

Residual current monitor RCMA420

AC / DC sensitive residual current monitor
for TN and TT systems
(AC, DC and pulsed DC currents)

4.2



RCMA420

Device features

- AC / DC sensitive residual current monitor Type B according to IEC 62020 and IEC 60755
- r.m.s. value measurement (AC + DC)
- Two separately adjustable response values 30...500 mA
- Frequency range 0...2000 Hz
- Starting delay, response delay and delay on release
- Digital measured value display via LC display
- Measured value memory for tripping value
- CT connection monitoring
- Power On LED, LED Alarm 1 / 2
- TEST / RESET button, internal / external
- Two separate alarm relays (one change-over contact each)
- N/O or N/C operation and fault memory behaviour selectable
- Continuous self monitoring
- Multi-functional LC display.
- Password protection for device settings
- Sealable transparent cover
- Two-module enclosure (36 mm)
- RoHS conform

Approvals



Product description

The AC / DC sensitive residual current monitor RCMA420 is designed for monitoring earthed power supply systems (TN and TT systems) where DC fault currents or residual currents continuously greater than zero may occur. These are in particular loads containing six-pulse rectifiers or one way rectifiers with smoothing, such as converters, battery chargers, construction site equipment with frequency-controlled drives. Currents in single conductors can be monitored too.

The prewarning stage (50...100% of the set response value $I_{\Delta n2}$) allow to distinguish between prewarning and alarm. Since the values are measured with measuring current transformers, the device is nearly independent of the load current and the nominal voltage of the system.

Applications

- AC / DC sensitive residual current monitoring in earthed two, three or four conductor systems.
- Monitoring of variable-speed drives, UPS systems, construction site equipment, printing machines, battery systems, laboratory equipment, wood working machines, MF welding systems, medical electrical equipment, etc.
- AC / DC sensitive current monitoring of single conductors de-energized under normal conditions (e. g. N and PE conductors)

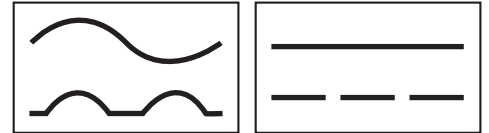
Function

Once the supply voltage U_S is applied, the starting delay is activated. Measured values changing during this time do not influence the switching state of the alarm relays.

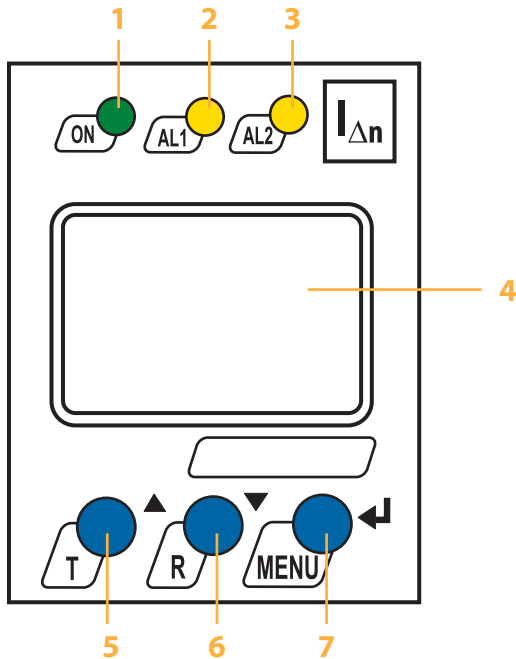
Residual current measurement takes place via an external measuring current transformer of the W20AB...W60AB series. The currently measured value is shown on the LC display. In this way any changes, for example when circuits are connected to the system, can be recognized easily. If the measured value exceeds one or both response values, the response delay " $t_{on1/2}$ " starts running. Once the response delay " $t_{on1/2}$ " has elapsed, the "K1 / K2" alarm relays switch and the alarm LEDs "AL1 / AL2" light up. If the current falls below the release value (response value plus hysteresis), the release delay " t_{off} " begins. Once the release delay " t_{off} " has elapsed, the alarm relays return to their original state and the alarm LEDs AL1 / AL2 go out. If the fault memory is enabled, the alarm relays remain in the alarm state and the LEDs light until the reset button is pressed or until the supply voltage is interrupted. The device function can be tested using the TEST button. The parameterization of the device can be carried out via the LC display and the function keys integrated in the front plate and can be password-protected.

Connection monitoring

The function of the device and the CT connections are continuously monitored. In the event of a fault, the alarm relays K1 / K2 switch without delay, the alarm LEDs AL1 / AL2 / ON flash. After eliminating the fault, the alarm relays return to their original state either automatically or by pressing the reset button.

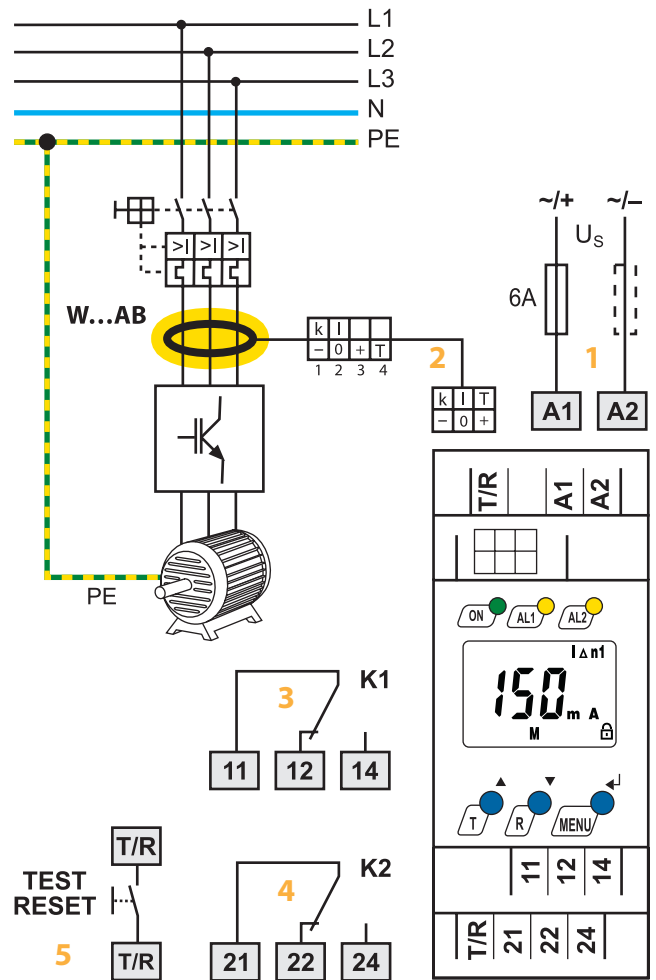


Operating and display elements



- 1 - Power "ON" LED (green); lights after connecting the device to the supply voltage and flashes in the event of system fault alarm respectively in the event of CT malfunction.
- 2 - Alarm LED "AL1" (yellow), prewarning; lights when the set response value $I_{\Delta n1}$ has been exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.
- 3 - Alarm LED "AL2" (yellow), Alarm; lights when the set response value $I_{\Delta n2}$ has been exceeded or flashes in the event of system fault alarm respectively in the event of CT malfunction.
- 4 - Multi-functional LC display
- 5 - TEST button: to call up the self test
Arrow up key: parameter change, to move up in the menu
- 6 - RESET button: to delete saved alarms
Arrow down key: parameter change, to move down in the menu
- 7 - MENU key: to call up the menu system
Enter key: to confirm parameter change
Press ESC: key > 1.5 s.

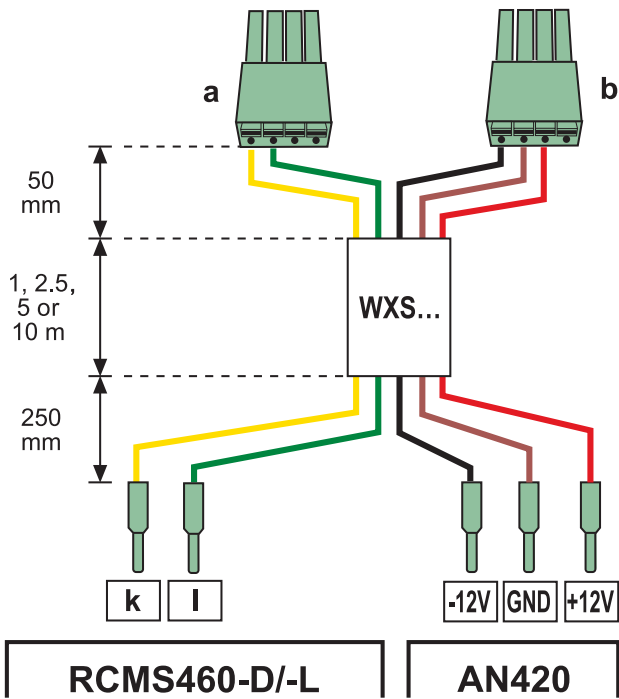
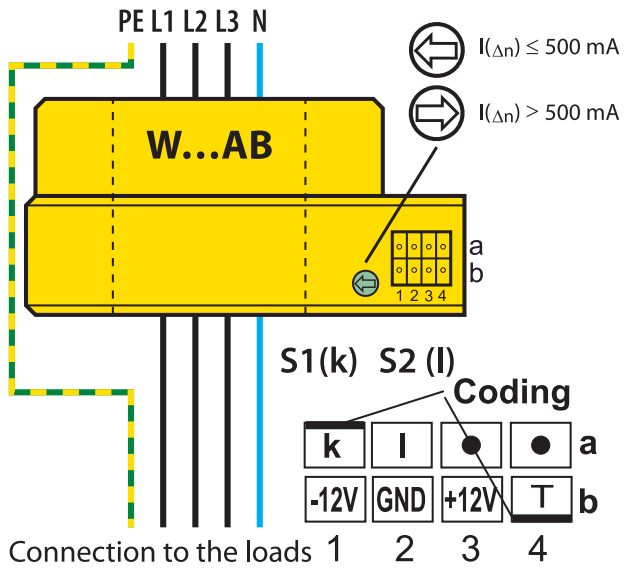
Wiring diagram



- 1 - Supply voltage U_s (see ordering information), a 6 A fuse recommended for line protection.
- 2 - Connector for the external measuring current transformer W20AB...W60AB.
- 3 - Alarm relay K1: $I_{\Delta n1}$ (prewarning).
- 4 - Alarm relay K2: alarm $I_{\Delta n2}$ (alarm).
- 5 - Combined TEST and RESET button, short-time pressing (< 1.5 s) = RESET, long-time pressing (> 1.5 s) = TEST.

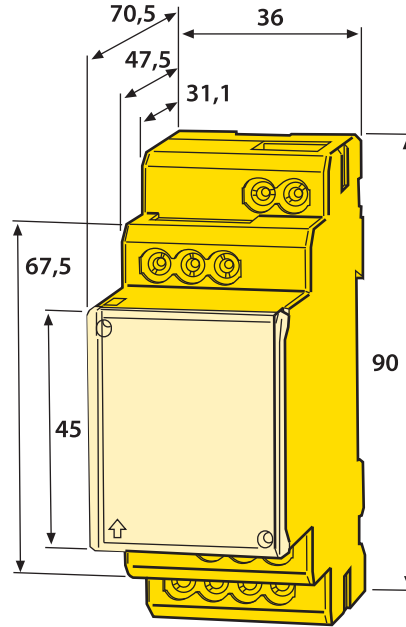
Note! Do not route the PE conductor through the measuring current transformer!

Connection of measuring current transformers



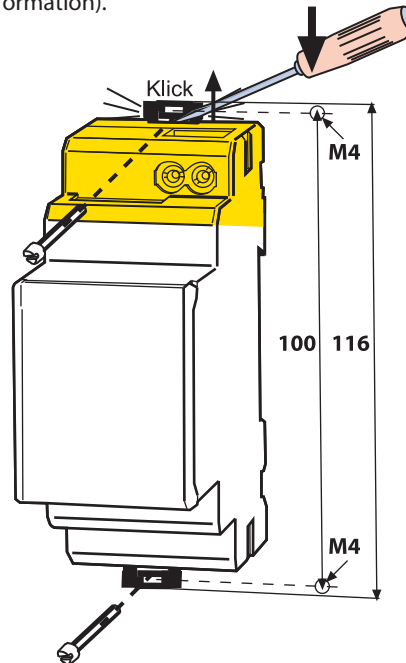
Dimension diagram XM420

Open the front plate cover in direction of arrow!
Dimensions in mm



Screw mounting

Note: The upper mounting clip must be ordered separately (see ordering information).



Technical data

| | |
|--|--|
| Insulation coordination acc. to IEC 60664-1 / IEC 60664-3 | |
| Rated insulation voltage | 250 V |
| Rated impulse voltage / pollution degree | 2.5 kV / III |
| Protective separation (reinforced insulation) between (A1, A2) – (k / I / - / 0 / +, T / R) – (11, 12, 14) – (21, 22, 24) | |
| Voltage test according to IEC 61010-1 | 2.21 kV |
| Supply voltage | |
| Supply voltage U_5 | see ordering information |
| Power consumption | ≤ 3 VA |
| Measuring circuit | |
| External measuring current transformer | W20AB, W35AB, W60AB series |
| Rated insulation voltage (measuring current transformer) | 800 V |
| Operating characteristic acc. to IEC 60755 | Type B |
| Rated frequency | 0...2000 Hz |
| Measuring range | 3...500 mA |
| Relative percentage error of measuring value | 0...-35 % |
| Display accuracy of measuring value | ± 17.5 % |
| Response values | |
| Rated residual operating current $I_{\Delta n1}$ (prewarning) | 50...100 % of $I_{\Delta n2}$ (15 mA)* |
| Rated residual operating current $I_{\Delta n2}$ (Alarm) | 10...500 mA (30 mA)* |
| Hysteresis | 10...25 % (15 %)* |
| Specified time | |
| Starting delay t | 0...10 s (0 s)* |
| Response delay t_{on2} (alarm) | 0...10 s (0 s)* |
| Response delay t_{on1} (prewarning) | 0...10 s (1 s)* |
| Delay on release t_{off} | 0...99 s (1 s)* |
| Operating time t_{ae} at $I_{\Delta n} = 1 \times I_{\Delta n1} / 2 / I_{\Delta n} = 5 \times I_{\Delta n1} / 2$ | ≤ 180 ms / ≤ 30 ms |
| Response time | $t_{an} = t_{ae} + t_{on1} / 2$ |
| Recovery time t_b | ≤ 300 ms |
| Displays, memory | |
| Display range, measured value | 0...500 mA |
| Relative percentage error | 0...-35 % / ± 2 digit |
| Measured-value memory for alarm value | data record measured values |
| Password | off / 0...999 (off)* |
| Fault memory behaviour | ON / OFF (ON)* |
| Inputs / outputs | |
| Cable length for external TEST / RESET button | 0...10 m |

Cable lengths for measuring current transformers

| | |
|--------------------------------------|------------------------------|
| Single wire 6 x 0.75 mm ² | 0...10 m |
| Connection | connectors WX... recommended |

Switching elements

| | | | | | |
|--|---|-------|-------|-------|-------|
| Number of switching elements | 2 x 1 changeover contact | | | | |
| Operating principle | N / C operation or N / O operation (N / O operation)* | | | | |
| Electrical service life under rated operating conditions | 10.000 switching operations | | | | |
| Contact data acc. to IEC 60947-5-1 | | | | | |
| Utilization category | AC-13 | AC-14 | DC-12 | DC-12 | DC-12 |
| Rated operational voltage | 230 V | 230 V | 24 V | 110 V | 220 V |
| Rated operational current | 5 A | 3 A | 1 A | 0,2 A | 0,1 A |
| Minimum contact load | 1 mA at AC / DC ≥ 10 V | | | | |

Environment / EMC

| | | |
|---|--|--|
| EMC | IEC 62020 | |
| Operating temperature | -25 °C...+55 °C | |
| Climatic class acc. to IEC 60721 | | |
| Stationary use (IEC 60721-3-3) | 3K5 (except condensation and formation of ice) | |
| Transport (IEC 60721-3-2) | 2K3 (except condensation and formation of ice) | |
| Long-time storage (IEC 60721-3-1) | 1K4 (except condensation and formation of ice) | |
| Classification of mechanical conditions IEC 60721 | | |
| Stationary use (IEC 60721-3-3) | 3M4 | |
| Transport (IEC 60721-3-2) | 2M2 | |
| Long-time storage (IEC 60721-3-1) | 1M3 | |

Connection

| | |
|---|---|
| Connection | screw terminals |
| rigid / flexible / conductor sizes | 0.2...4 / 0.2...2.5 mm ² / 24...12 AWG |
| Multi-conductor connection (2 conductors with the same cross section) | |
| rigid / flexible | 0.2...1.5 / 0.2...1.5 mm ² |
| Stripping length | 8...9 mm |
| Tightening torque | 0.5...0.6 Nm |

Other

| | |
|--|---------------------------|
| Operating mode | continuous operation |
| Position of normal use | any |
| Degree of protection, internal components / terminal (IEC 60529) | IP30 / IP20 |
| Enclosure material | polycarbonate |
| Flammability class | UL94V-0 |
| DIN rail mounting acc. to | IEC 60715 |
| Screw mounting | 2 x M4 with mounting clip |
| Standards | IEC 62020 |
| Instruction leaflet | TGH1411 |
| Weight | ≤ 150 g |

() * Factory setting

Ordering information

| Type | Response range $I_{\Delta n}$ | Frequency range | Supply voltage U_5 * | Art. No. |
|-------------|-------------------------------|-----------------|---|-------------|
| RCMA420-D-1 | 30...500 mA | 0...2000 Hz | DC 9.6...94 V/ AC 42...460 Hz 16...72 V | B 9404 3001 |
| RCMA420-D-2 | 30...500 mA | 0...2000 Hz | DC 70...300 V/ AC 42...460 Hz 70...300 V | B 9404 3002 |

* Absolute values

Measuring current transformers

| Type | Inside diameter (mm) | Art. No. |
|-------|----------------------|-------------|
| W20AB | ø 20 | B 9808 0008 |
| W35AB | ø 35 | B 9808 0016 |
| W60AB | ø 60 | B 9808 0026 |

Connection cable measuring current transformer – RCMA420-D

| Type | Length / m | Art. No. |
|--------|------------|-------------|
| WX-100 | 1 | B 9808 0503 |
| WX-250 | 2.5 | B 9808 0504 |
| WX-500 | 5 | B 9808 0505 |

Accessories

| Type | Art. No. |
|--------------------------------------|-------------|
| Mounting clip for enclosure XM420 | B 9806 0008 |
| Snap-on mounting for W20... / W35... | B 9808 0501 |
| Snap-on mounting for W60... | B 9808 0502 |
| (1 unit required for each device) | |

Measuring current transformers of the W...AB series



Measuring current transformer W60AB



Measuring current transformer W35AB on DIN rail

Device features

- W20AB...W60AB for AC / DC sensitive residual current monitors of the RCMA420 series
- W20AB...W210AB for residual current evaluators of the RCMS460 / 490 series

Approvals



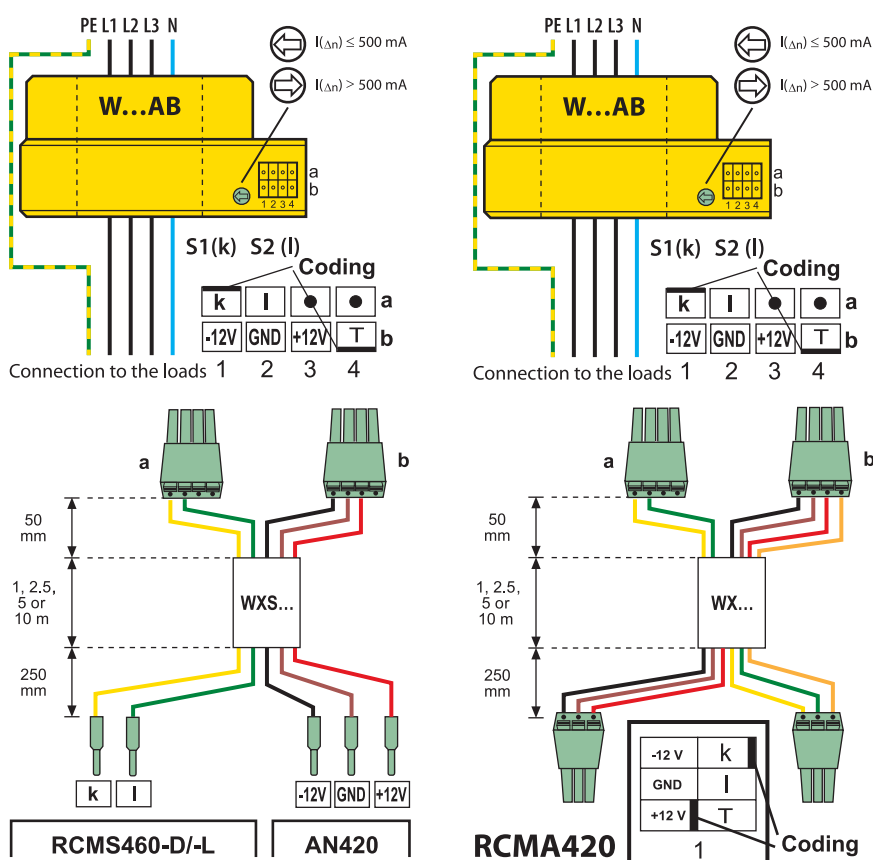
Product description

Measuring current transformers of the W...AB series are measuring current transformers which in combination with devices of the RCMA420 resp. RCMS460 / 490 series convert AC and DC currents into evaluable measurement signals. Connection to the respective devices is via a five-wire or six-wire cable. The CTs can be used in DC, AC, and 3(N)AC systems. If the measuring current transformers are to be connected to an RCMS460 / 490 system, one AN420 power supply unit is required for six measuring current transformers each.

Installation instructions

- Make sure that all live conductors are routed through the measuring current transformer.
- Do not route shielded conductors through the measuring current transformer.
- Never route a PE conductor through the measuring current transformer!

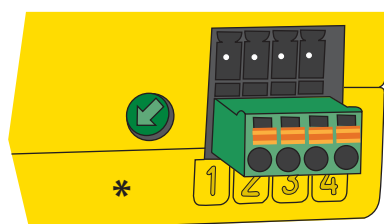
Wiring diagram



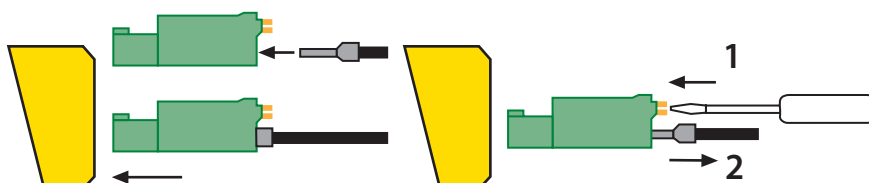
Connection to the RCMS460 / 490 residual current monitor using the WXS-... connecting cable.

Colour coding for WXS... and WX...: k = yellow, I = green, -12 V = black, GND = brown, +12 V = red, Test (T) = orange

Connection to the RCMA420 residual current monitor using the WX-... connecting cable.



* Selection switch measuring range





Technical data

| | |
|--|----------------------------------|
| Insulation coordination acc. to IEC 60664-1 / IEC 60664-3 | |
| Rated insulation voltage | 800 V |
| Rated impulse voltage / pollution degree | 8 kV / III |
| Supply voltage | |
| Supply voltage U_S | DC +/- 12 V |
| Operating range of U_S | 0.95...1.05 x U_S |
| Power consumption | ≤ 2.5 VA |
| CT circuit | |
| Rated primary residual current | 10 mA...10 A |
| Rated continuous thermal residual current I_{cth} | 40 A |
| Rated short-time thermal residual current I_{tth} | 60 x I_{cth} = 2.4 kA / 1 s |
| Rated dynamic current I_{dyn} | 2.5 x I_{tth} = 6.0 kA / 40 ms |

| | |
|---|--|
| Environment / EMC | |
| EMC | IEC 62020:2003-11 |
| Operating temperature | - 25 °C...+ 55 °C |
| Climatic class acc. to IEC 60721 | |
| Stationary use (IEC 60721-3-3) | 3K5 (except condensation and formation of ice) |
| Transport (IEC 60721-3-2) | 2K5 (except condensation and formation of ice) |
| Long-time storage (IEC 60721-3-1) | 1K5 (except condensation and formation of ice) |
| Classification of mechanical conditions IEC 60721 | |
| Stationary use (IEC 60721-3-3) | 3M4 |
| Transport (IEC 60721-3-2) | 2M2 |
| Long-time storage (IEC 60721-3-1) | 1M3 |

| | |
|--------------------|------------|
| Connection | |
| Type of connection | connectors |

Connection RCMA / RCMS-measuring current transformer
refer to table "Connecting cables"

| | |
|---|------------------------------|
| Other | |
| Degree of protection, internal components (IEC 60529) | IP40 |
| Degree of protection, terminals (IEC 60529) | IP20 |
| Screw mounting | M5 with mounting bracket |
| DIN rail mounting | with snap-on mounting |
| Flammability class | UL94V-0 |
| Standards | IEC 60044-1 |
| Instruction leaflet | BP409012 |
| Approval | UL under consideration, GOST |

Ordering information

| Type | Inside diameter | Fixing | | Art. No. |
|--------|-----------------|----------|----------------|-------------|
| | | DIN rail | Screw mounting | |
| W20AB | ∅ 20 mm | × | × | B 9808 0008 |
| W35AB | ∅ 35 mm | × | × | B 9808 0016 |
| W60AB | ∅ 60 mm | × | × | B 9808 0026 |
| W120AB | ∅ 120 mm | -- | × | B 9808 0041 |
| W210AB | ∅ 210 mm | -- | × | B 9808 0040 |

Power supply unit

| Type | Supply voltage | Art. No. |
|---------|---|-------------|
| AN420-2 | DC 70...300 V / AC 42...460 Hz 70...276 V | B 9405 3100 |

Ordering information

Connecting cables

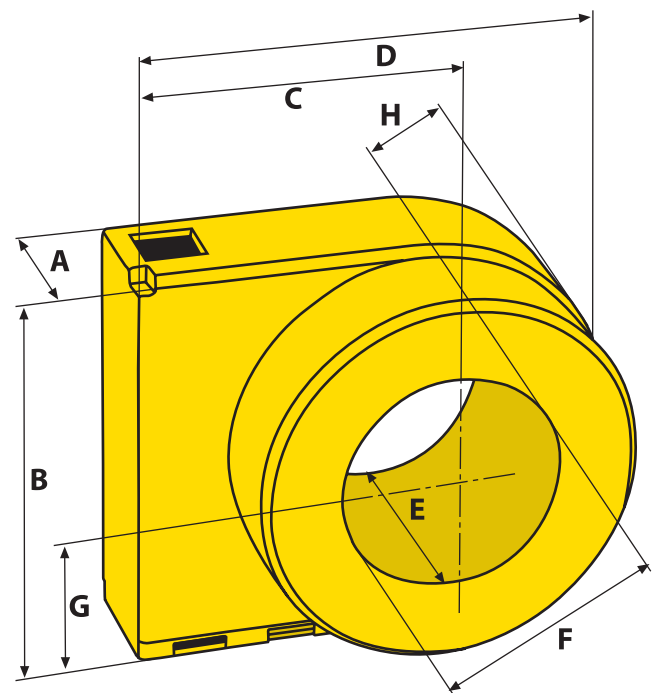
| Type | Device | Length / m | Art. No. |
|----------|---------------|------------|-------------|
| WX-100 | RCMA420 | 1 | B 9808 0503 |
| WX-250 | RCMA420 | 2.5 | B 9808 0504 |
| WX-500 | RCMA420 | 5 | B 9808 0505 |
| WX-1000 | RCMA420 | 10 | B 9808 0511 |
| WXS-100 | RCMS460 / 490 | 1 | B 9808 0506 |
| WXS-250 | RCMS460 / 490 | 2.5 | B 9808 0507 |
| WXS-500 | RCMS460 / 490 | 5 | B 9808 0508 |
| WXS-1000 | RCMS460 / 490 | 10 | B 9808 0509 |

Control cable LiYY flexible, 6 x AWG 20 (6 x 0.52 mm²), approved acc. to UL 2464

Accessories

| Type | Art. No. |
|-----------------------------------|-------------|
| Snap-on mounting for W20AB, W35AB | B 9808 0501 |
| Snap-on mounting for W60AB | B 9808 0502 |

Dimension diagram



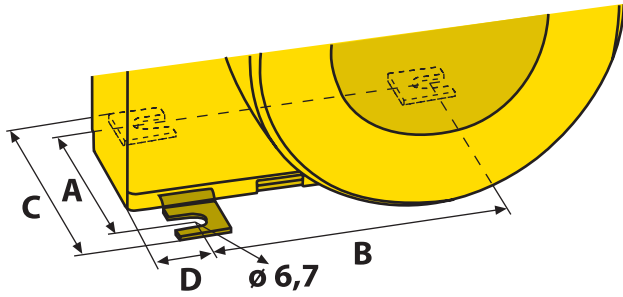
Dimensions

| Type | A | B | C | D | E | F | G | H | Weight |
|--------|----|-------|-------|------|------|-------|-------|------|---------|
| W20AB | 30 | 56.3 | 50 | 76.4 | 48.5 | ∅ 20 | 56.3 | 16.4 | 0.18 kg |
| W35AB | 30 | 79.2 | 62 | 99.5 | 55 | ∅ 35 | 79.2 | 20 | 0.35 kg |
| W60AB | 37 | 116.4 | 79 | 135 | 67 | ∅ 60 | 116.4 | 24 | 0.57 kg |
| W120AB | 37 | 191.5 | 116.5 | 210 | 67 | ∅ 120 | 191.5 | 33.5 | 1.92 kg |
| W210AB | 45 | 304.5 | 173 | 323 | 80 | ∅ 210 | 304.5 | 45 | 5.8 kg |

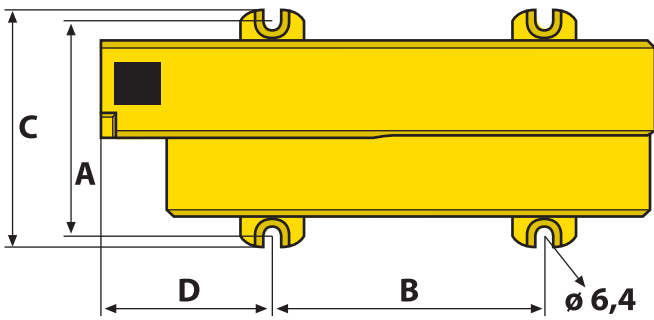
Dimensions in mm

Mounting details

Screw mounting with mounting brackets: W20AB, W35AB, W60AB



Screw mounting: W120AB, W210AB

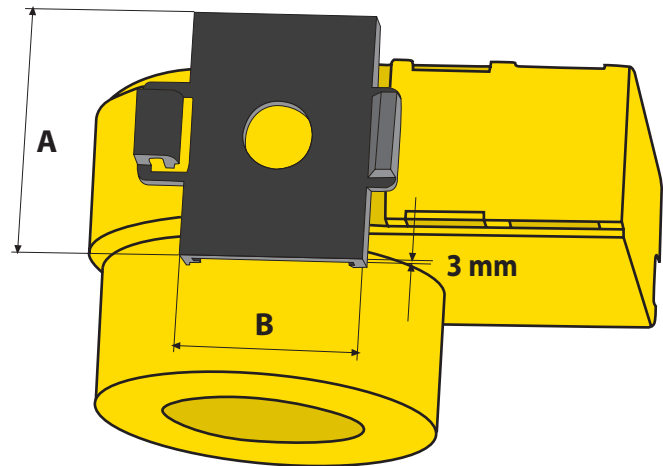
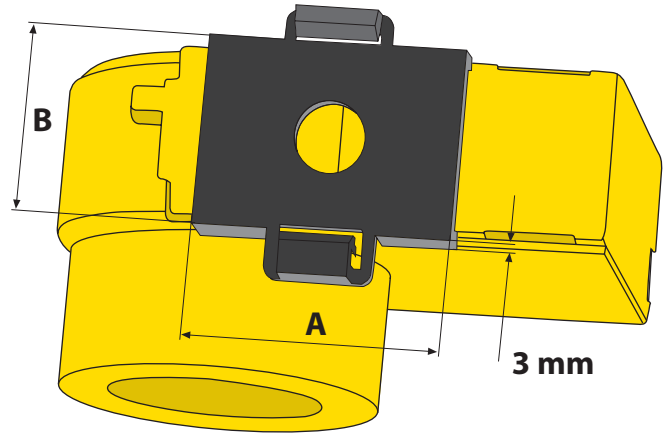


Dimensions screw mounting

| Type | A | B | C | D |
|---|----|------|----|-------|
| W20AB (fixing with two mounting brackets, diagonally) | 47 | 29 | 63 | 20.35 |
| W35AB (fixing with two mounting brackets, diagonally) | 47 | 48.5 | 63 | 12.85 |
| W60AB (fixing with max. three mounting brackets) | 54 | 66 | 70 | 17 |
| W120AB | 51 | 103 | 61 | 65 |
| W210AB | 98 | 180 | 69 | 83 |

Dimensions in mm

Snap-on mounting on DIN rail, for vertical or horizontal mounting: W20AB, W35AB, W60AB



Dimensions snap-on mounting

| Type | A | B |
|-------|------|----|
| W20AB | 43.5 | 32 |
| W35AB | 43.5 | 32 |
| W60AB | 50 | 39 |

Dimensions in mm

Selection list

| Type | RCMA420 | RCMS460 / 490 |
|--------|---------|---------------|
| W20AB | × | × |
| W35AB | × | × |
| W60AB | × | × |
| W120AB | -- | × |
| W210AB | -- | × |