

ifm electronic



Operating instructions

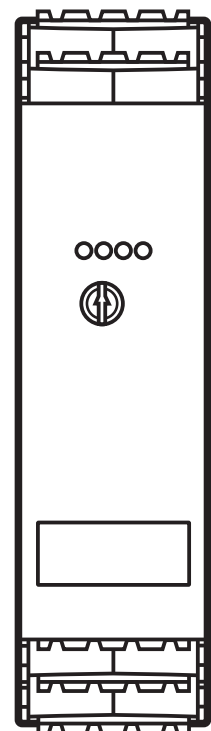
**ecomat200**<sup>®</sup>

Level control relay

DL0203

UK

80097642 / 00 10 / 2014



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# 1 Preliminary note

This document applies to the level control relay DL0203.

This document is intended for specialists. These specialists are people who are qualified by their training and their experience to see risks and to avoid possible hazards that may be caused during operation, installation or maintenance of the device.

Read this document before use to familiarise yourself with operating conditions, installation and operation. Keep this document during the entire duration of use of the device.

## **WARNING**

Adhere to the warning notes and safety instructions (→ 2 Safety instructions).

### 1.1 Symbols and warnings used

► Instructions

> Reaction, result

[...] Designation of keys, buttons or indications

→ Cross-reference



Important note

Non-compliance can result in malfunction or interference.



Information

Supplementary note.

## **WARNING**

Warning of serious personal injury.

Death or serious irreversible injuries may result.

## **CAUTION**

Warning of personal injury.

Slight reversible injuries may result.

## **NOTE**

Warning of damage to property.

## 2 Safety instructions

### 2.1 General

Follow the operating instructions. Non-observance of the instructions, operation which is not in accordance with use as prescribed below, wrong installation or incorrect handling can affect the safety of operators and machinery.

The installation and connection must comply with the applicable national and international standards. Responsibility lies with the person installing the device.

The system installer is responsible for the safety of the system into which the device is integrated.

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### 2.2 Target group

The device must only be installed, connected and put into operation by a qualified electrician.

### 2.3 Electrical connection

Disconnect the unit externally before handling it. Also disconnect any independently supplied relay load circuits.

Make sure that the external voltage is generated and supplied according to the requirements for safety extra-low voltage (SELV) since this voltage is supplied without further measures near the operating elements and at the terminals for the supply of connected sensors.

The wiring of all signals in connection with the SELV circuit of the device must also comply with the SELV criteria (safety extra-low voltage, safe electrical isolation from other electric circuits).

If the externally supplied or internally generated SELV voltage is externally grounded, the responsibility lies with the user in accordance with the applicable national installation regulations. All statements in these operating instructions refer to the unit the SELV voltage of which is not grounded.

It is not allowed to supply external voltage to the terminals for the pulse pick-up supply. The consumption of current which exceeds the value given in the technical data is not allowed.

An external main switch must be installed for the unit which can switch off the unit and all related circuits. This main switch must be clearly assigned to the unit.

## **2.4 Handling**

Be careful when handling the unit once power is applied. This is only allowed by qualified personnel due to the protection rating IP 20.

## **2.5 Installation location**

For the correct operation the device must be mounted in a housing which can only be opened using a tool or in a locked control cabinet (both protection rating IP 54 or higher) as an enclosure in accordance with EN 61010.

## **2.6 Housing temperature**

As described in the technical specifications below the device can be operated in a wide ambient temperature range. Because of the additional internal heating the operating elements and the housing walls can have high perceptible temperatures when touched in hot environments.

## **2.7 Tampering with the device**

In case of malfunction of the unit or queries please contact the manufacturer. Any tampering with the device can seriously affect the safety of operators and machinery. This is not permitted and leads to the exclusion of any liability and warranty claims.

### 3 Functions and features

The device is used to keep a medium level between 2 sensors. To do so it controls the inlet of a tank (e.g. valve or pump).

It receives signals from 2 external sensors and switches its outputs according to the adjustable input delay. The input delay protects against unintended switching caused by waves on a medium surface.

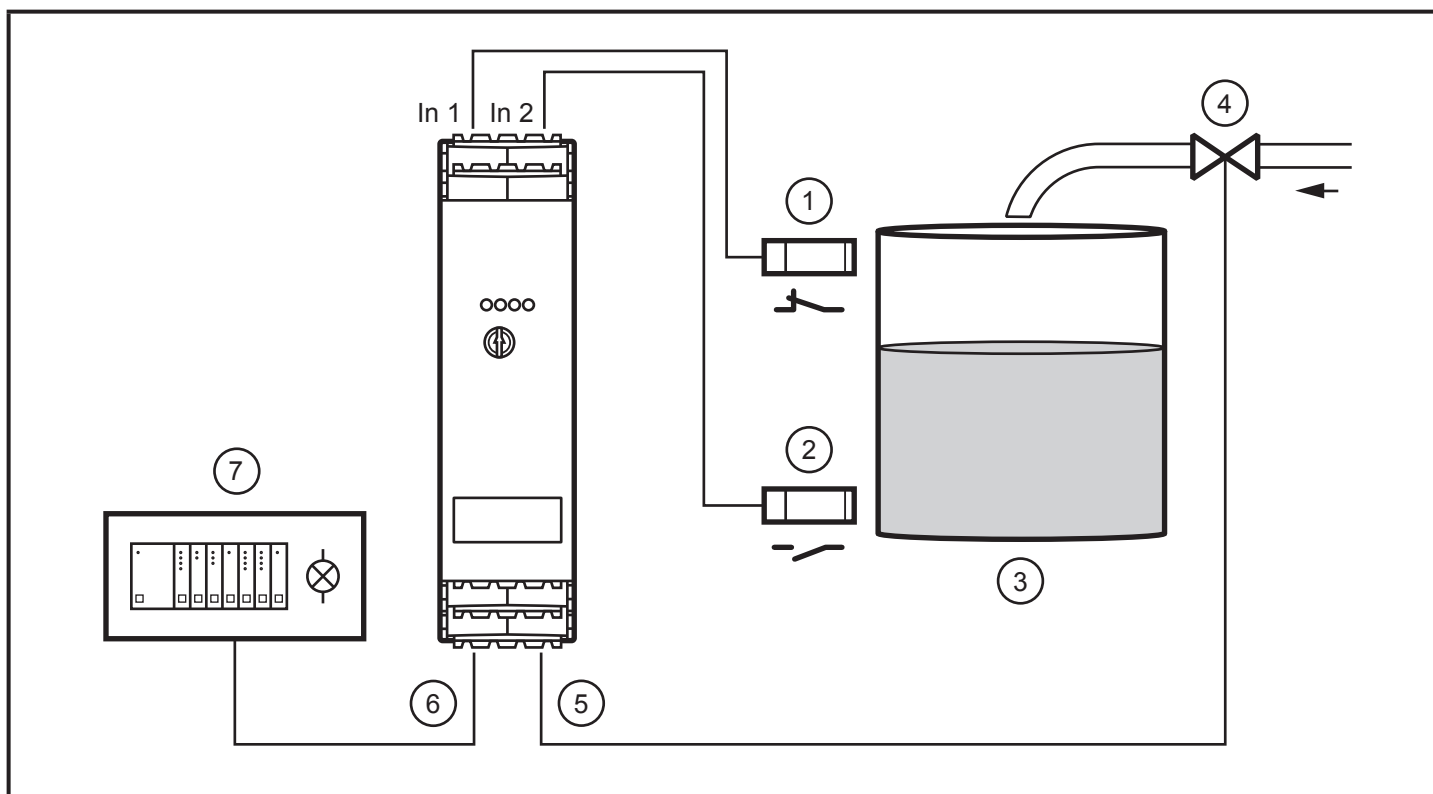
Sensor supply and transistor output are equipped with an independent overload/short circuit protection.

#### **WARNING**

The device is not approved for safety-related tasks in the field of operator protection.

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### 3.1 Functionality



#### Level control

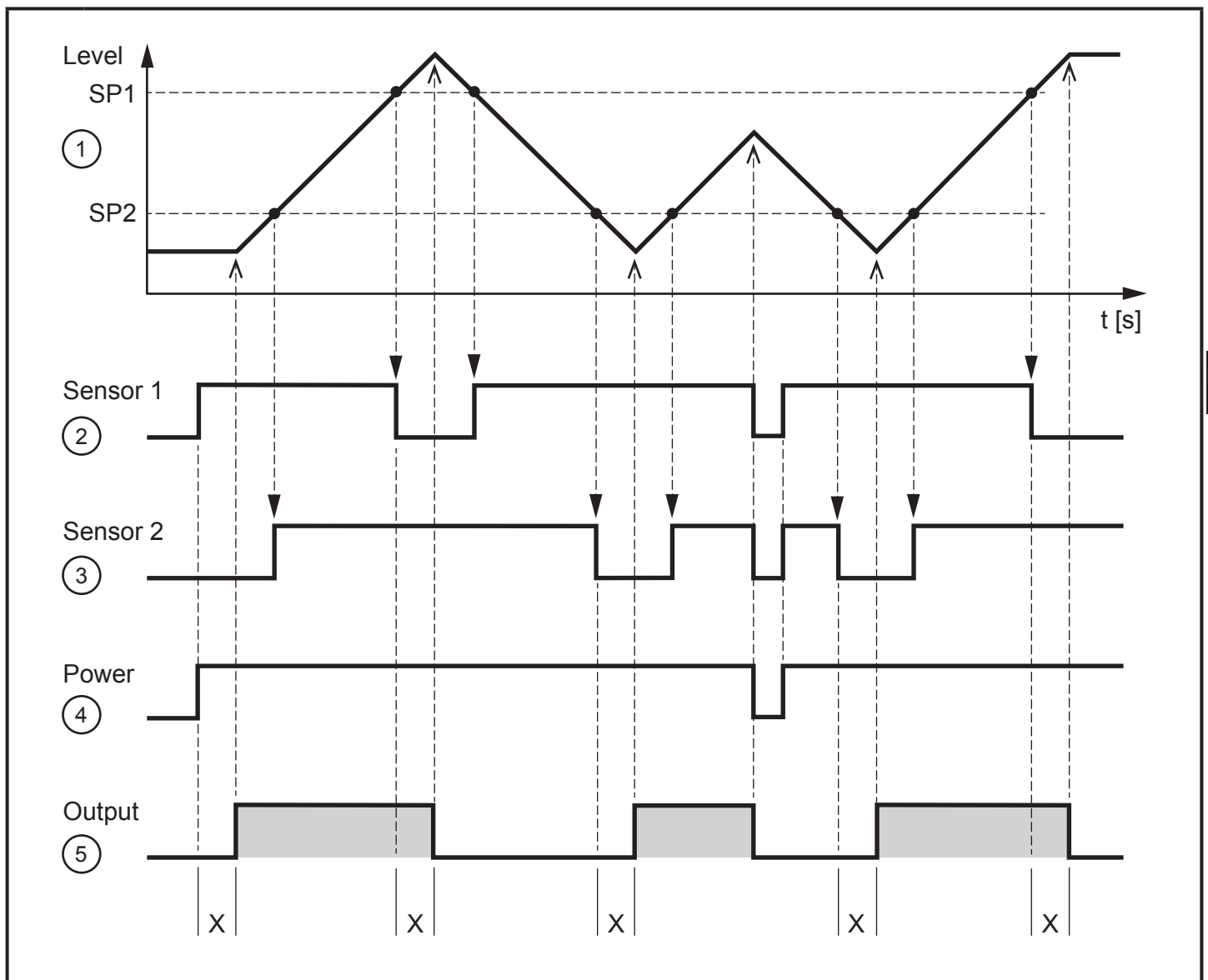
- 1: Sensor 1 with normally closed output for input 1 (upper level)
- 2: Sensor 2 with normally open output for input 2 (lower level)
- 3: Tank with liquid or dry bulk material
- 4: Valve or pump (inlet)
- 5: Relay output
- 6: Transistor output
- 7: PLC or signalling device

Process	Relay
After switching on the device	de-energised
Level is below both sensors	energised
Level is above both sensors	de-energised
Level is between the sensors	depending on the previous state

Relay energised, i.e. switched (transistor output switched)



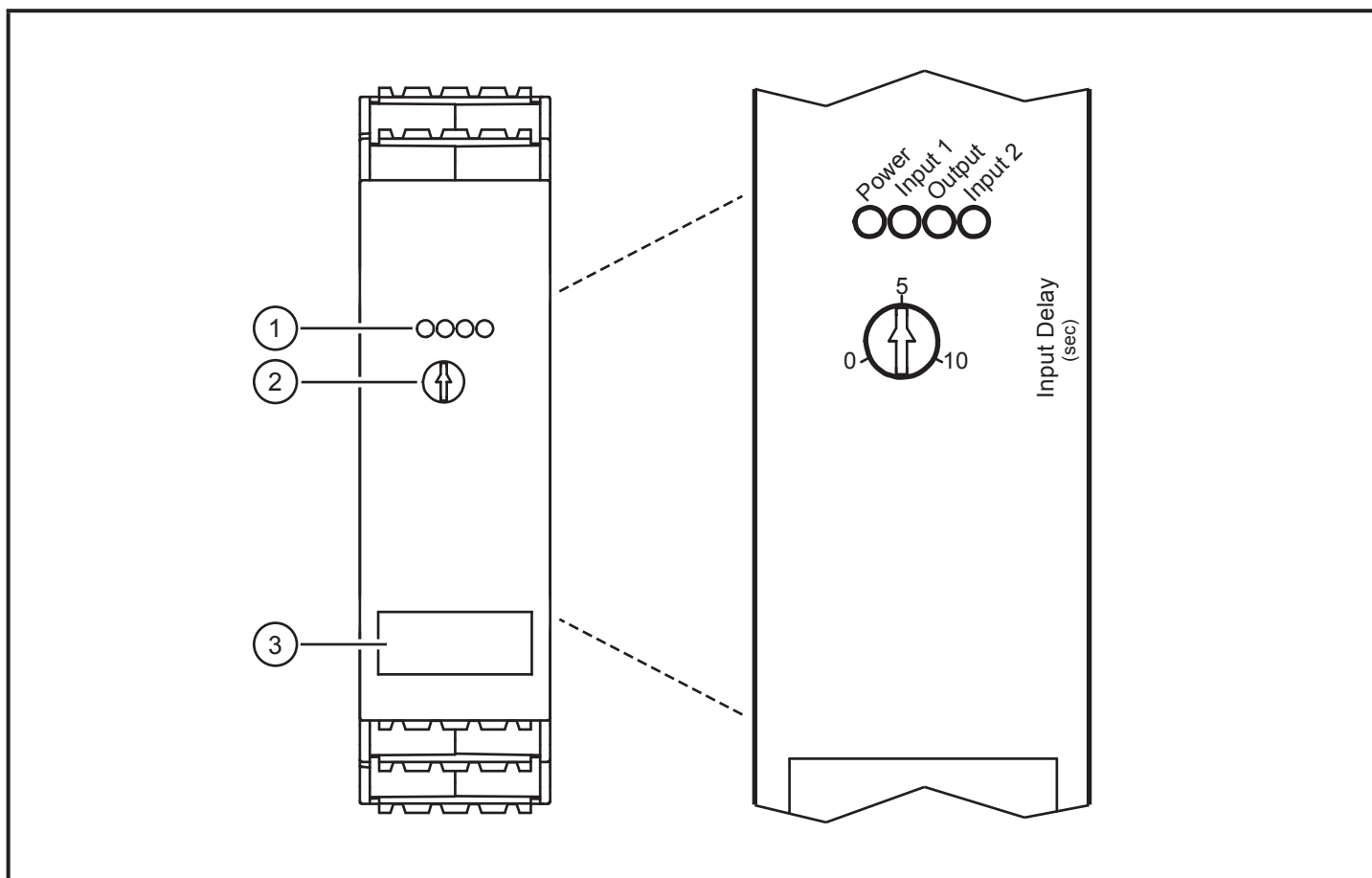
### 3.1.1 Switching diagram



▬ = relay energised, i.e. switched (transistor output switched)

- 1: Level of the medium
- 2: Sensor 1 with normally closed output for input 1 (upper level)
- 3: Sensor 2 with normally open output for input 2 (lower level)
- 4: Power supply
- 5: Output
- SP1 Switch point sensor 1 (upper level)
- SP2 Switch point sensor 2 (lower level)
- X Input delay (→ 7.1)

## 4 Operating and display elements



Operating and display elements

- 1: LEDs
- 2: Potentiometer
- 3: Panel for labelling

### 4.1 LEDs

LED	Colour	Status	Description
Power	Green	On	Voltage supply OK
Input 1	Yellow	On	Input 1 signal "High"
Output	Green	On	Relay energised (transistor switched)
Input 2	Yellow	On	Input 2 signal "High"

Error signals and diagnosis (→ 10 Troubleshooting)

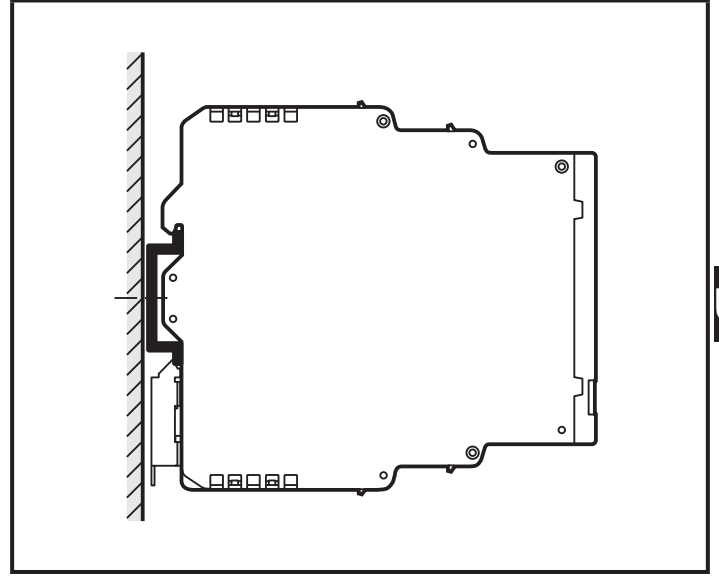
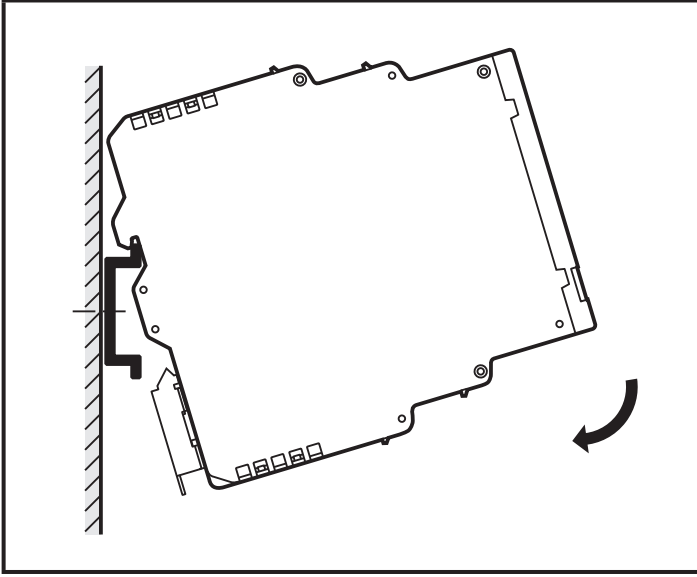
### 4.2 Potentiometer

Potentiometer	Setting
Input Delay	Input delay [s] (→ 7.1)

## 5 Installation

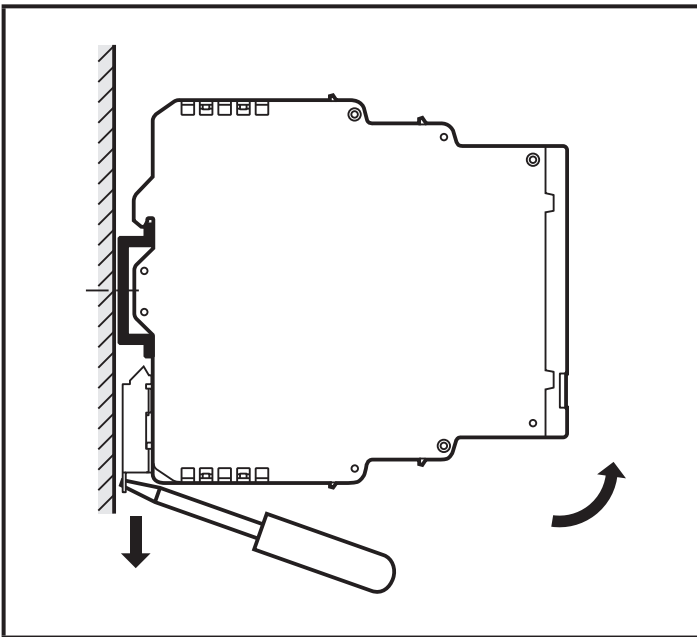
### 5.1 Installation of the device

- ▶ Install the device on a 35 mm DIN rail.



- ▶ Leave enough space between the unit and the top and bottom of the control cabinet to enable air circulation and to avoid excessive heating.
- ▶ Take into account the internal heating of all units when mounting several units side by side. The environmental conditions must be observed for every unit.

#### 5.1.1 Remove the device



### 5.2 Mounting of the sensors

- ▶ Follow the manufacturer's installation instructions.

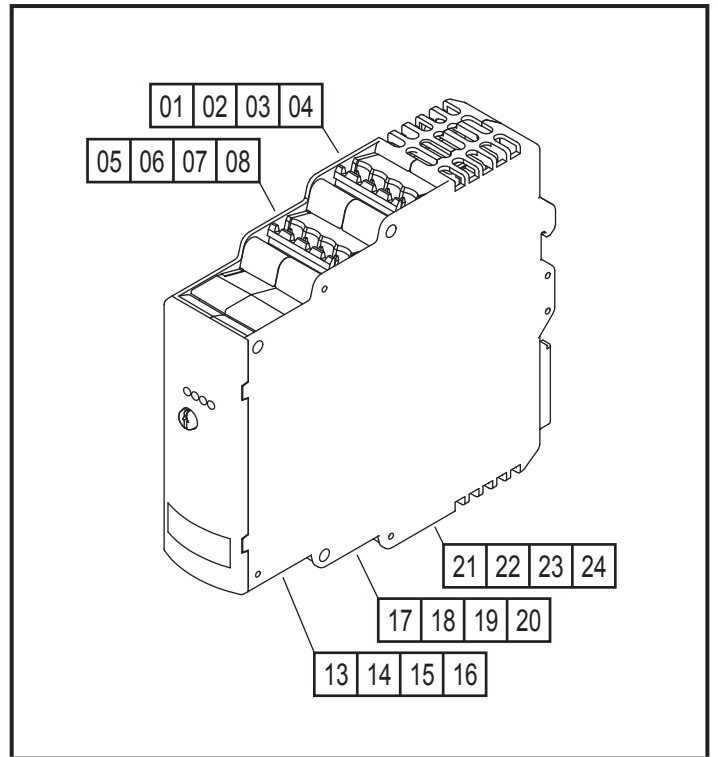
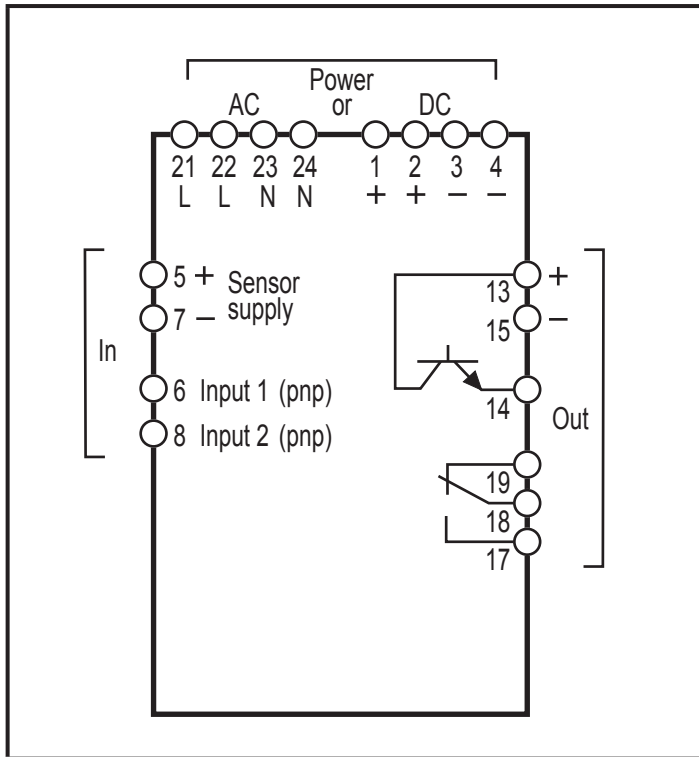
# 6 Electrical connection

## 6.1 Connection accessories

The unit is supplied including connectors.

You can find more information about the available accessories at:  
[www.ifm.com](http://www.ifm.com) → Data sheet search → Article number → Accessories

## 6.2 Terminal connection



Terminal connection

### ⚠ WARNING

Only the supplied or technically identical connectors may be used on the terminals blocks for the AC supply (21...24) and the relay output (17...20) (→ 9 Technical data).

To ensure protection rating IP 20 for the housing and the terminals, fully tighten the screws of the unused connector contacts.

### ⚠ WARNING

Do not use unconnected terminals which are not shown in the drawing such as terminal 20 as support point terminal.

## 6.3 Voltage supply (power)

- ▶ Voltage supply see type label.
- ▶ Connect the device only to one of the possible voltage connections, i.e. either to terminals 21/22 and 23/24 (AC) or to terminals 1/2 and 3/4 (24 V DC).
- ▶ Lay all supply and signal cables separately. Use a screened cable if required in the application.

### 6.3.1 AC supply

#### **WARNING**

The AC supply cable must be protected according to the cross-section used (max. 10 A).

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If the unit is supplied on AC, the low voltage provided for the sensor supply meets the SELV criteria according to EN 61010, overvoltage category II, soiling degree 2.

### 6.3.2 DC supply

- ▶ The SELV criteria (safety extra-low voltage) must be met for the DC supply.
- ▶ The DC supply cable L+ (terminals 1/2) must be protected externally with a 315 mA time-lag fuse (5 x 20 mm or similar).

The DC supply terminals are directly connected to the sensor supply terminals.

## 6.4 Inputs

### 6.4.1 General



The assignment of the sensors to the inputs is predetermined.

Input 1 = sensor 1 with normally closed output (upper level)

Input 2 = sensor 2 with normally open output (lower level)



The connection of mechanical switch contacts is not recommended since they tend to bounce and produce faulty pulses.

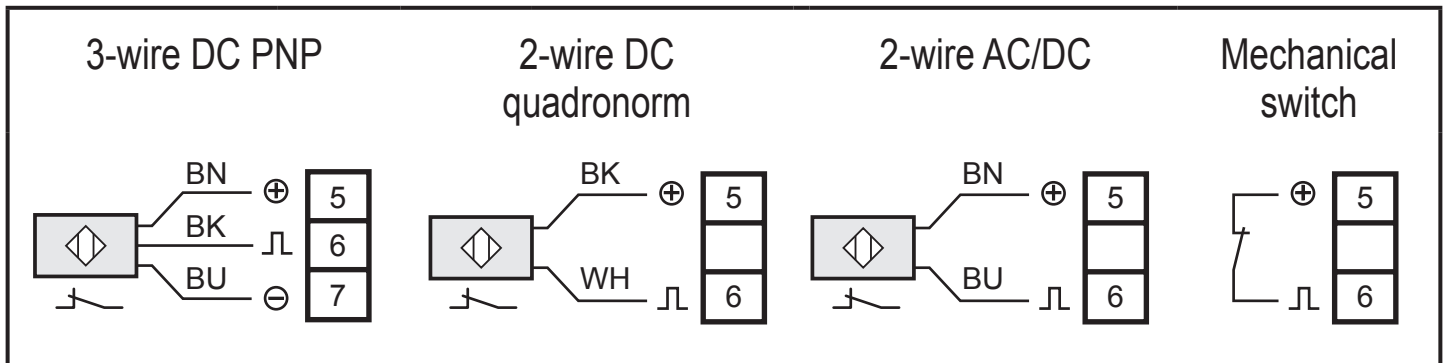
Terminals 5 and 7 can be used for the sensor supplies.

### 6.4.2 Connection of sensor 1 (upper level)



For the correct operation use a sensor with normally closed output

(→ 3.1 Functionality).



BN = brown

BK = black

BU = blue

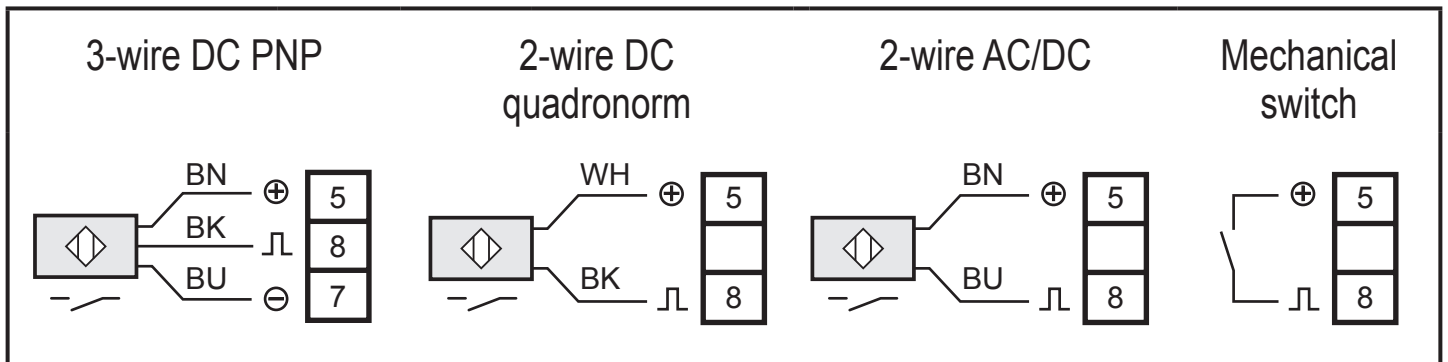
WH = white

### 6.4.3 Connection of sensor 2 (lower level)



For the correct operation use a sensor with normally open output

(→ 3.1 Functionality).



BN = brown

BK = black

BU = blue

WH = white

## 6.5 Outputs

### 6.5.1 Relay output

- ▶ Connect the changeover contact depending on the used valve or pump (→ 6.6 Connection of the valve or pump).
- ▶ To prevent excessive wear and to comply with the EMC standards, interference suppression of the contacts is required for switching inductive loads.

#### **WARNING**

If the device is operated on an AC supply (terminals 21/22 and 23/24) this must use the same supply cable (phase) as the voltage supply to switch an AC voltage via the relay output.

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If the relay output is used to switch very small currents (e.g. PLC input), considerable contact resistance can arise. For this purpose use the transistor output.

### 6.5.2 Transistor output

- ▶ The transistor output needs an external +24 V DC supply on terminal 13. Protect this +24 V DC supply cable externally with a 315 mA time-lag fuse (5 x 20 mm or similar).
- ▶ Connect the reference point (GND) of the external power supply with terminal 15 or 3/4 of the device. Otherwise no switching operation is possible.
- ▶ The SELV criteria (safety extra-low voltage) must be met for the DC supply of the transistor outputs.

## 6.6 Connection of the valve or pump

- ▶ The principle of normally open operation must be adhered to for the connection of the valve or the pump. For example, connect the normally open output of the device (terminals 17/18) to a valve with normally closed operation.



By adhering to the principle of normally open operation the inlet or outlet of the medium is blocked in the event of a wire break or a power failure.

## 7 Settings

- ▶ Set the continuously adjustable potentiometer using a suitable screwdriver.

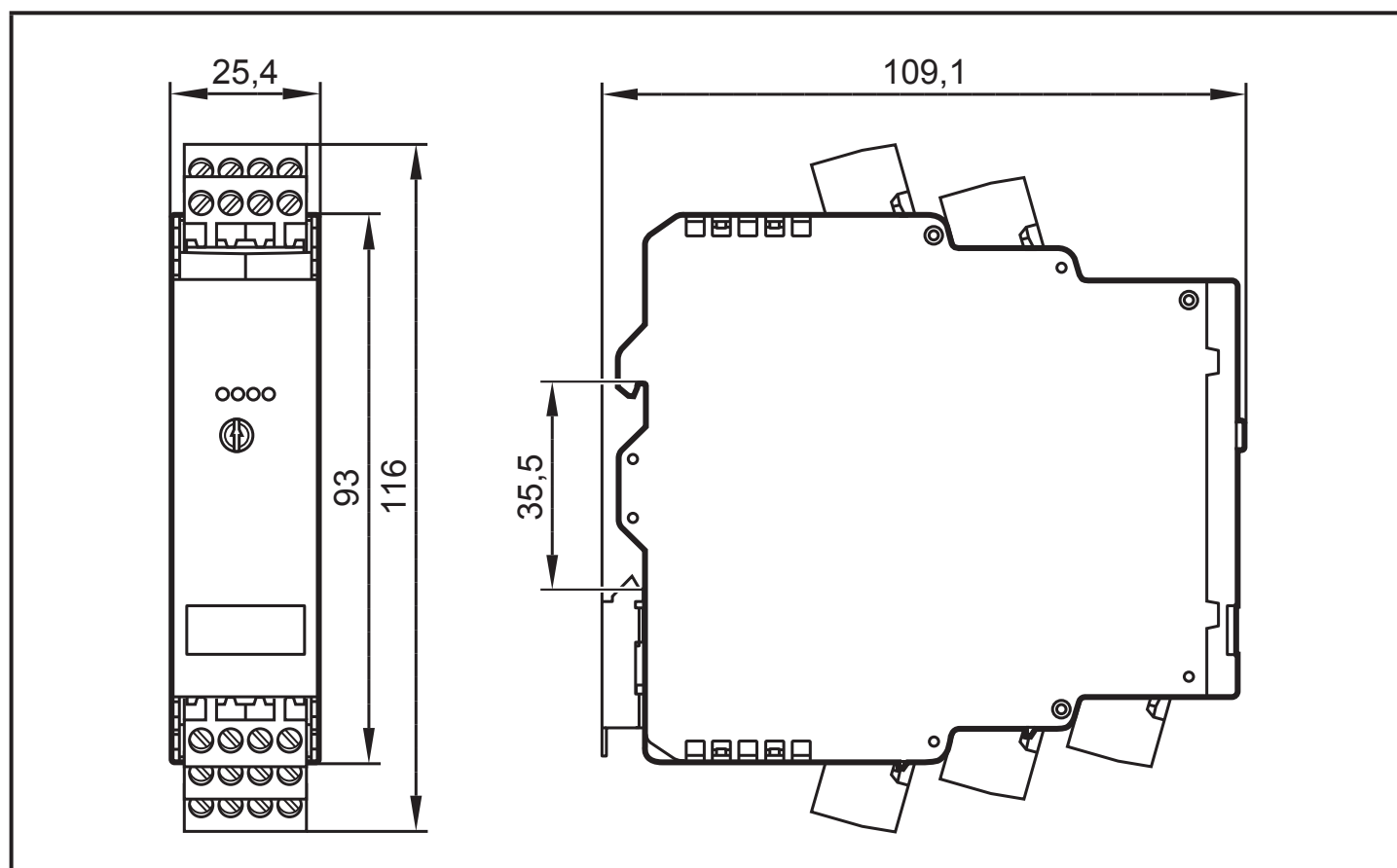
### 7.1 Input delay

The input delay sets the minimum duration of the stable input signal to be evaluated. It protects against unintended switching caused by waves on a medium surface.

Value	0...10 s
-------	----------



## 8 Scale drawing



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## 9 Technical data

Level control relay		DL0203
Nominal voltage AC	[V]	110....240
Nominal frequency	[Hz]	50....60
Voltage tolerance	[%]	-20/+10
Power consumption	[W]	6
Alternatively		
Nominal voltage DC	[V]	27 (typ. 24)
Voltage tolerance	[%]	-20/+10
Power consumption	[W]	4
Auxiliary energy for sensors	[V]	18.5...30 DC SELV, ≤ 100 mA
Sensor type		PNP (type 2 to IEC 61131-2)
Input frequency	[Hz]	≤ 5

Level control relay		DL0203
Relay contact rating	[A]	4 Resistive load (240 V AC or 24 V DC) Electrically isolated Reinforced insulation to EN 61010 Overvoltage category II, Degree of soiling 2 to 240 V AC nominal voltage
Transistor switching voltage	[V]	10...30 DC SELV
Transistor current rating	[mA]	≤ 100
Protection housing / terminals		IP 20 / IP 20
Ambient temperature	[°C]	-25...60
Storage temperature	[°C]	-25...70
Max. perm. relative humidity	[%]	80 (31 °C) Linearly decreasing to 50 (40 °C) Non condensing
Maximum operating altitude	[m]	2000 above sea level
Connection		
Device		4-pole terminal blocks with 5.0 mm pitch
Connector		4 poles with screw connection (supplied with the unit)
Type		Phoenix Contact MSTBT 2,5/4-ST BK 0.2...2.5 mm <sup>2</sup> (AWG 30...12)

Data sheets are available at:

[www.ifm.com](http://www.ifm.com) → Data sheet search → Article number

## 9.1 Approvals/standards

EC declarations of conformity, approvals etc. can be downloaded at:

[www.ifm.com](http://www.ifm.com) → Data sheet search → Article number → More information

# 10 Troubleshooting

LED				Error	Troubleshooting
Power	Input 1	Output	Input 2		
⊗	--	○	--	Sensor wire break or wrong sensor type	Check sensors and their connections
				Short circuit at sensor supply	Remove short circuit
⊗	--	●	--	Short circuit at transistor output	Remove short circuit
○	--	○	●	Internal device error	Contact service

Legend:

○ off                      ● on                      ⊗ flashing                      -- any


# 11 Maintenance, repair, disposal

## 11.1 Maintenance

The unit is maintenance-free.

## 11.2 Cleaning the housing surface

- ▶ Disconnect the device.
- ▶ Clean the device from dirt using a soft, chemically untreated and dry cloth.

 Micro-fibre cloths without chemical additives are recommended.

## 11.3 Repair

- ▶ The device must only be repaired by the manufacturer. Observe the safety instructions.

## 11.4 Disposal

- ▶ Dispose of the device in accordance with the national environmental regulations.

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