

ifm electronic



Operating instructions

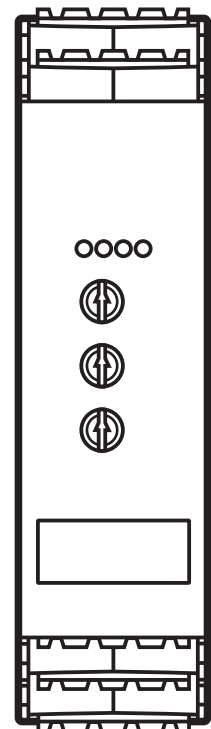
ecomat200

Level monitoring relay

DL0201

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1 Preliminary note

This document applies to the level monitoring relay DL0201.

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

3.1 General

The device is used to protect a tank against overflow or running dry.

The device receives signals from an external sensor and switches its outputs according to the adjustable input and output delays.

- The input delay protects against unintended switching caused by waves on a medium surface.
- The output delay protects the controlled actuator (e.g. pump or valve) against excessive wear.

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

WARNING

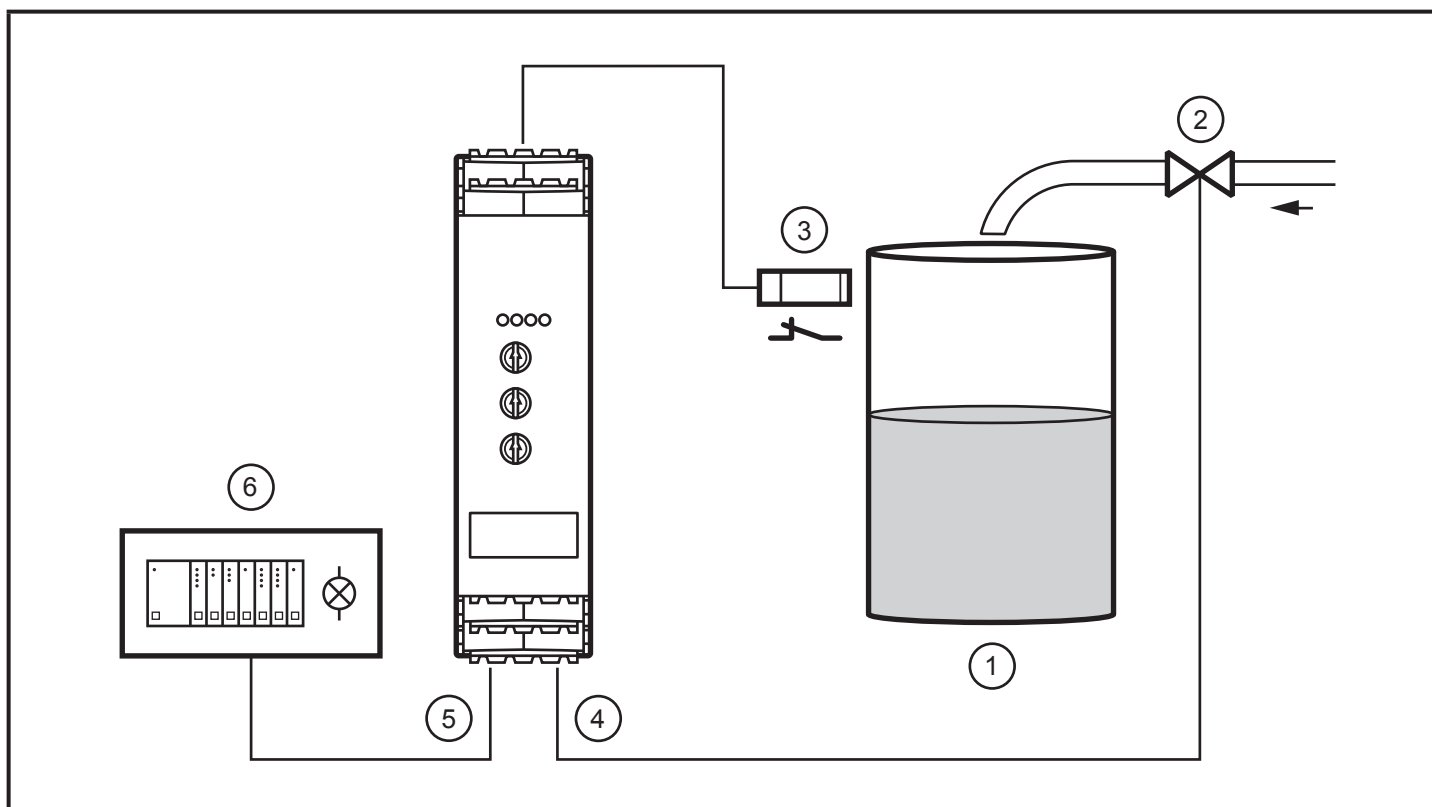
The device is not approved for safety-related tasks in the field of operator protection.

Schematic diagrams and switching diagrams:

(→ 3.2 Overflow protection)

(→ 3.3 Run-dry protection)

3.2 Overflow protection



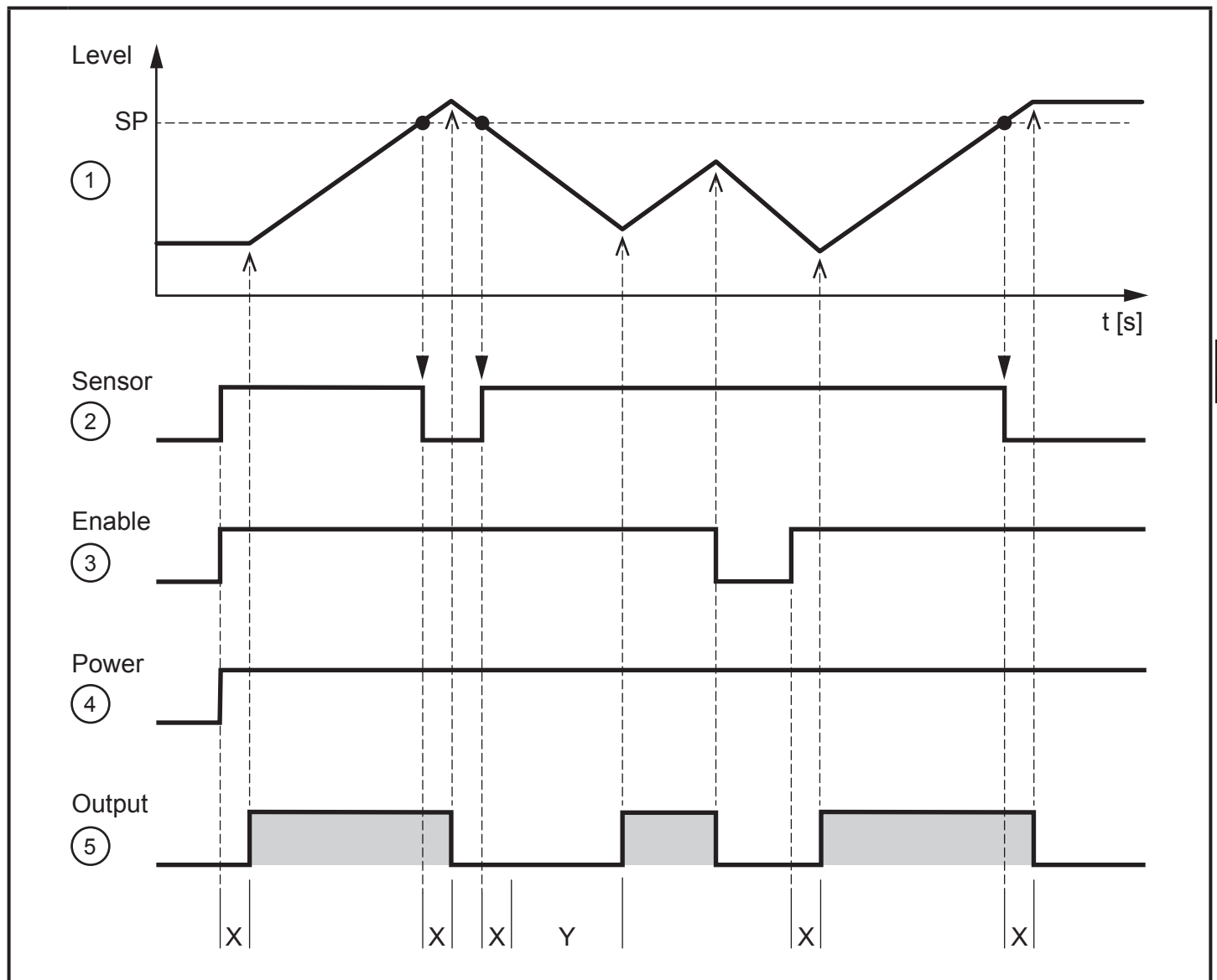
Overflow protection

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

Process	Relay
After switching on the device	de-energised
After activation of the device via the enable signal	de-energised
Level is below the sensor	energised
Level is above the sensor	de-energised
Level decreases below the sensor and output delay time is started	de-energised
After output delay time	energised

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

3.2.1 Switching diagram



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

- 1: Level of the medium
- 2: Sensor with normally closed output
- 3: Enable signal
- 4: Power supply
- 5: Output

SP Switch point

X Input delay (→ 7.1)

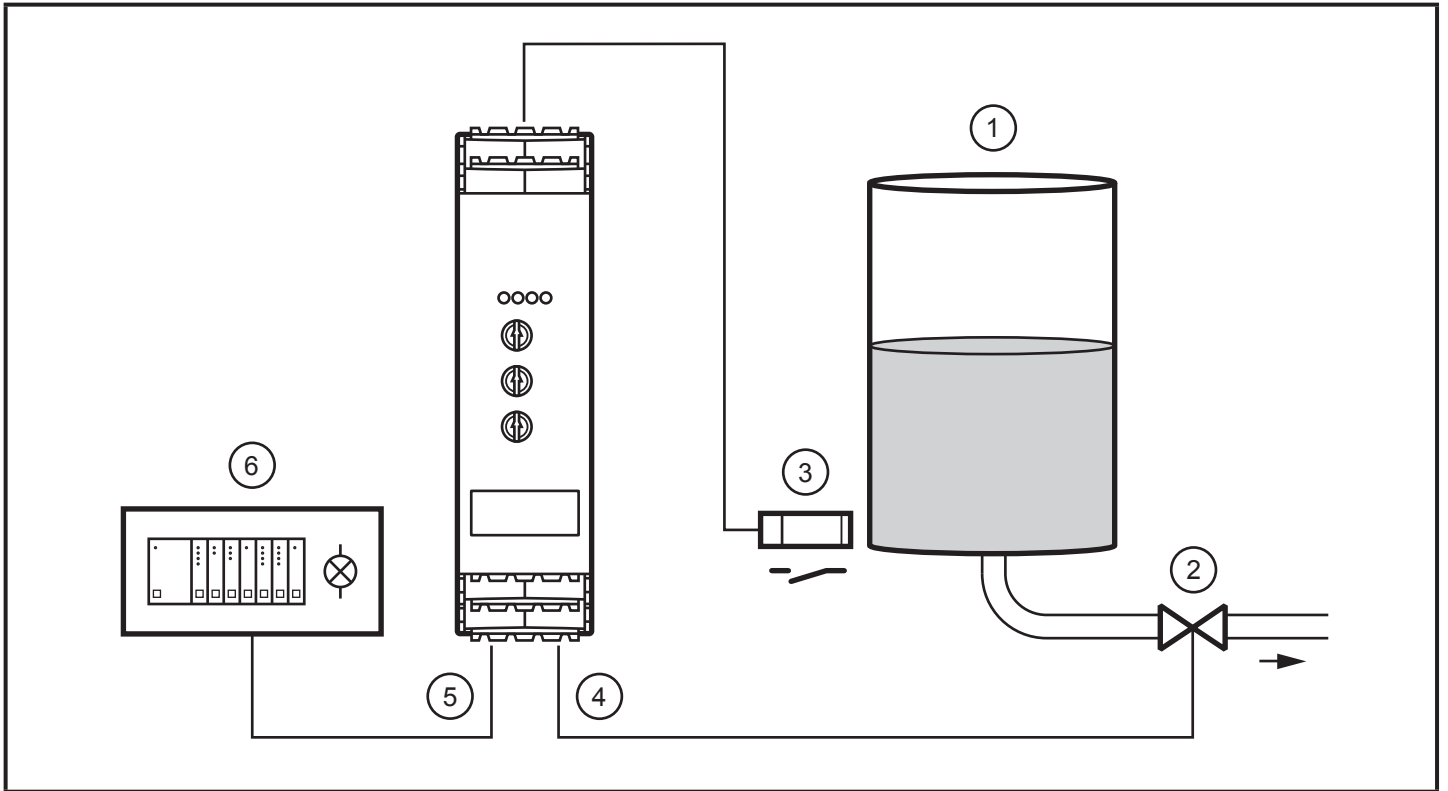
Y Output delay (→ 7.2)



Output delay (Y) is not active:

- after switching on the device.
- when the sensor signal is "High" and simultaneously the enable signal changes from "Low" to "High".

3.3 Run-dry protection



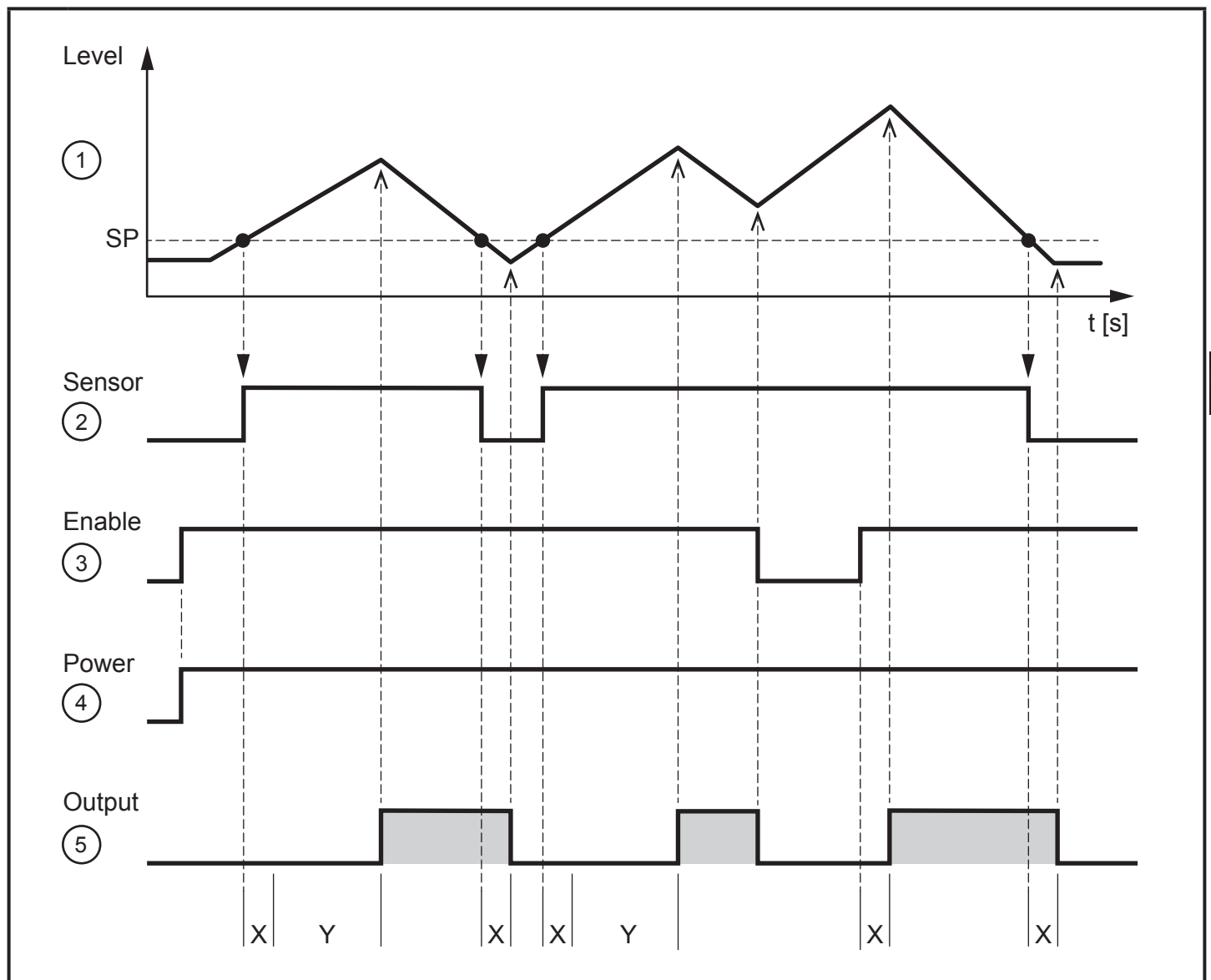
Run-dry protection

- 1: Tank with liquid or dry bulk material
- 2: Valve or pump (outlet)
- 3: Sensor with normally open output
- 4: Relay output
- 5: Transistor output
- 6: PLC or signalling device

Process	Relay
After switching on the device	de-energised
After activation of the device via the enable signal	de-energised
Level is above the sensor	energised
Level is below the sensor	de-energised
Level increases above the sensor and output delay time is started	de-energised
After output delay time	energised

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

3.3.1 Switching diagram



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

- 1: Level of the medium
- 2: Sensor with normally open output
- 3: Enable signal
- 4: Power supply
- 5: Output

SP Switch point

X Input delay (→ 7.1)

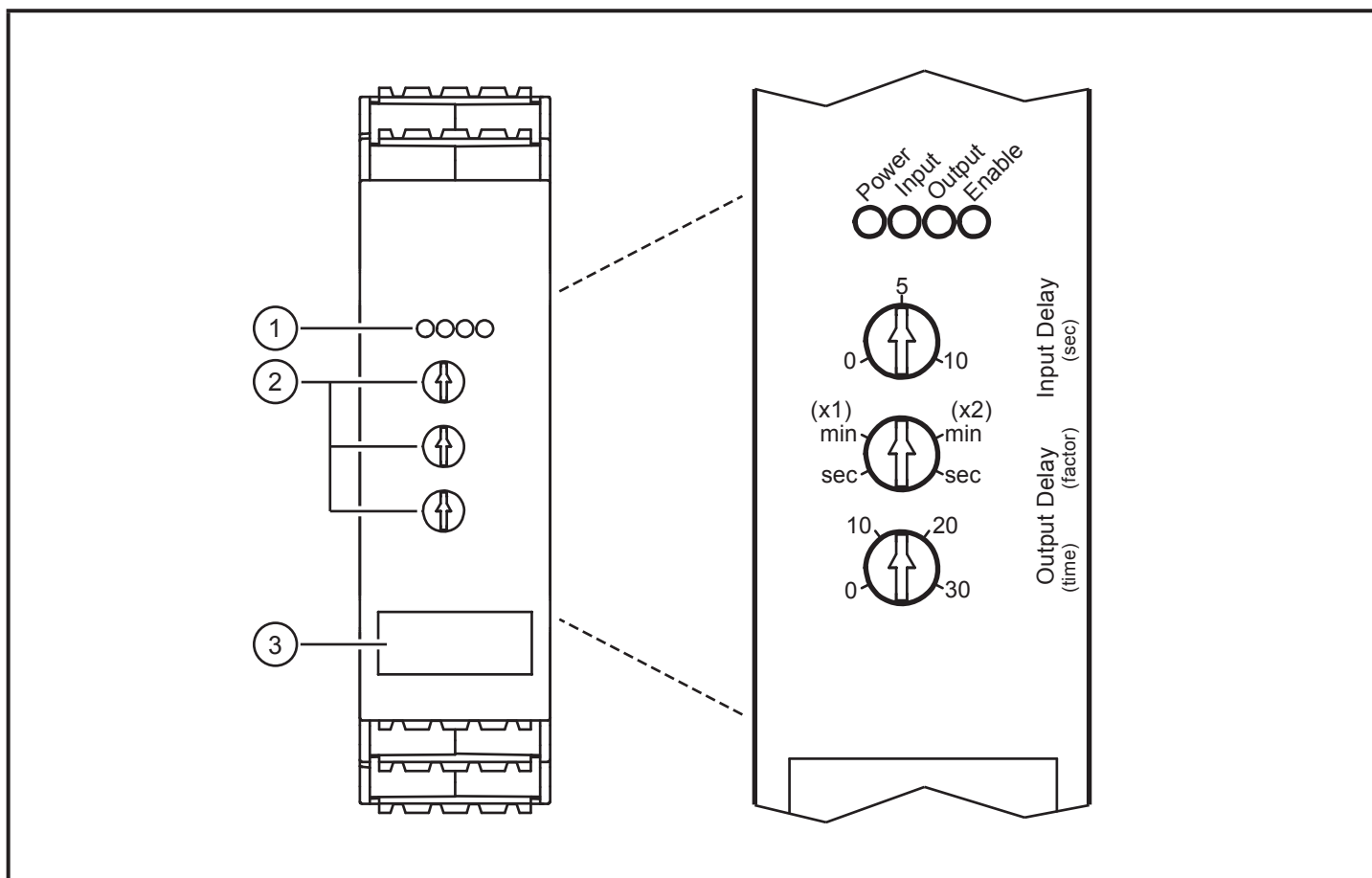
Y Output delay (→ 7.2)



Output delay (Y) is not active:

- after switching on the device.
- when the sensor signal is "High" and simultaneously the enable signal changes from "Low" to "High".

4 Operating and display elements



Operating and display elements

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

4.1 LEDs

LED	Colour	Status	Description
Power	Green	On	Voltage supply OK
		Flashing	Potentiometer "Output Delay (factor)" in invalid setting zone
Input	Yellow	On	Input signal "High"
Output	Green	On	Relay energised (transistor switched)
		Flashing	Output delay active
Enable	Yellow	On	Enable input switched (+ 24 V DC is applied to the enable input). Device activated.

Error signals and diagnosis (→ 10 Troubleshooting)

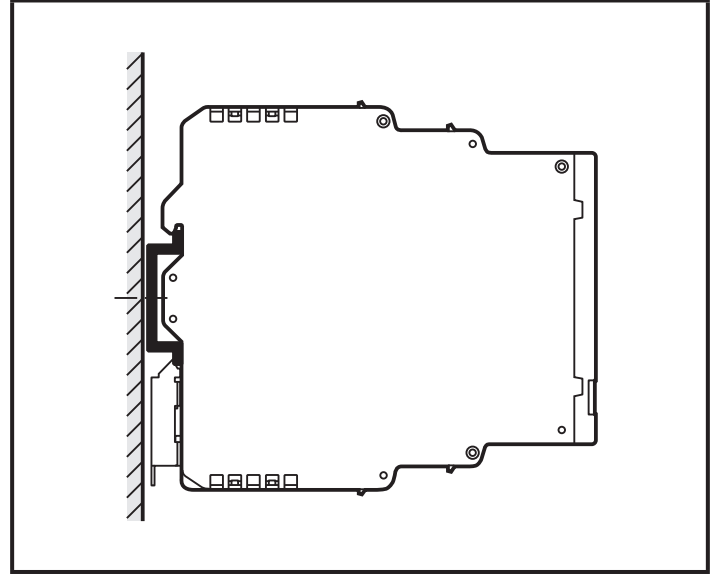
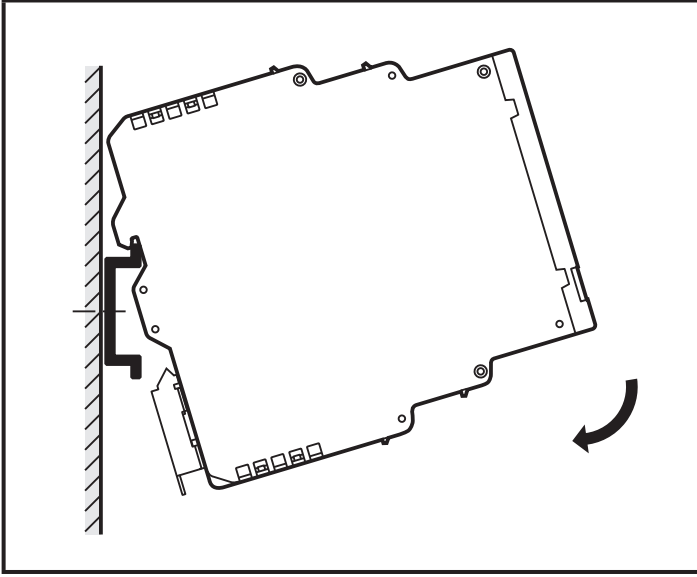
4.2 Potentiometers

Potentiometer	Setting	
Input Delay	Input delay	(→ 7.1)
Output Delay (factor)	Output delay factor [sec (x1), min (x1), sec (x2), min (x2)]	(→ 7.2.1)
Output Delay (time)	Output delay	(→ 7.2.2)

5 Installation

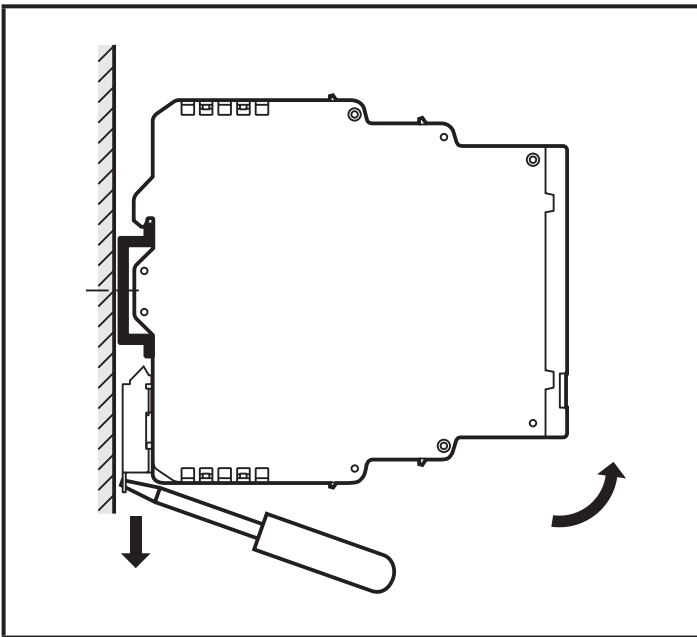
5.1 Installation of the device

- ▶ 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.

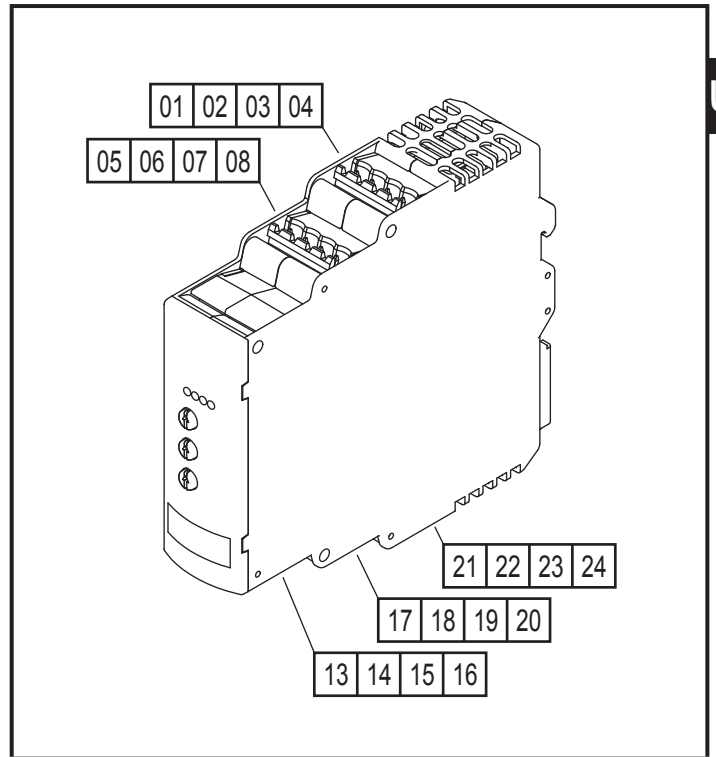
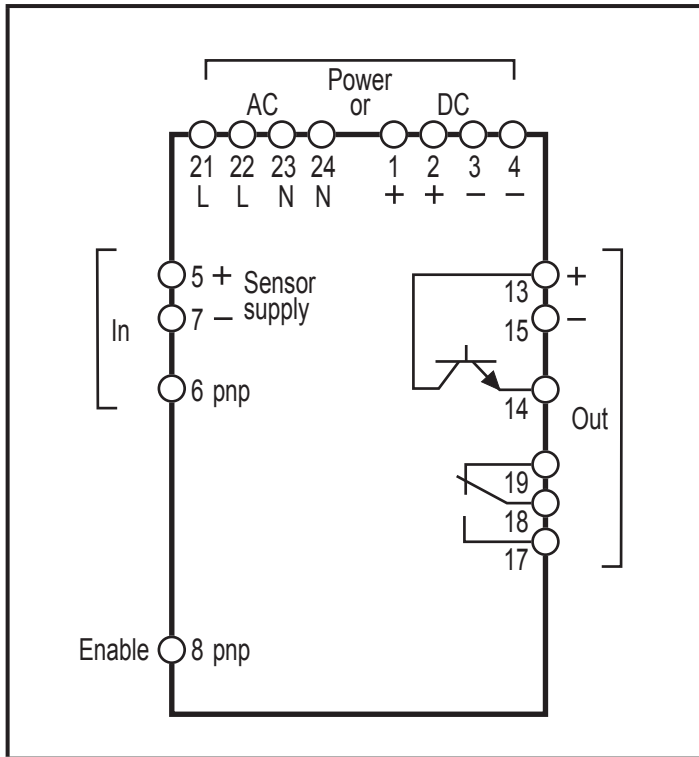
6 Electrical connection

6.1 Connection accessories

The unit is supplied including connectors.

You can find more information about the available accessories at:
www.ifm.com → Data sheet search → Article number → Accessories

6.2 Terminal connection



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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).

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

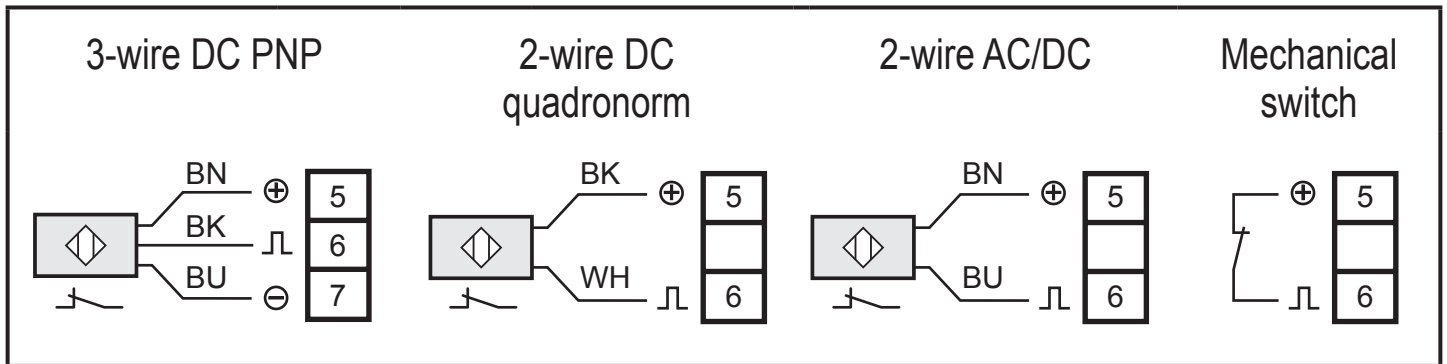
Terminals 5 and 7 can be used for the sensor supply.

6.4.2 Sensor for overflow protection



Use a sensor with normally closed output for overflow protection.
(→ 3.2 Overflow protection)

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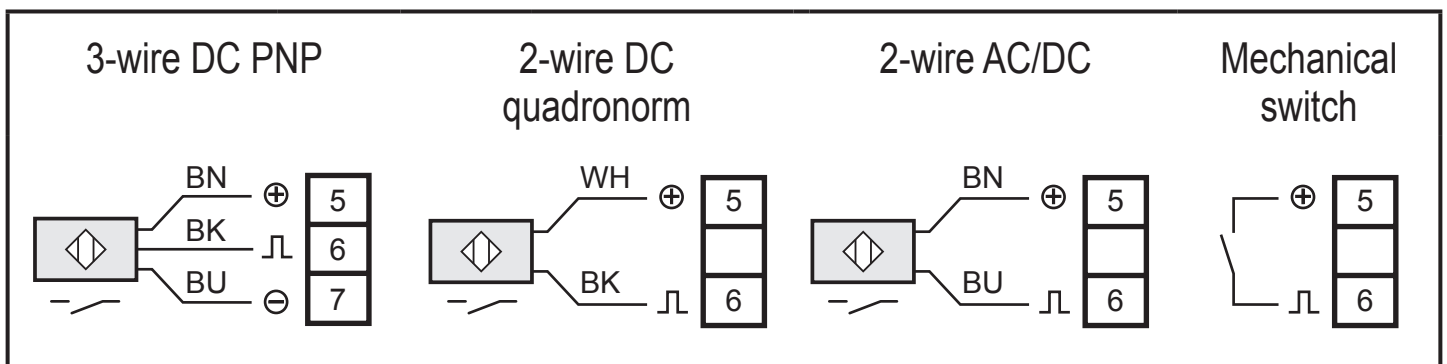


BN = brown BK = black BU = blue WH = white

6.4.3 Sensor for run-dry protection



Use a sensor with normally open output for run-dry protection.
(→ 3.3 Run-dry protection)



BN = brown BK = black BU = blue WH = white

6.4.4 Enable input

The enable signal is required to activate the device.

It can be supplied directly from 24 V DC or from terminal 5 or controlled by another sensor (for example leakage sensor).

When + 24 V DC is applied, the device is active.

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.



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 potentiometers using a suitable screwdriver.

7.1 Input delay

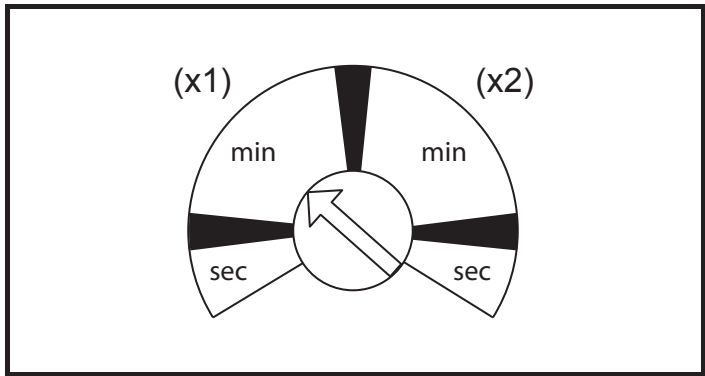
The input delay sets the minimum duration of the stable input signal to be evaluated. It protects against unintended switching caused by waves on a medium surface.	
Values	0...10 s

7.2 Output delay

The output delay sets the minimum duration of the output in de-energised state. It protects the controlled actuator (e.g. pump or valve) against excessive wear.	
Values	0...30 s / 0...60 s / 0...30 min / 0...60 min Depending on the position of the output delay factor and the output delay time potentiometers.

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7.2.1 Output delay factor



□ = valid setting zone
■ = invalid setting zone

Potentiometer "Output Delay (factor)"

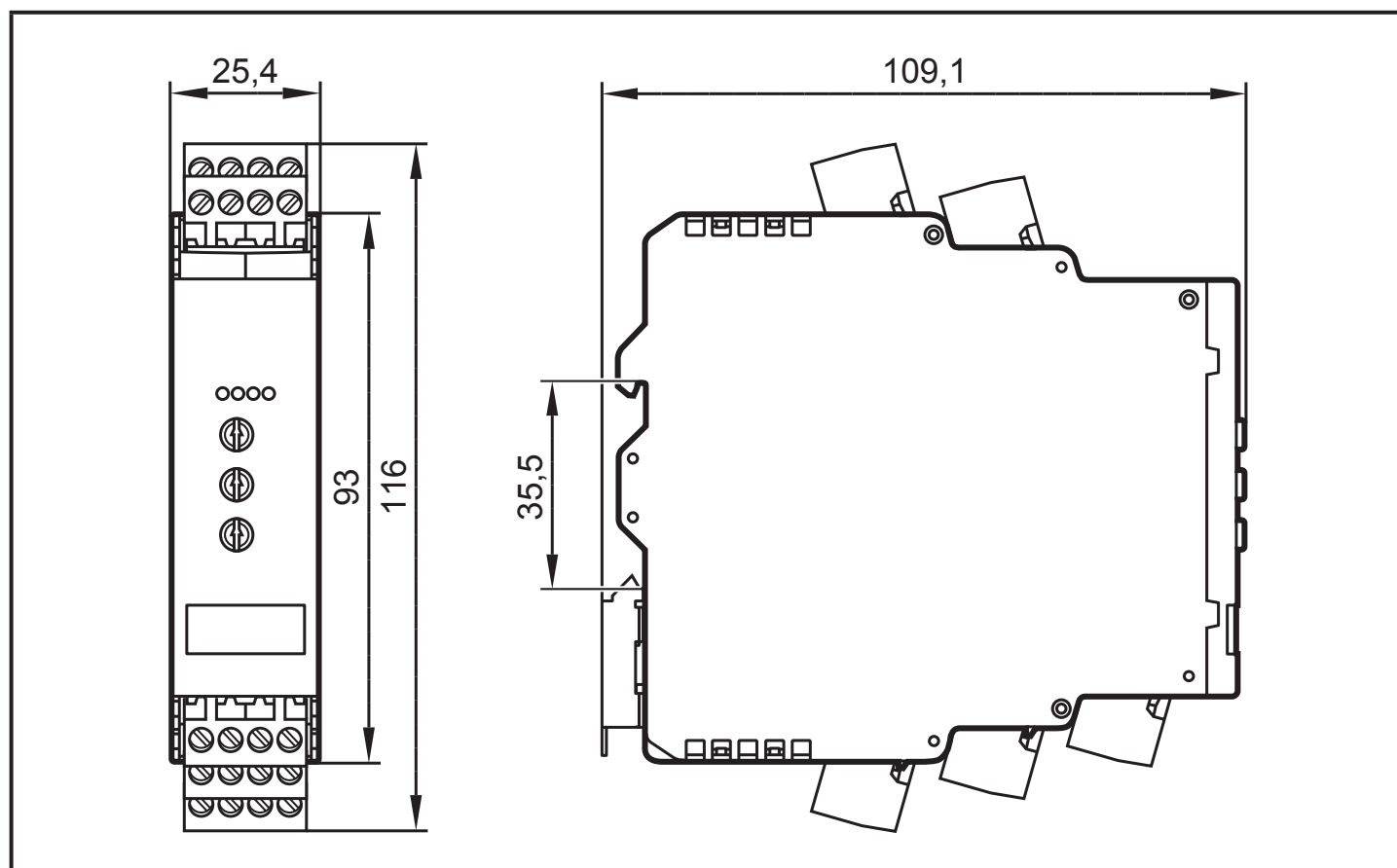
- Note that the setting of the potentiometer is within a valid zone.
- > If the setting is outside a valid zone, the device is disabled and [POWER] flashes.

Values	sec x1 / min x1 / min x2 / sec x2
--------	-----------------------------------

7.2.2 Output delay time

Values	0...30
--------	--------

8 Scale drawing



9 Technical data

Level monitoring relay		DL0201
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 monitoring relay		DL0201
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 ² (AWG 30...12)

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Data sheets are available at:

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 → Data sheet search → Article number → More information

10 Troubleshooting

LED				Cause / Error	Troubleshooting
Power	Input	Output	Enable		
●	●	⊗	●	Output delay time is active	Wait till output delay time is expired
⊗	--	○	--	Potentiometer "Output Delay (factor)" in invalid setting zone	Correct potentiometer position (→ 7.2.1)
				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.