

ifm electronic



Operating instructions

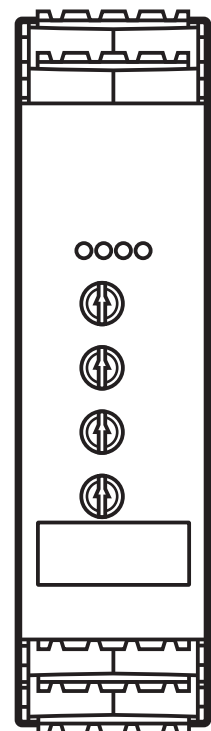
ecomat200

Speed monitor

D200

UK

80005257 / 00 05 / 2014



Contents

| | | |
|-------|---|----|
| 1 | Preliminary note..... | 4 |
| 1.1 | Symbols used | 4 |
| 1.2 | Warning signs used | 4 |
| 2 | Safety instructions | 5 |
| 2.1 | General..... | 5 |
| 2.2 | Target group..... | 5 |
| 2.3 | Electrical connection..... | 5 |
| 2.4 | Handling | 6 |
| 2.5 | Installation location | 6 |
| 2.6 | Housing temperature | 6 |
| 2.7 | Tampering with the device | 6 |
| 3 | Functions and features | 7 |
| 4 | Operating and display elements | 8 |
| 4.1 | LEDs..... | 8 |
| 4.2 | Potentiometer | 9 |
| 5 | Installation..... | 10 |
| 5.1 | Installation of the device | 10 |
| 5.1.1 | Remove the device..... | 10 |
| 5.2 | Mounting of the sensors | 10 |
| 6 | Electrical connection..... | 11 |
| 6.1 | Connection accessories | 11 |
| 6.2 | Terminal connection..... | 11 |
| 6.3 | Voltage supply (power) | 12 |
| 6.3.1 | AC supply | 12 |
| 6.3.2 | DC supply | 12 |
| 6.4 | Inputs..... | 12 |
| 6.4.1 | Connection of the sensor..... | 12 |
| 6.4.2 | Enable input..... | 13 |
| 6.5 | Outputs | 13 |
| 6.5.1 | Relay output | 13 |
| 6.5.2 | Transistor output..... | 13 |
| 7 | Settings..... | 14 |
| 7.1 | Frequency range and switching function (function) | 14 |

| | | |
|-------|---|----|
| 7.1.1 | Frequency range (SPx1/SPx100)..... | 14 |
| 7.1.2 | Switching function I...IV | 14 |
| 7.2 | Switch point (SP) | 15 |
| 7.3 | Hysteresis | 15 |
| 7.4 | Start-up delay | 16 |
| 7.5 | Switching diagram | 17 |
| 7.5.1 | With start-up delay and coupled voltage supplies | 17 |
| 7.5.2 | With start-up delay and enable signal coupled to the motor..... | 18 |
| 8 | Scale drawing | 19 |
| 9 | Technical data..... | 19 |
| 9.1 | Approvals/standards | 20 |
| 10 | Troubleshooting | 21 |
| 11 | Maintenance, repair, disposal | 21 |
| 11.1 | Maintenance | 21 |
| 11.2 | Cleaning the housing surface | 21 |
| 11.3 | Repair | 21 |
| 11.4 | Disposal | 21 |

UK

1 Preliminary note

This document applies to devices of the type "speed monitor D200".

The devices differ in the following points:

setting range of the switch point SP [Hz] (→ 4 Operating and display elements).

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 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.

1.2 Warning signs used

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.

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.

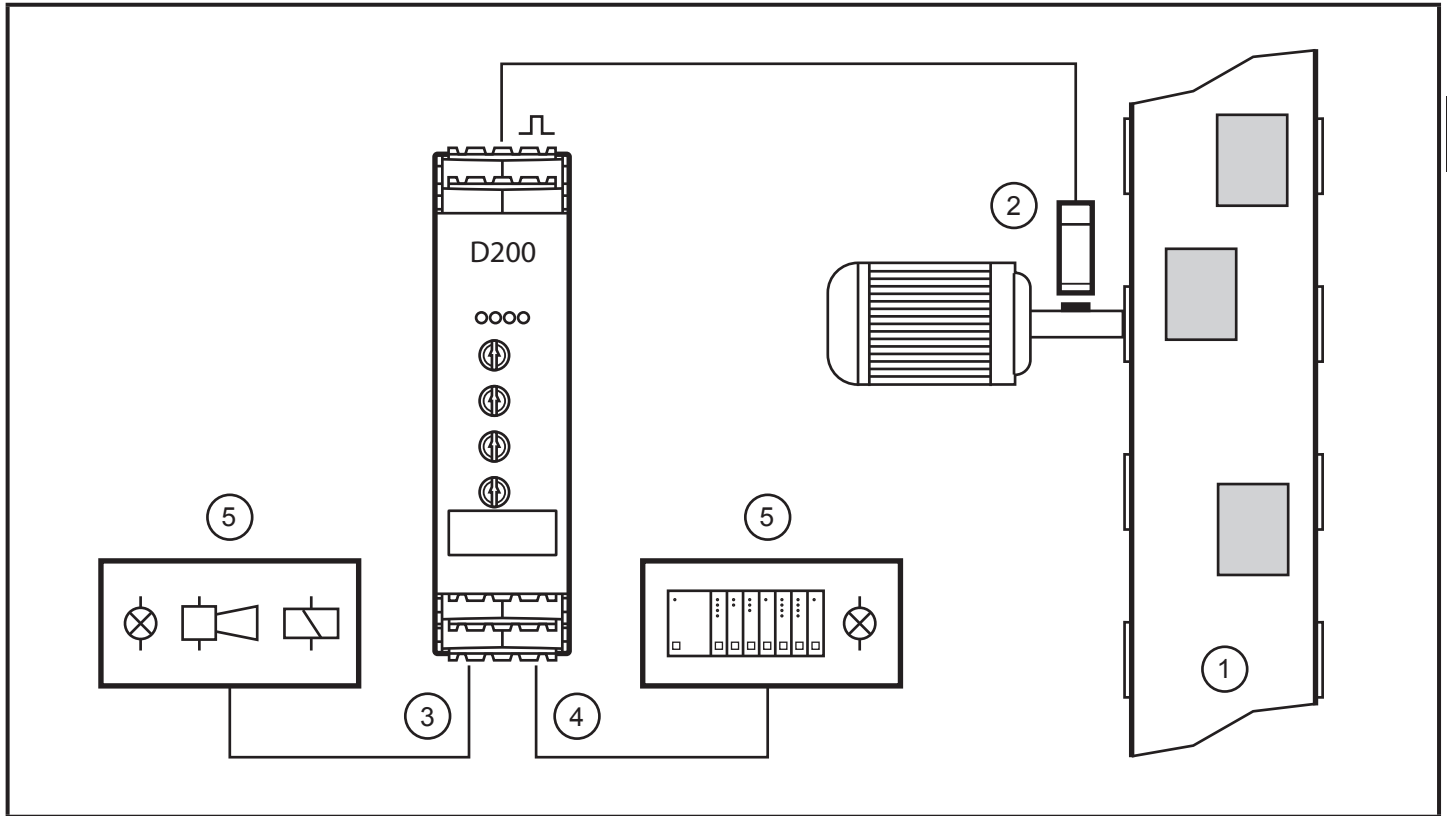
2.7 Tampering with the device

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 D200 speed monitor is a pulse evaluation system. It monitors rotating, linear, vibrating or oscillating movements.

It receives the pulses from external sensors, measures the pulse interval and calculates the input frequency. This value is compared with the set switch points; the outputs are switched in accordance with the set parameters.



UK

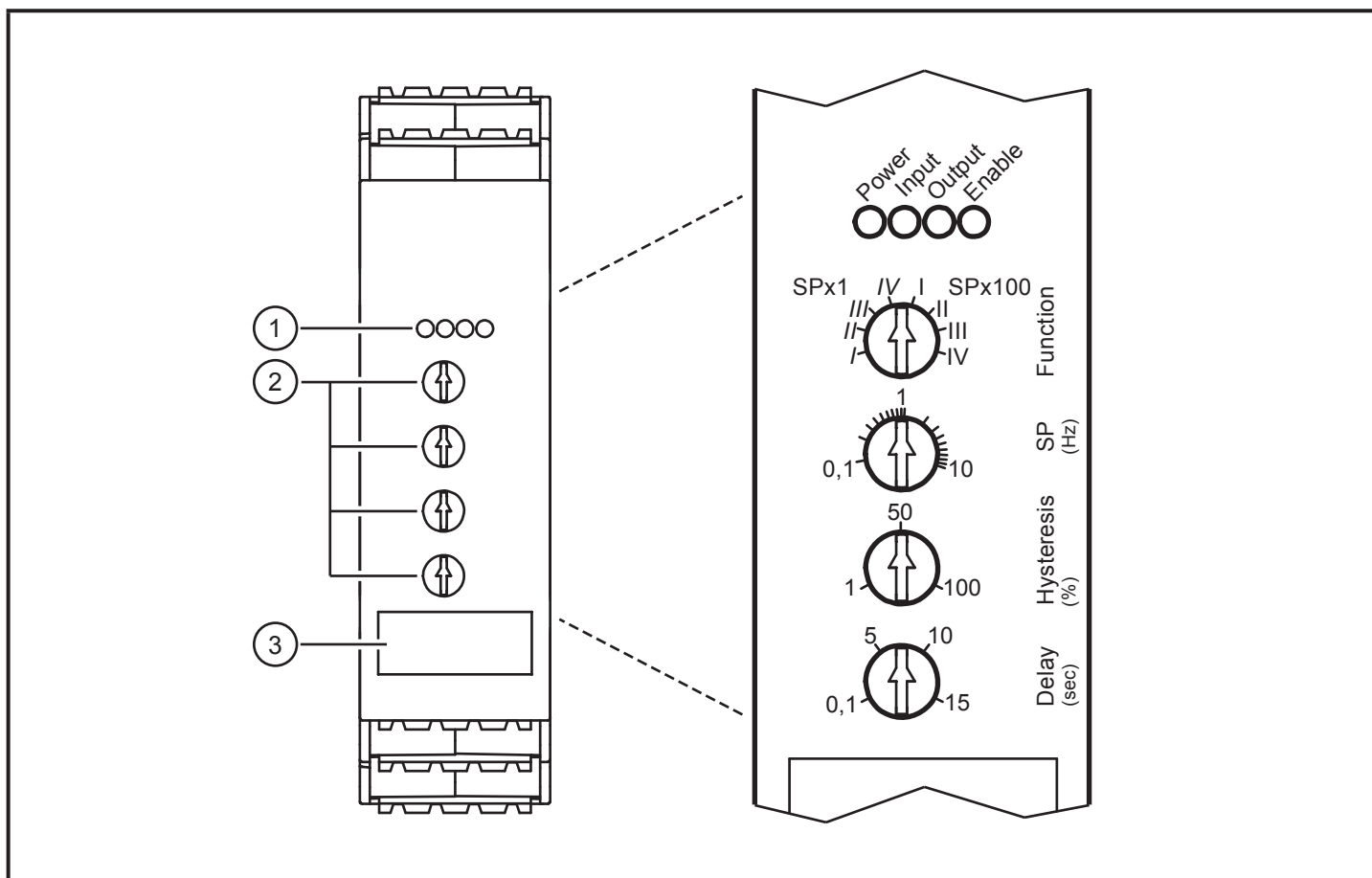
Example: speed monitoring of a motor shaft on a conveyor belt

- 1: Conveyor belt
- 2: Pulse pick-up on the motor shaft
- 3: Relay output
- 4: Transistor output
- 5: Signals depending on the selected switching function

⚠ WARNING

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

4 Operating and display elements



Example: device with switch point range 0.1...10 Hz and 10...1000 Hz

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

4.1 LEDs

| LED | Colour | Status | Description |
|--------|--------|----------|---|
| Power | Green | On | Voltage supply OK |
| | | Flashing | Potentiometer "Function" in invalid setting zone (→ 7.1) |
| Input | Yellow | Flashing | Input pulses |
| Output | Green | On | Relay energised Transistor switched |
| Enable | Yellow | On | Enable input switched (+24 V DC is applied to the enable input) Start-up delay active |

Error signals and diagnosis (→ 10 Troubleshooting)

4.2 Potentiometer

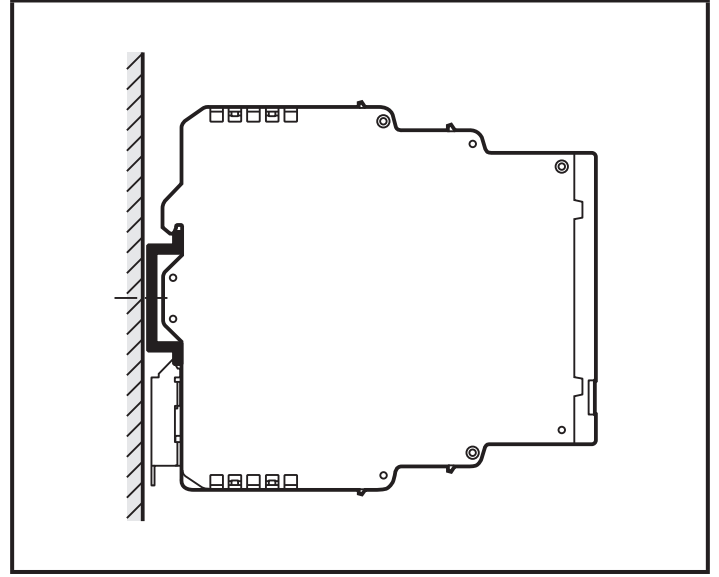
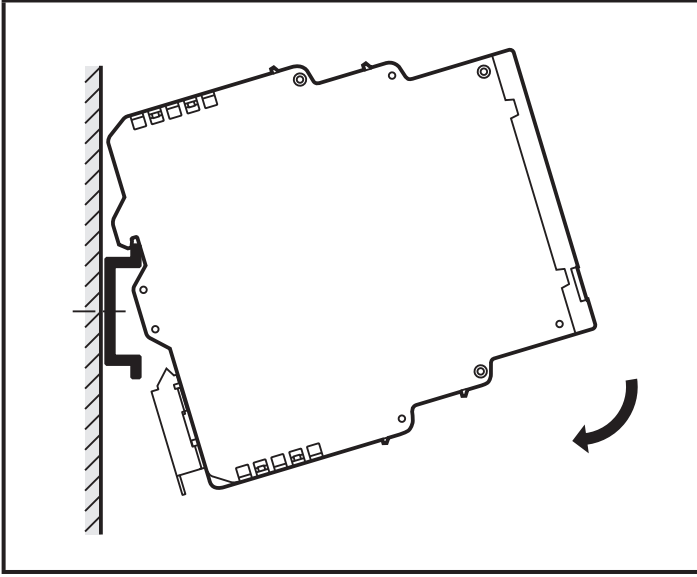
| Potentiometer | Setting | |
|---------------|---|-----------|
| Function | Frequency range [SPx1/SPx100] | (→ 7.1.1) |
| | Switching function [I...IV] | (→ 7.1.2) |
| SP | Switch point [Hz] The adjustable frequency value depends on the potentiometer position "Function". | (→ 7.2) |
| Hysteresis | Hysteresis [%] | (→ 7.3) |
| Delay | Start-up delay [s] | (→ 7.4) |

UK

5 Installation

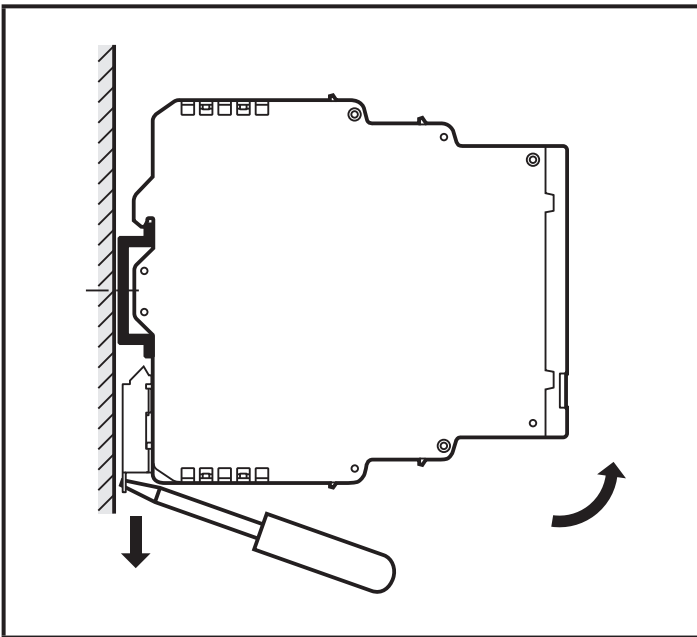
5.1 Installation of the device

- ▶ 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.

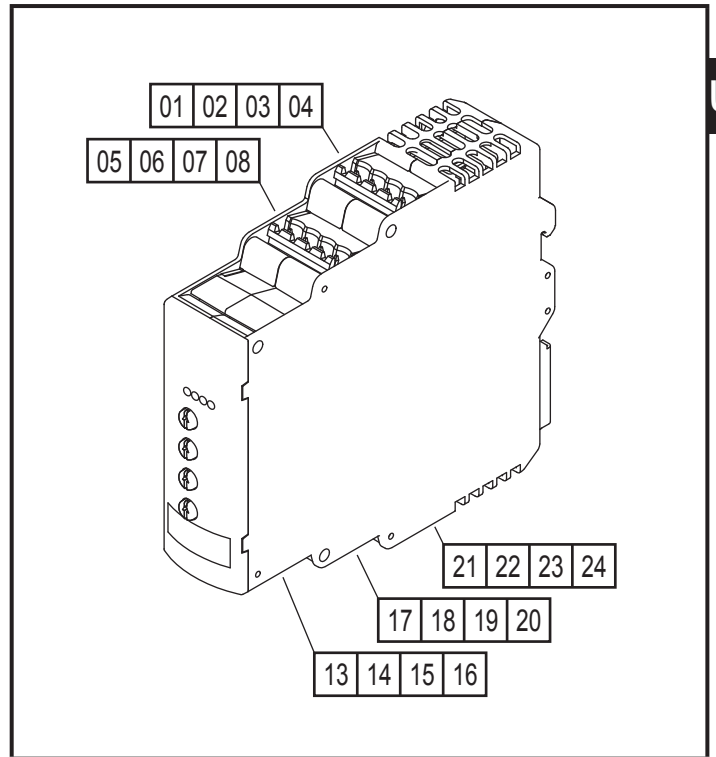
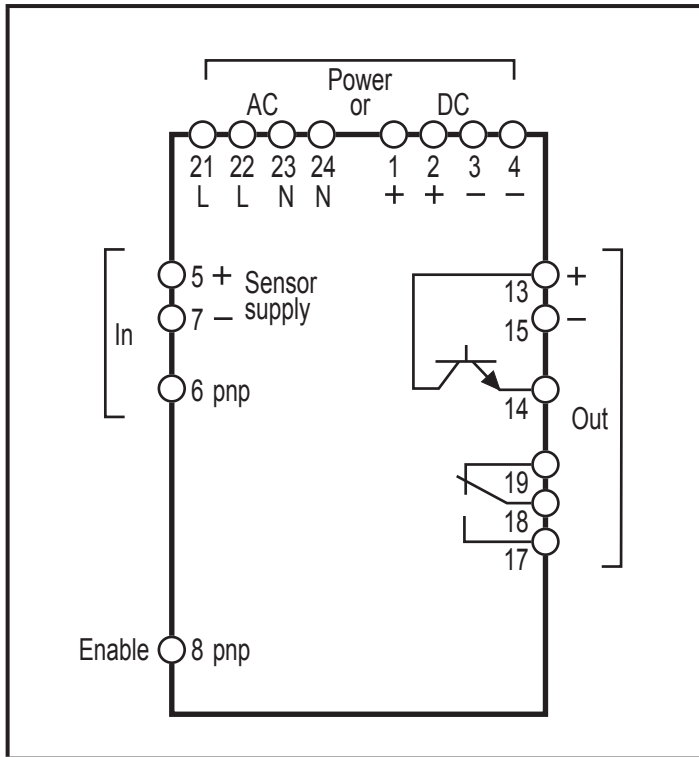
6 Electrical connection

6.1 Connection accessories

The unit is supplied including the connector.

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

6.2 Terminal connection



UK

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.

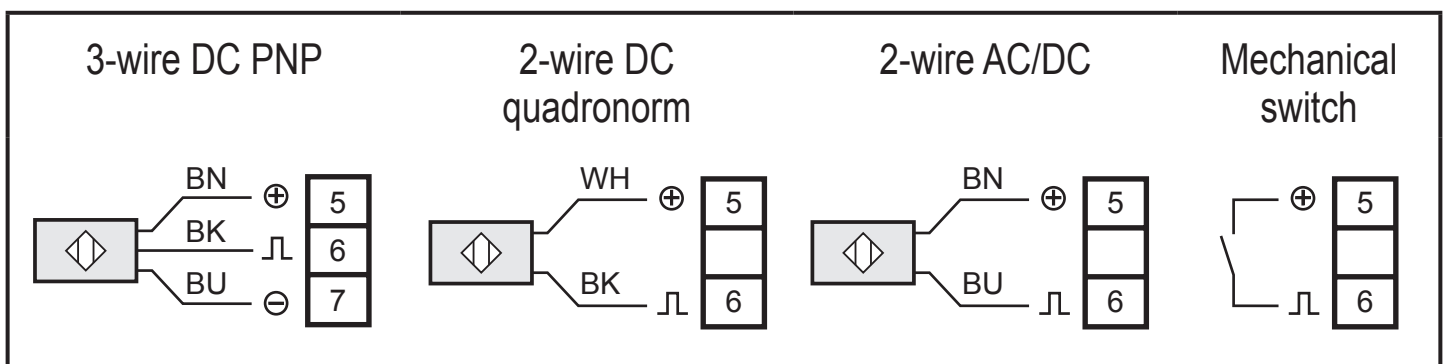
6.3.2 DC supply

- ▶ 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 Connection of the sensor



BN = brown

BK = black

BU = blue

WH = white

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


The terminals 5 and 7 can be used for the sensor supply or for the enable input.

6.4.2 Enable input

Using the enable input (terminal 8) the start-up delay can be started.

- ▶ To do so, connect the internal +24 V DC voltage (terminal 5) or an external +24 V DC voltage to terminal 8 via a closing contact.
- ▶ If an external voltage is used, connect the negative reference point of this voltage to terminal 3 or 4 of the device.

 When the contact is open (+24 V DC no longer applied) and the set start-up delay has elapsed monitoring starts.

 A +24 V DC continuous signal results in a permanent deactivation of the monitoring. The same state as during the start-up delay is indicated.

UK


6.5 Outputs

6.5.1 Relay output

- ▶ 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.

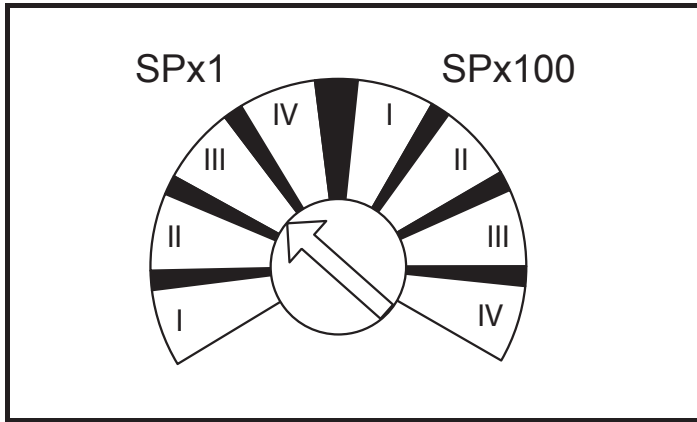
6.5.2 Transistor output

- ▶ 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.

7 Settings

► Set the continuously adjustable potentiometers using a suitable screwdriver.

7.1 Frequency range and switching function (function)



□ = valid setting zone
 ■ = invalid setting zone

Potentiometer "Function"

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

7.1.1 Frequency range (SPx1/SPx100)

| |
|--|
| SPx1 |
| corresponds to the marking on the device |

| |
|--|
| SPx100 |
| corresponds to the marking on device x 100 |

7.1.2 Switching function I...IV

| | |
|----|--|
| I | Status signal: minimum speed reached / standstill |
| | Relay energises (transistor output switched) when the current value is below the switch point. |
| | <ul style="list-style-type: none"> • If the input frequency increases again, the relay switches back when the current value is above the switch point + hysteresis (SP+HY). • The relay is de-energised during the start-up delay and as long as the input frequency is greater than the set switch point. |
| II | Error signal: underspeed / blocked |
| | Relay de-energises (transistor output open) when the current value is below the switch point. |
| | <ul style="list-style-type: none"> • If the input frequency increases again, the relay switches back when the current value is above the switch point + hysteresis (SP+HY). • The relay is energised during the start-up delay and as long as the input frequency is greater than the set switch point. |

| | |
|-----|--|
| III | Status signal: speed reached |
| | Relay energises (transistor output switched) when the current value is above the switch point. |
| | <ul style="list-style-type: none"> • If the input frequency decreases again, the relay switches back when the current value is below the switch point - hysteresis (SP-HY). • The relay is de-energised during the start-up delay and as long as the input frequency is smaller than the set switch point. |
| IV | Error signal: overspeed |
| | Relay de-energises (transistor output open) when the current value is above the switch point. |
| | <ul style="list-style-type: none"> • If the input frequency decreases again, the relay switches back when the current value is below the switch point - hysteresis (SP-HY). • The relay is energised during the start-up delay and as long as the input frequency is smaller than the set switch point. |

UK

Switching function in combination with switch point, hysteresis and start-up delay (→ 7.5 Switching diagram)

7.2 Switch point (SP)

| | |
|---|--|
| Value at which the output changes its switching status according to the switching function. | |
| Value | according to the marking on the device, e.g. 0.1...10 Hz or 10...1000 Hz (depending on the potentiometer position SPx1/SPx100) |

7.3 Hysteresis

| | |
|---|-----------|
| The hysteresis value determines the difference between the reset point and the switch point SP. | |
| If the distance between cams is not the same, different pulse sequence times are measured. They may be alternately above or below the switch point so that the output changes its switching status continuously and rapidly. This behaviour can be prevented by increasing the hysteresis factor. | |
| Value | 1...100 % |

7.4 Start-up delay

Enables the suppression of error signals when a plant is started.

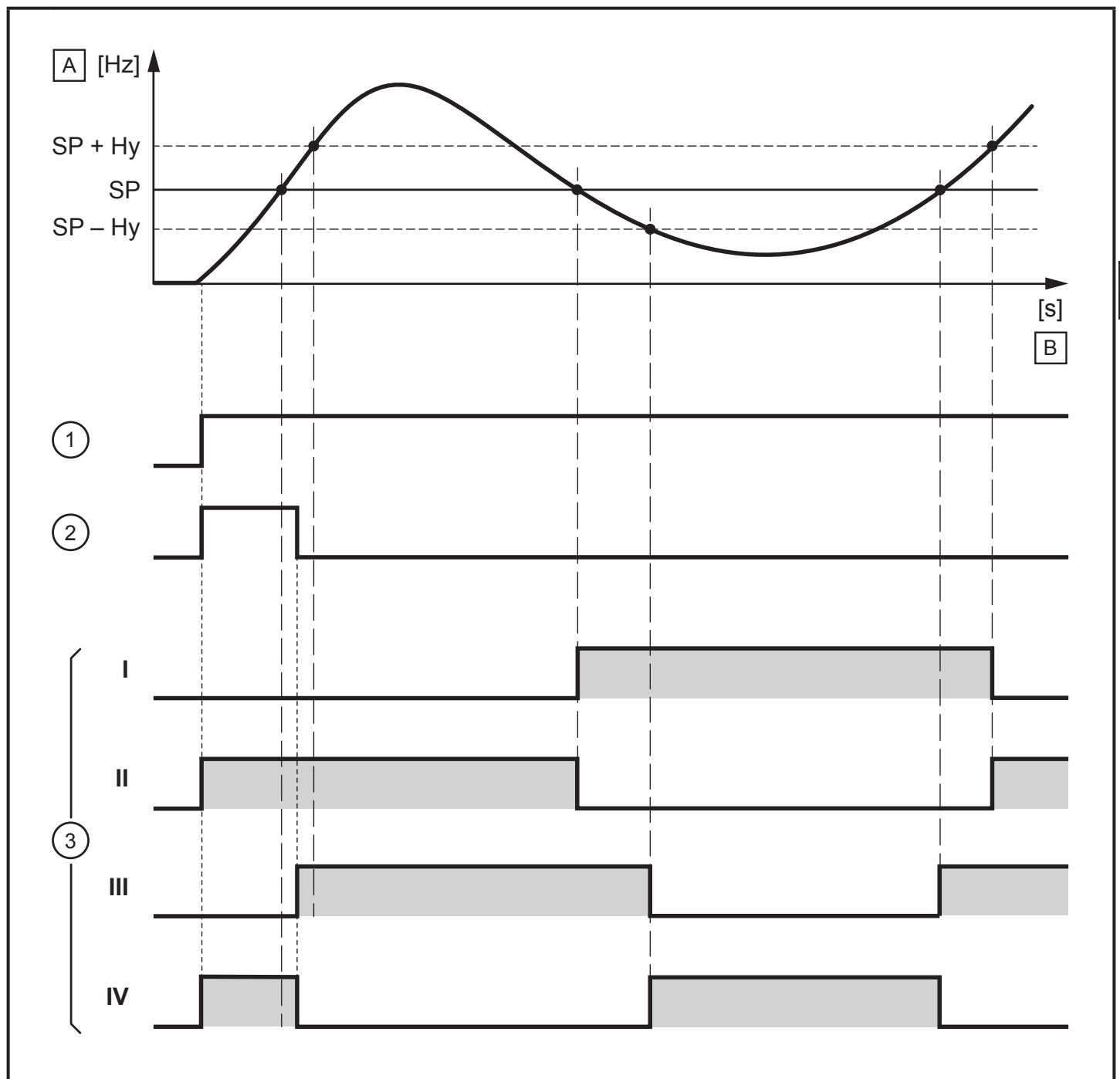
After power on the start-up delay is active only once.

- If the motor is often switched on and off, it is useful to couple the supply voltages of the motor and speed monitor. By doing so, the start-up delay is active every time the motor is turned on.
- If a coupled connection of the voltage supplies is not possible, use the enable input (→ 6.4.2 Enable input).

| | |
|-------|------------|
| Value | 0.1...15 s |
|-------|------------|

7.5 Switching diagram

7.5.1 With start-up delay and coupled voltage supplies



1: Voltage supply speed monitor (coupled to the motor)

2: Start-up delay

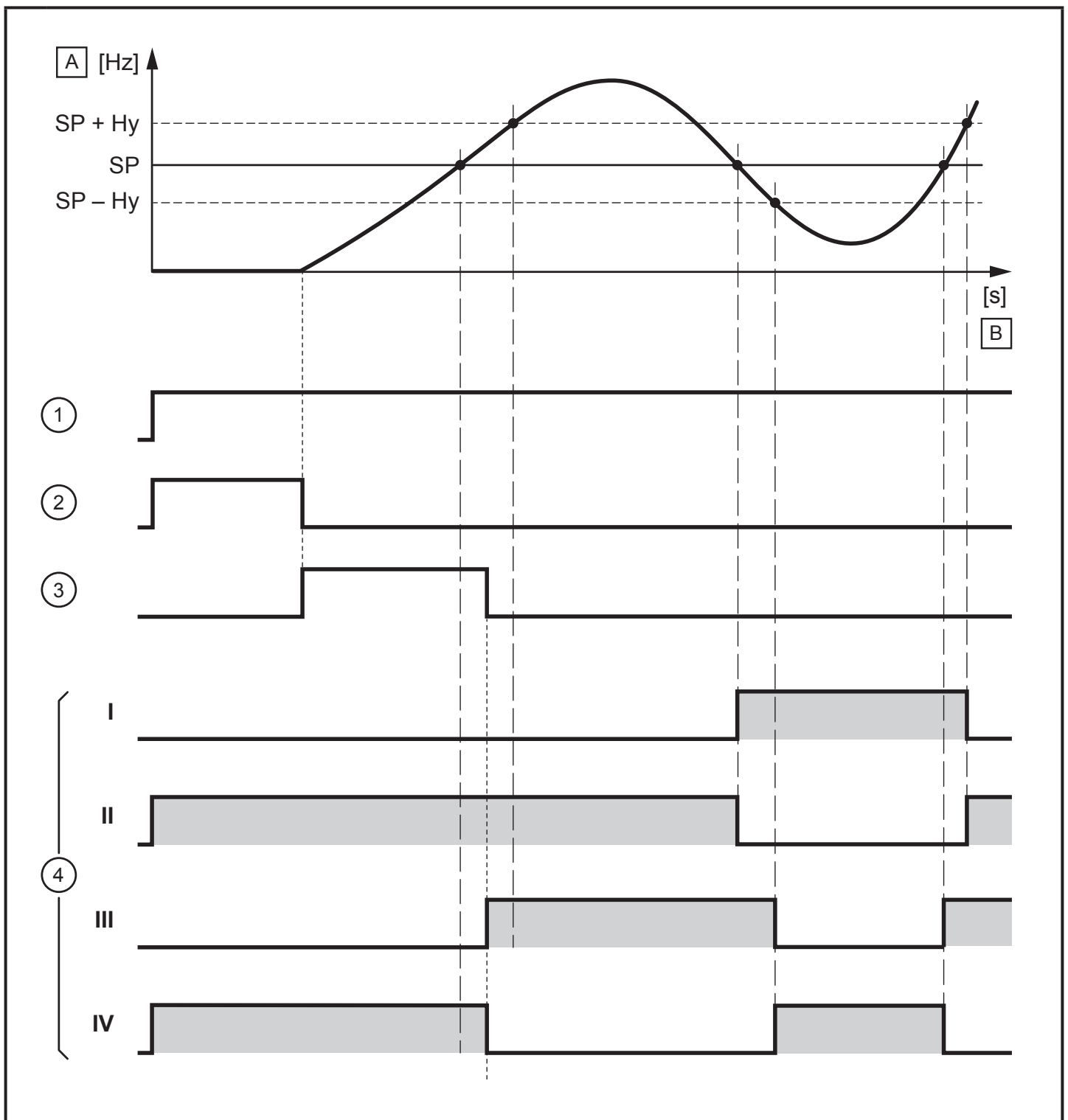
3: Switching functions

A Input frequency as an indication of speed

B Time

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

7.5.2 With start-up delay and enable signal coupled to the motor



1: Voltage supply speed monitor

2: +24 V DC signal at the enable input (coupled to the motor)

3: Start-up delay

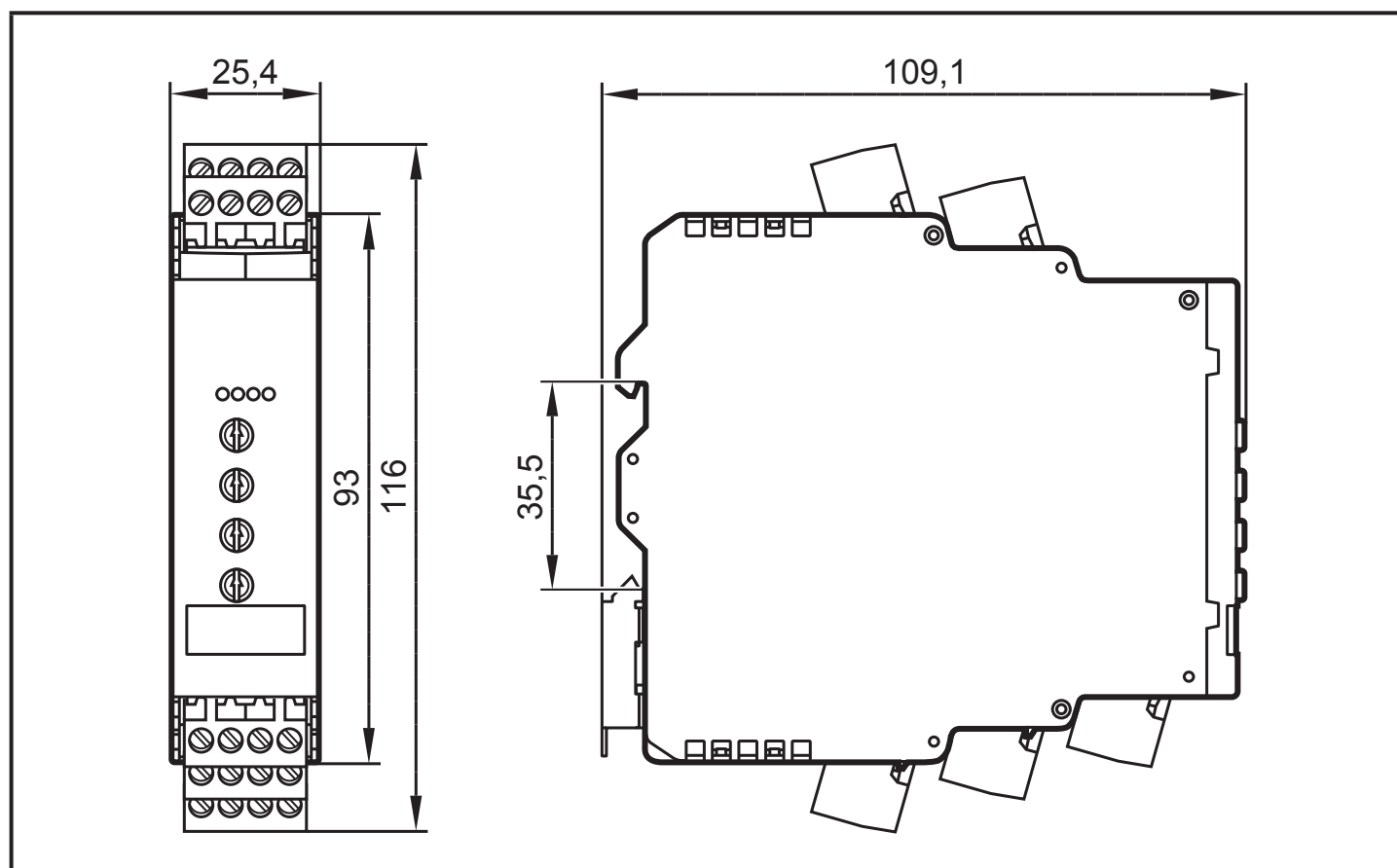
4: Switching functions

A: Input frequency as an indication of speed

B: Time

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

8 Scale drawing



UK

9 Technical data

| Speed monitor type | | D200 |
|------------------------------|------|-----------------------------|
| 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 (pulse input) | | PNP (type 2 to IEC 61131-2) |
| Input frequency | [Hz] | ≤ 5000 |

| Speed monitor type | | D200 |
|--------------------------------|------|--|
| 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) |

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 | | | | Error | Troubleshooting |
|-------|-------|--------|--------|--|--|
| Power | Input | Output | Enable | | |
| ⊗ | -- | ○ | -- | Potentiometer "Function" in invalid setting zone | Correct potentiometer position (→ 7.1) |
| | | | | Short circuit at sensor supply | Remove short circuit |
| | | | | Overspeed | Check whether the input frequency is outside the permissible frequency range (→ 9) |
| ⊗ | -- | ● | -- | 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.