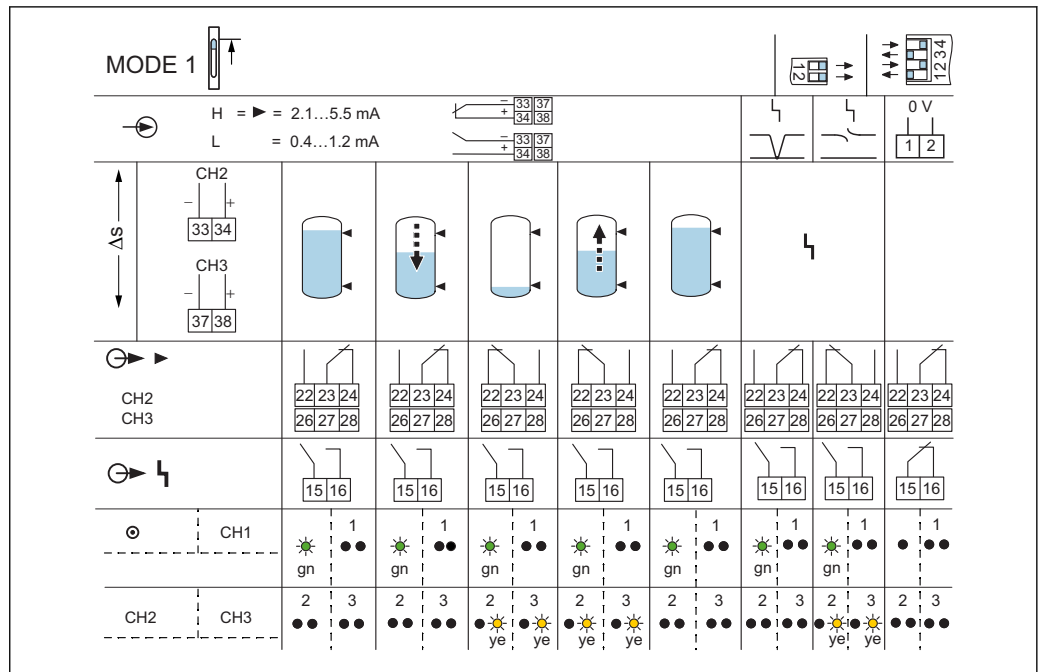
Relay outputs of output channels 2 and 3 switch simultaneously.

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.

8.2.15 CH2 - CH3 (Δs) limit signal H without fault signaling



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

Δs , e. g. pump control at one tank

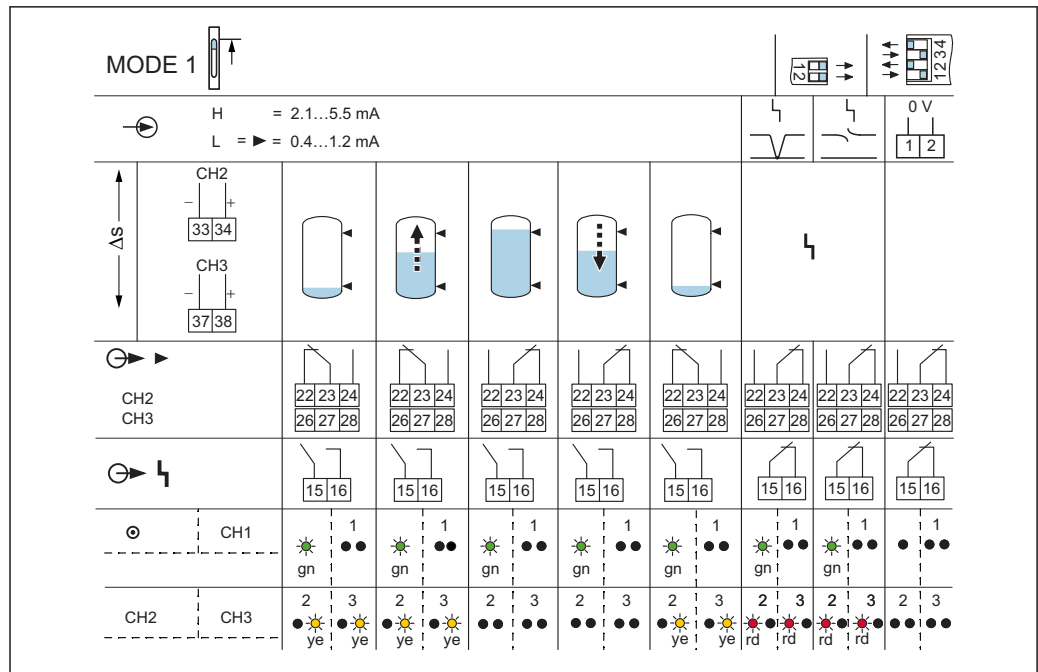
- 1 sensor (H level) connected at input channel 2 (terminals 33 and 34)
- 1 sensor (L level) connected at input channel 3 (terminals 37 and 38).

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 channels 1, 2 and 3 is switched off.

8.2.16 CH2 - CH3 (Δs) limit signal L with fault signaling



A0039612

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

Δs , 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)

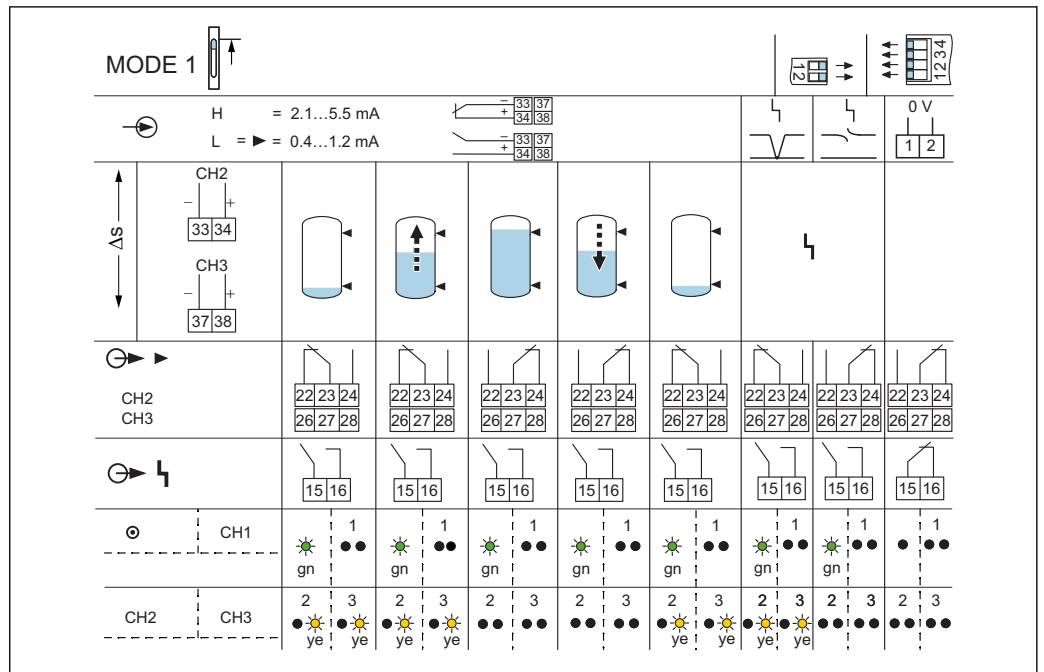
Relay outputs of output channels 2 and 3 switch simultaneously.

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.

8.2.17 CH2 - CH3 (Δs) limit signal L without fault signaling



A0039613

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

Δs , e. g. pump control at one tank

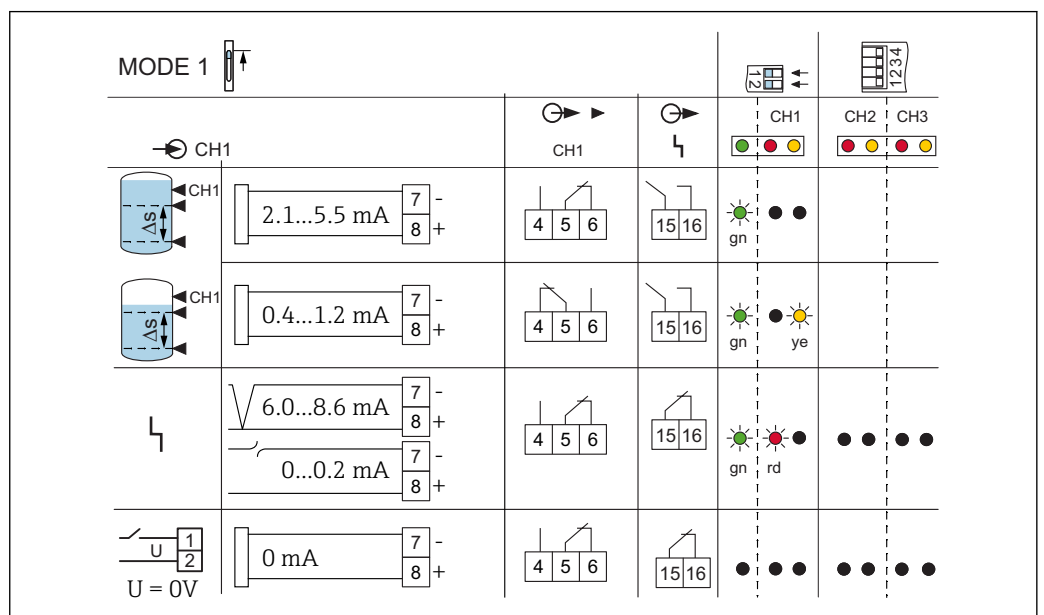
- 1 sensor (H level) connected at input channel 2 (terminals 33 and 34)
- 1 sensor (L level) connected at input channel 3 (terminals 37 and 38)

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 channels 1, 2 and 3 is switched off.

8.2.18 CH2 - CH3 (Δs) + CH1 limit signal H with fault signaling



A0039679

33 Switching behavior and signaling with error current $H > 2.1$ mA (FEL56)

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 → 33, 35.

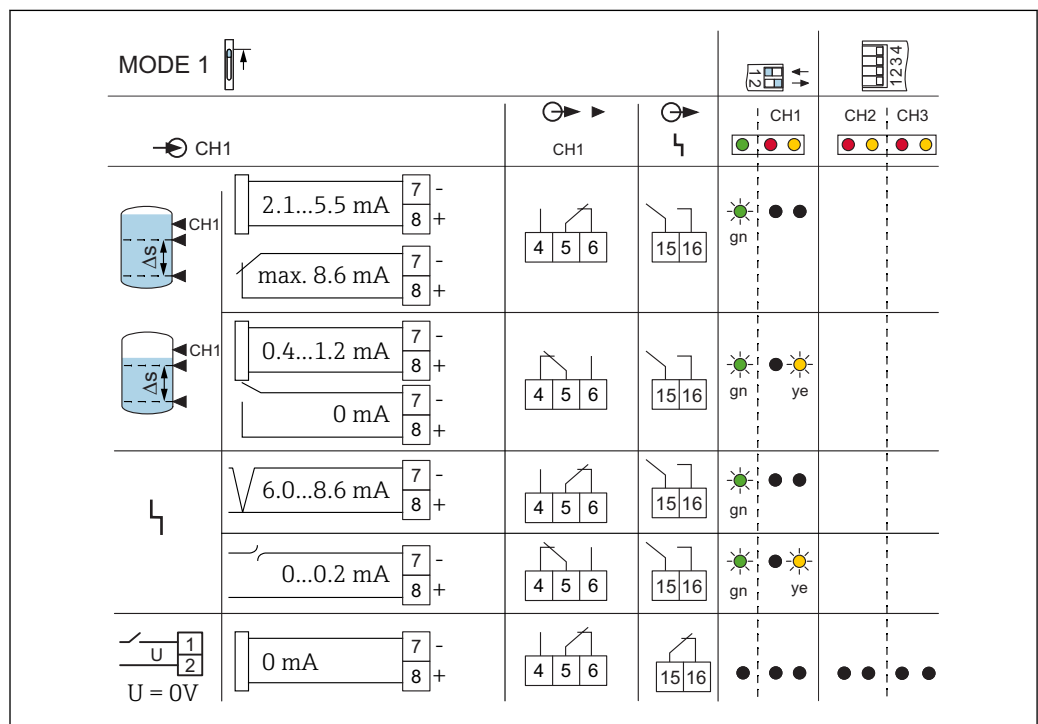
This ensures, for example, that a pump can be switched on at L level and switched off at H level.

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.

8.2.19 CH2 - CH3 (Δs) + CH1 limit signal H without fault signaling



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

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 → 34, 36.

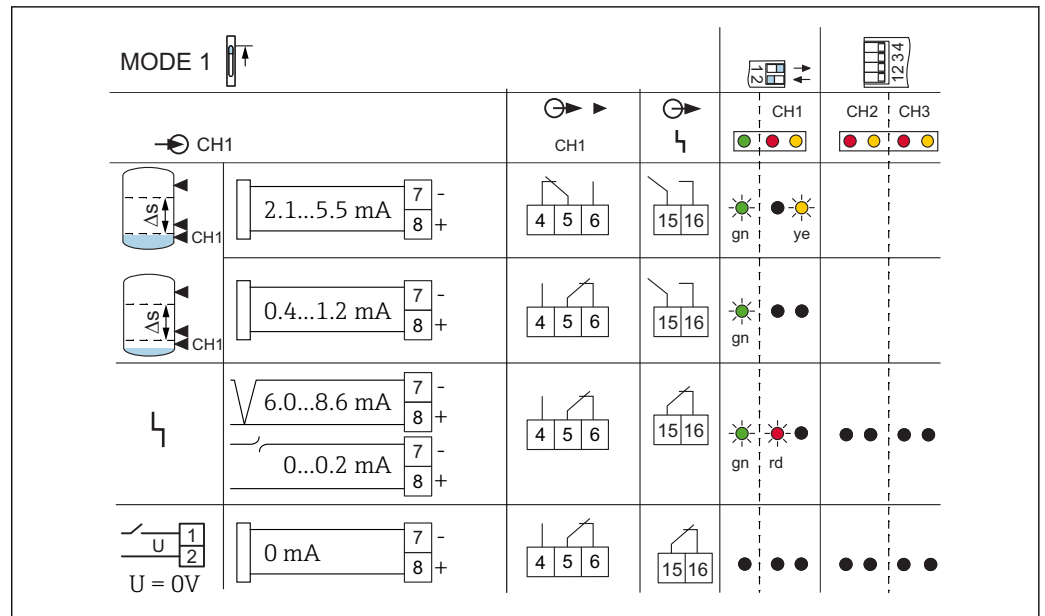
This ensures, for example, that a pump can be switched on at L level and switched off at H level.

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 off.

8.2.20 CH2 - CH3 (Δs) + CH1 limit signal L with fault signaling



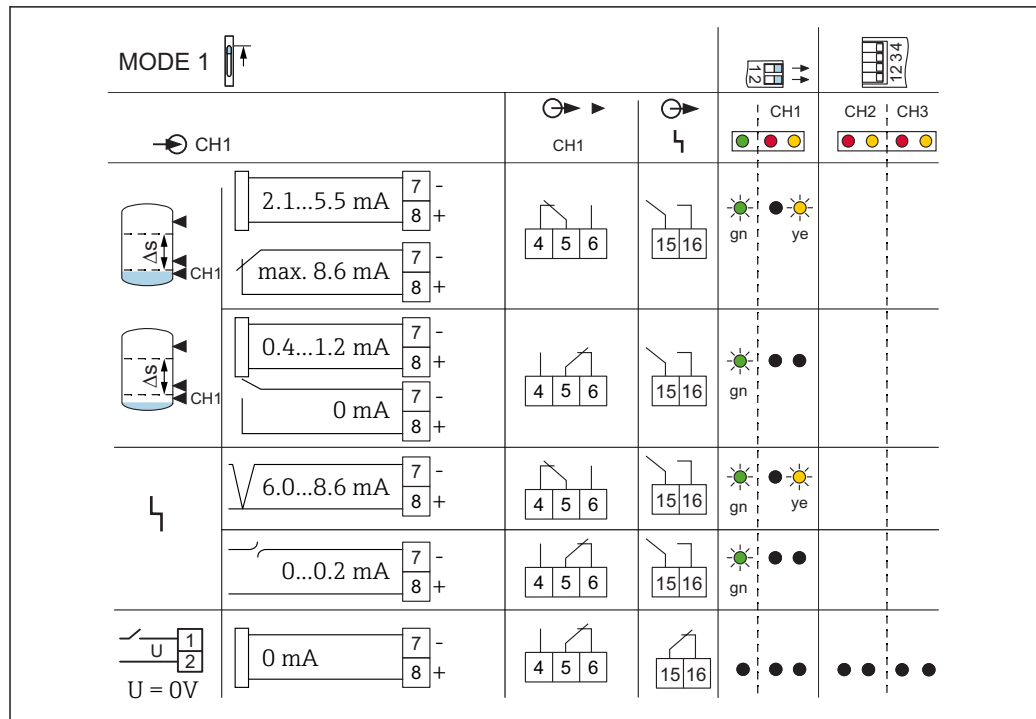
35 Switching behavior and signaling with error current $L < 1.2$ mA (FEL48, FEL58, FEL68, FEM58, FEI58)

Δs , e. g. pump control at one tank and additional overflow prevention (HH level)

- 1 sensor for overflow 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 → 35, 37.
 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.

8.2.21 CH2 - CH3 (Δs) + CH1 limit signal L without fault signaling



A0039682

36 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 → 36, 38.

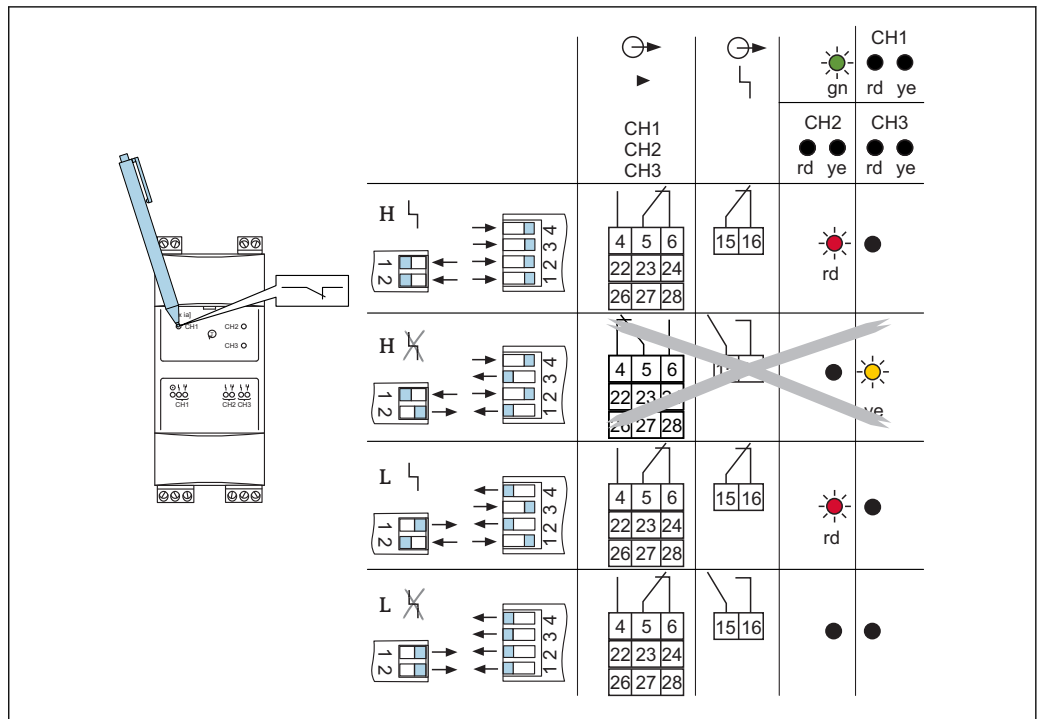
This ensures, for example, that a pump can be switched on at L level and switched off at H level.

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.

8.2.22 Function testing of follow-on devices



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37 Function testing of follow-on devices

9 Diagnostics and troubleshooting

Does not switch

- Possible cause: no supply voltage present (green LED is not lit)
Corrective measure: check power supply
- Cause: electronics are defective
Corrective measure: replace Nivotester
- Cause: welded contacts (following a short-circuit)
Corrective measure: replace Nivotester; install fuse in contact circuit
- Cause: sensor is defective
Corrective measure: replace sensor
- Cause: incorrect signal input
Corrective measure: connect correct input

Switches incorrectly

- Possible cause: switch on Nivotester for limit signal is incorrectly set
Corrective measure: correctly set the switch behind the front panel on the Nivotester
- Possible cause: inverted sensor function
Corrective measure: reverse output signal at sensor, e. g. configure minimum/maximum safety mode differently

Continuous fault signaling

- Possible cause: switch connected as measuring transmitter without current limiting resistors
Corrective measure: connect resistors or switch off fault signaling
- Possible cause: short-circuit or disconnect in the signal line to the sensor
Corrective measure: check signal line
- Possible cause: sensor electronics are defective
Corrective measure: replace electronics
- Possible cause: no sensor connected
Corrective measure: switch off fault signaling for unused channel
- Possible cause: Nivotester is defective
Corrective measure: replace Nivotester

10 Maintenance

10.1 Maintenance schedule

As a general rule, no specific maintenance work is required.


11 Repair

11.1 General information

11.1.1 Repair concept

Endress+Hauser repair concept

- Measuring devices have a modular design
- Customers can carry out repairs

 For more information on service and spare parts, please contact your Endress+Hauser sales representative.

11.1.2 Repair of Ex-certified devices

WARNING


Limitation of electrical safety due to incorrect connection!

Risk of explosion!

- ▶ Only specialist personnel or the Endress+Hauser service team may carry out repairs on Ex-certified devices.
- ▶ Relevant standards and national regulations on hazardous areas, safety instructions and certificates must be observed.
- ▶ Use only original Endress+Hauser spare parts.
- ▶ Please note the device designation on the nameplate. Only identical parts may be used as replacements.
- ▶ Carry out repairs according to the instructions. On completion of repair work, carry out the routine test specified for the device.
- ▶ Only the Endress+Hauser service team is permitted to modify a certified device and convert it to another certified version.
- ▶ All repairs and modifications must be documented.

11.2 Spare parts

- Some replaceable measuring device components are identified by means of a spare part nameplate. This contains information about the spare part.
- All the spare parts for the measuring device along with the order code are listed in the *W@M Device Viewer* (www.endress.com/deviceviewer) and can be ordered. If available, users can also download the associated Installation Instructions.

 Measuring device serial number or QR code:
Located on the device and spare part nameplate.

11.3 Return

The measuring device must be returned if the wrong device has been ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium. To ensure safe, swift and professional device returns, please refer to the procedure and conditions for returning devices provided on the Endress+Hauser website at <http://www.endress.com/support/return-material>

11.4 Disposal



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), our products are marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Such products may not be disposed of as unsorted municipal waste and can be returned to Endress+Hauser for disposal at conditions stipulated in our General Terms and Conditions or as individually agreed.

12 Accessories

12.1 Protective housing, protection class IP66

- With integrated DIN rail
- With transparent cover
- Cover can be closed and sealed
- Dimensions (in) W/H/D: 180/182/165 (7.1/7.2/6.5)
- Order number: 52010132

13 Technical data

13.1 Supply voltage

13.1.1 Alternating current version (AC)

Voltage range: 85 to 253 V_{AC}, 50/60 Hz

13.1.2 Direct current version (DC)

- Voltage range: 20 to 30 V_{AC}/ 20 to 60 V_{DC}
- D/C power supply: 200 mA
- Permissible residual ripple within tolerance: U_{ss} = maximum 2 V

13.2 Power consumption

AC

maximum 4.2 W

DC

4.0 W (at U_{min} 20 V)

13.3 Output signal

- Relay output per channel: a potential-free changeover contact for the level alarm
- Quiescent current fail-safe mode: MIN/MAX safety can be selected with DIL switch
- 1 fault-signaling relay for channels 1, 2 and 3 (one potential-free changeover contact, but it is only possible to connect to two contacts)
- Switching delay: approx. 0.5 s
- Operating life: at least 10⁵ switching operations with maximum contact load
- Relay contact switching capacity:

Alternating voltage (AC)

U ~ maximum 250 V

I ~ maximum 2 A

P ~ maximum 500 VA with cos φ ≥ 0.7

Direct current (DC)

U = maximum 40 V

I = maximum 2 A

P = maximum 80 W

13.4 Ambient temperature range

- For single installation: -20 to +60 °C (-4 to 140 °F)
- For side-by-side installation without lateral spacing: -20 to +50 °C (-4 to +122 °F)
- For installation in protective housing: -20 to +40 °C (-4 to +104 °F)
A maximum of four single-channel Nivotester devices or a maximum of two 3-channel Nivotester devices or a maximum of two single-channel Nivotester devices plus one 3-channel Nivotester device may be installed.
- Storage temperature: -20 to +85 °C (-4 to 185), preferably at 20 °C (68 °F)

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