# LINETRAXX® CMS460-D

Multi-channel AC, pulsed DC sensitive load current evaluator

for AC systems (TN, TT and IT systems)

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**Multi-channel AC and pulsed DC sensitive load current evaluators for AC systems (TN, TT and IT systems)**



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## Device features

- Optional AC or pulsed DC sensitive measurements for each channel
- r.m.s. value measurement
- 12 measuring channels per individual device for load current
- Up to 90 evaluators CMS460-D in the system (1080 measuring channels)
- Fast parallel scanning for all channels
- Response ranges 100 mA…125 A (42…2000 Hz)
- Preset function
- Adjustable time delays
- Adjustable frequency behaviour (e.g. fire and plant protection)
- History memory with date and time stamp for 300 data records/channel
- Data logger for 300 data records/channel
- Analysis of the harmonics, THD
- Two alarm relays with one changeover contact each
- N/O or N/C operation and fault memory selectable
- Connection external test and reset button
- Backlit graphical display (7-segment display) and alarm LEDs
- Data exchange via BMS bus
- Password protection for device setting
- RoHS compliant

## Certifications



## Product description

The CMS460 system consists of one or several CMS460-D load current evaluators which are able to detect and evaluate load currents in earthed and unearthed power supplies via the associated measuring current transformers. The maximum voltage of the system to be monitored depends on the nominal insulation voltage of the measuring current transformer used in the case of busbar systems, or on the cables or conductors that are routed through.

W… (closed), WR… (rectangular) and WS… (split-core) and WF… (flexible) measuring current transformers are used for alternating and pulsating currents. Any combination of the various measuring current transformer series can be connected to the evaluator measuring channels. Each CMS460-D utilises 12 measuring channels. Up to 90 load current evaluators can be connected via a BMS bus (RS-485 interface with BMS protocol), thereby up to 1080 measuring channels (sub-circuits) can be monitored.

If this product is to be used for fire or plant protection, the frequency response can be set accordingly. The measured currents can be analysed for harmonics.

## Typical applications

- Monitoring of loads and installations for load currents in the frequency range of 42…2000 Hz (measuring current transformers W…, WR…, WS…, WF…)
- Monitoring of currents regarded as fire hazards in flammable atmospheres
- EMC monitoring of TN systems for "stray currents" and additional N-PE connections
- Monitoring of N conductors for overload caused by harmonics
- Monitoring of PE and equipotential bonding conductors to ensure they are free of current

## Function

The currents are detected and evaluated as true r.m.s. values in the frequency range of 42…2000 Hz. All channels are scanned simultaneously so that the maximum scanning time for all channels is ≤ 180 ms if 1x the response value is exceeded and ≤ 30 ms if 5x the response value is exceeded.

The current values of all channels are shown on the LC display in bar graph format. If one of both values falls below or exceeds the set response value, the response delay $t_{on}$ begins. Once the response delay has expired, the common alarm relays "K1/K2" switch and the alarm LEDs 1/2 light up.

Two response values/common alarm relays, which can be set separately, allow a distinction to be made between "prewarning" and "alarm". The faulty channel(s) and the associated measured value are shown on the LC display. If the current exceeds or falls below the release value (response value plus hysteresis), the delay on release $t_{off}$ begins. Once the delay has expired, the common alarm relays return to their original position.

If the fault memory is enabled, the common alarm relays remain in the alarm position until the reset button is pressed or a reset command is sent via the BMS bus. The device function can be tested using the test button. Parameters are assigned to the device via the LCD and the control buttons on the front of the connected CMS460-D or via connected panels and protocol converters (e.g. FTC470XET).

The preset function allows the response values to be set for all channels considering the currently measured value for each channel.

The CMS460-D utilises a backlit graphical display where detailed information of all devices connected to the bus are displayed. This device is capable of assigning parameters to all CMS460-D devices connected to the bus (e.g. RCMS460-D/-L, RCMS490-D/-L, CMS460-D) and displaying all measurement details. Several CMS460-D devices can be used in one system.

## History memory

The device utilises a history memory for failsafe storing of up to 300 data records (date, time, channel, event code, measured value), so that all data about an outgoing circuit or an area can be traced back at any time (what happened when).

## Analysis of harmonics

The analysis of the harmonics of the measured currents can be selected via a menu item in CMS460-D. There the THD factor and the current value of the harmonics (1…40 at 50/60 Hz, 1…5 at 400 Hz) is displayed numerically and graphically.

## Overview of device features

| Distinctive device features | CMS460-D |
|---|---|
| Rated operating current pulsed DC sensitive Type A | 100 mA…125 A |
| Backlit graphics display | ■ |
| Parameter setting function | ■ |
| Password | ■ |
| Error code indication | ■ |
| Address range | 1…90 |
| Master/slave | ■ |
| Internal clock | ■ |
| Common alarm relay for all channels | 2 x 1 changeover contact |
| Analysis of the harmonics $I_\Delta$, THD | ■ |
| History memory 300 data records | ■ |
| Data logger for 300 data records/ channel | ■ |
| PRESET | ■ |
| Number of measuring channels | 12 |
| Enclosure | XM460 |

## Dimension diagram

Dimensions in mm
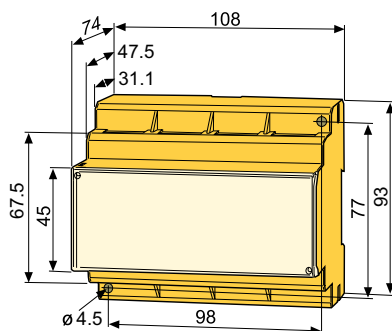
## Operating and display elements CMS460-D
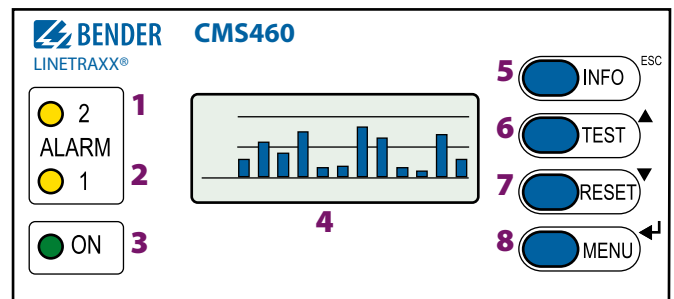
1 - ALARM 2   LED lights up when the measured value exceeds or falls below the response value "Alarm".

2 - ALARM 1   LED lights up when the measured value exceeds or falls below the response value "Prewarning". In the event of a device error, the LED lights up.

3 - ON   LED lights up when the device is switched on and flashes during power on until the device is ready for operation.

4 -   Backlit graphics LC display

5 - INFO   to query standard information
ESC   to exit the menu function without changing parameters

6 - TEST   to call up automatic self test
▲   to change parameters, scroll

7 - RESET   to delete alarm and fault messages
▼   to change parameters, scroll

8 - MENU   to toggle between the standard display, menu and alarm display
↵   to confirm parameter changes

## Wiring diagram
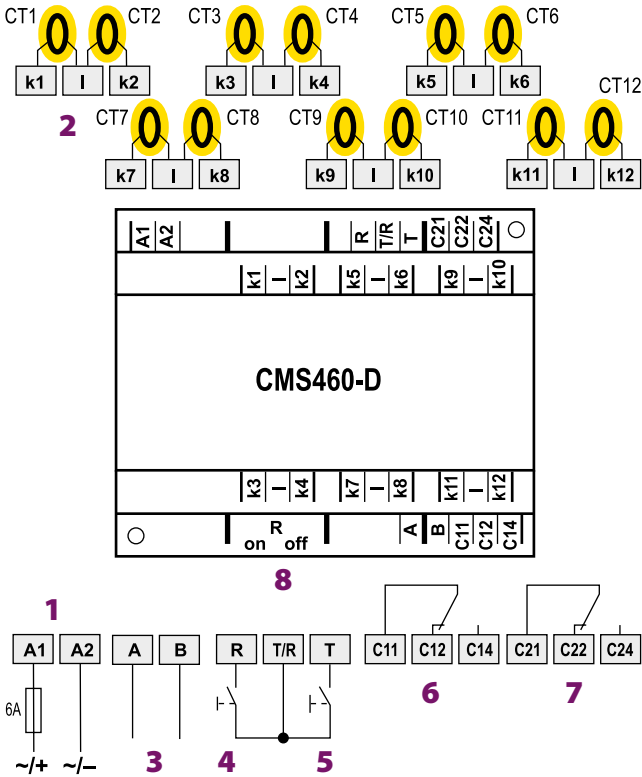


1 - Connection of supply voltage $U_S$ (see ordering information), 6 A fuse recommended.

2 - Connection of measuring current transformers CT1…CT12

3 - RS-485 interface with BMS protocol

4 - External reset button "R" (N/O contact)*

5 - External test button "T" (N/O contact). The external "T/R" buttons of several devices must not be connected to one another.

6 - Alarm relay "K1": Alarm 1, common alarm for alarm, prewarning, device error, ext. alarm (adjustable)

7 - Alarm relay "K2": Alarm 2, common alarm for alarm, prewarning, device error, ext. alarm (adjustable)

8 - $R_{on/off}$: Activate or deactivate the BMS bus terminating resistor (120 Ω)

## Connection W…, WR…, WS… series measuring current transformers (pulsed current sensitive)

Example: W…
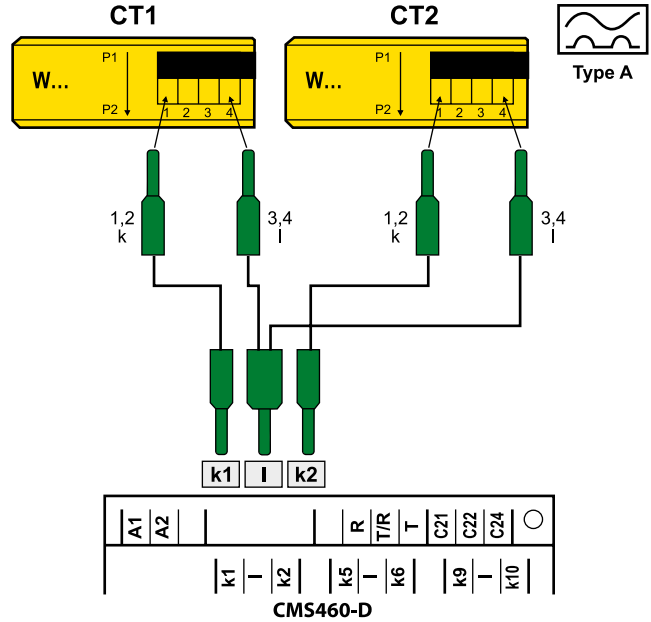


## Connection WF… series measuring current transformer (pulsed DC sensitive)
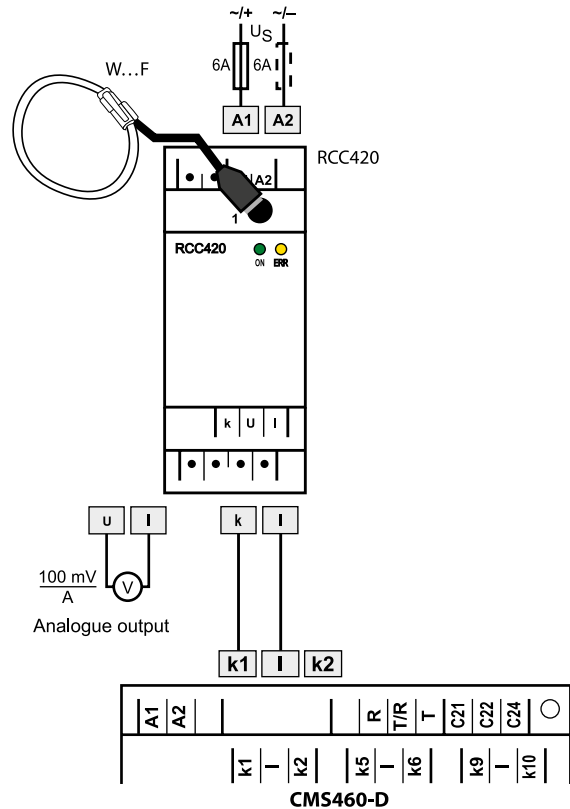
**Frequency settings**

The frequency response of the equipment can be set for a linear frequency response (up to the maximum frequency of 2000 Hz) if used for fire protection or for a frequency response in accordance with IEC 60990. For plant protection, the load current is measured up to the rated system frequency. The figure below shows the corresponding frequency response.

**Frequency curves**
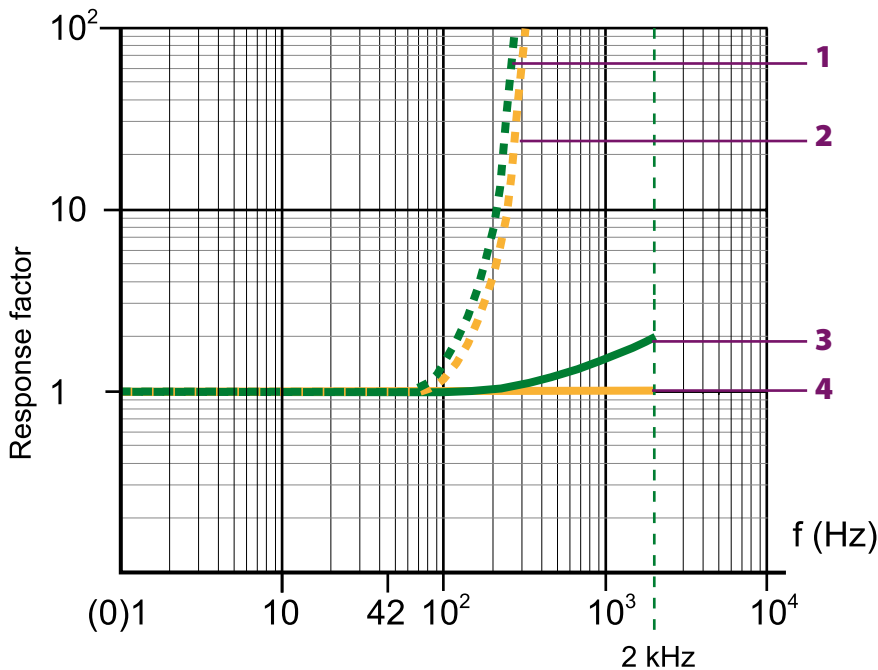
Response factor = $I_\Delta/I_{\Delta n}$

($I_\Delta$)    Response current: Measured value at which the CMS responds.

($I_{\Delta n}$)   Rated operating current: Set response value

1 -   Menu option "50 Hz"
      – plant protection: Only evaluates the fundamental component of the current.

2 -   Menu option "60 Hz"
      – plant protection: Only evaluates the fundamental component of the current.

3 -   Menu option "IEC" Touch current for let go in accordance with IEC 60990

4 -   Menu option "None"
      – fire protection: Response factor remains the same over the entire frequency range.

**Example for the design of a standard system consisting of an CMS460-D with up to 12 measuring points**
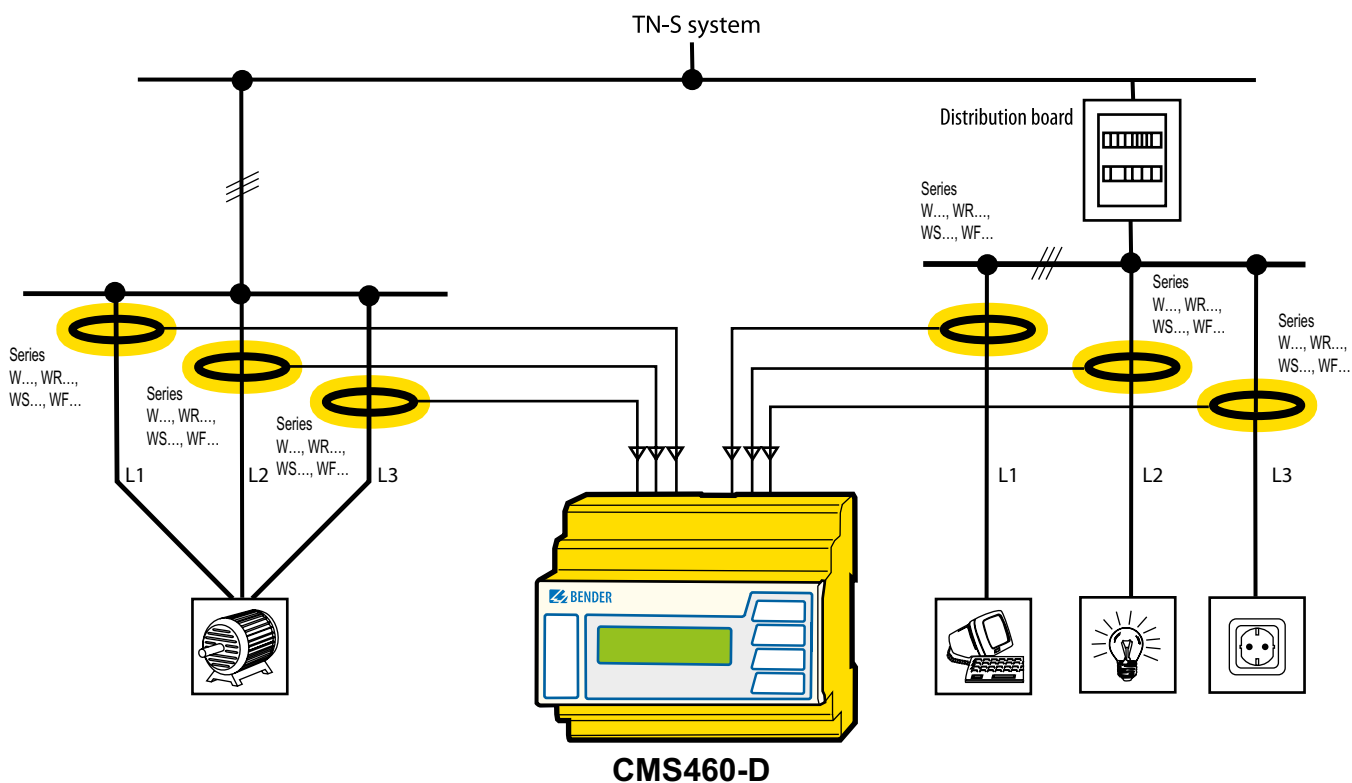
**Example for the design of a standard system consisting of two CMS460-D and one COM460IP BMS-Ethernet gateway**
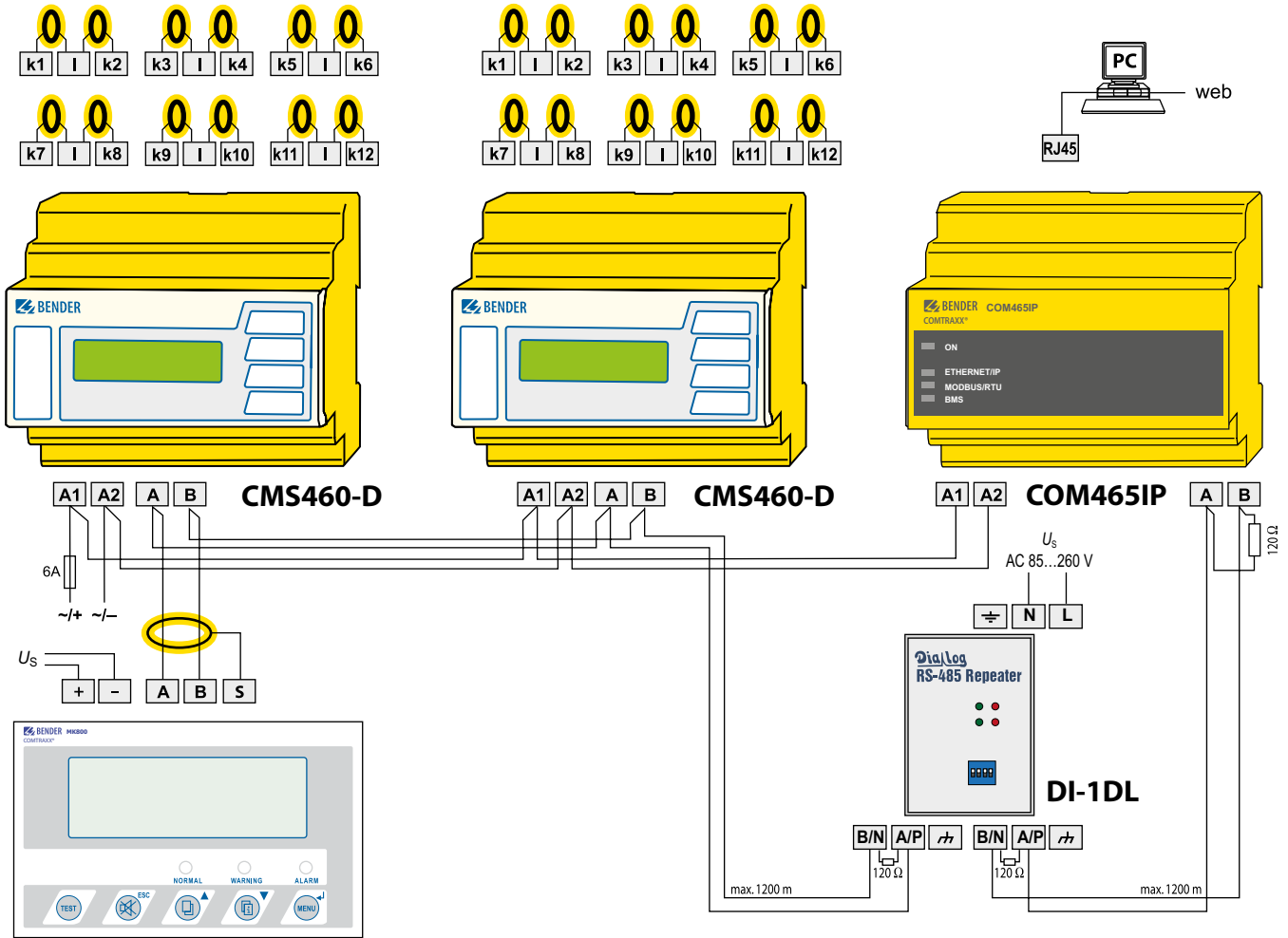
## Technical data

### Insulation coordination acc. to IEC 60664-1/IEC 60664-3 for the versions:

**a) CMS460-D1**

| | |
|---|---|
| Supply voltage $U_S$ | DC 24…75V/AC 24…60 V (AC/DC ±20 %) |
| Supply voltage frequency | DC, 50/60 Hz |
| Rated insulation voltage | 100 V |
| Overvoltage category/pollution degree | III/3 |
| Rated impulse voltage | 2.5 kV |
| Protective separation (reinforced insulation) between | (A1, A2) - (k1, l…k12, R, T/R, T, A, B) |
| Voltage test acc. to IEC 61010-1 | 1.344 kV |
| Rated insulation voltage | 250 V |
| Overvoltage category/pollution degree | III/3 |
| Rated impulse voltage | 4 kV |
| Basic insulation between: | (A1, A2), (k1, l…k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44), (51,54), (61,64), (71,74), (81,84), (91,94), (101,104), (111,114), (121,124) |
| Basic insulation between: | (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64) |
| Voltage test acc. to IEC 61010-1 | 2.21 kV |
| Rated insulation voltage | 250 V |
| Overvoltage category/pollution degree | III/3 |
| Rated impulse voltage | 6 kV |
| Protective separation (reinforced insulation) between | (C11, C12, C14) - (C21, C22, C24) - (11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) - (91,94) - (101,104) - (111,114) - (121,124) |
| Voltage test acc. to IEC 61010-1 | 3.536 kV |

**b) CMS460-D2**

| | |
|---|---|
| Supply voltage $U_S$ | AC/DC 100…240 V (-20…+15 %) |
| Supply voltage frequency | DC, 50/60 Hz |
| Rated insulation voltage | 250 V |
| Overvoltage category/pollution degree | III/3 |
| Rated impulse voltage | 6 kV |
| Protective separation (reinforced insulation) between | (A1, A2) - (k1, l…k12, R, T/R, T, A, B), (C11, C12, C14), (C21, C22, C24), (11,14), (21,24), (31,34), (41,44), (51,54), (61,64), (71,84), (81,84), (91,94), (101,104), (111,114), (121,124) |
| Protective separation (reinforced insulation) between | (C11, C12, C14) - (C21, C22, C24) - (11, 14, 21, 24, 31, 34) - (41, 44, 51, 54, 61, 64) - (71,74) - (81,84) - (91,94) - (101,104) - (111,114) - (121,124) |
| Voltage test acc. to IEC 61010-1 | 3.536 kV |
| Rated insulation voltage | 250 V |
| Overvoltage category/pollution degree | III/3 |
| Rated impulse voltage | 4 kV |
| Basic insulation between: | k1, l…k12, R, T/R, T, A, B) - (C11, C12, C14), (C21, C22, C24) |
| Basic insulation between: | (11, 14) - (21, 24) - (31, 34) - (41, 44) - (51, 54) - (61, 64) |
| Voltage test acc. to IEC 61010-1 | 2.21 kV |

### Measuring circuit

| | |
|---|---|
| External measuring current transformers | W…, WR…, WS…, WF… series (type A) |
| Load | 1 Ω |
| Rated insulation voltage (measuring current transformer) | 800 V |
| Operating characteristics acc. to IEC 60755 | type A |
| | depending on measuring current transformer series (type A)* |
| Rated frequency | 42…2000 Hz (type A) |
| Cut-off frequency | none, IEC, 50 Hz, 60 Hz (none)* |
| Measuring range | 100 mA…125 A (measuring current transformer type A) |
| | 100 mA…30 A (measuring current transformer Flex) |
| | Crest factor up to 10 A = 4, up to 125 A = 2 |
| Rated operating current In2 (alarm) | 100 mA…125 A (16 A overcurrent)* |
| Rated operating current In1 (prewarning) | 10…100 % x In2* |
| Preset for alarm | offset: 0…20 A (1 A)* and I x factor 1…99 (3 )* |
| Relative uncertainty | +10…-20 % |
| Hysteresis | 2…40% (20 %)* |
| Factor for additional CT | /2…10; x 1…10 (x 1)* |
| Number of measuring channels (per device/system) | 12/1080 |

### Time response

| | |
|---|---|
| Start-up delay $t$(start-up) per device | 0…99 s (0 ms)* |
| Response delay $t_{on}$ per channel | 0…999 s (200 ms)* |
| Delay on release $t_{off}$ per channel | 0…999 s (200 ms)* |
| Operating time $t_{ae}$ at $I_n = 1$ x $I_{n1/2}$ | ≤ 180 ms |
| Operating time $t_{ae}$ at $I_n = 5$ x $I_{n1/2}$ | ≤ 30 ms |
| Response time $t_{an}$ for current measurement | $t_{an} = t_{ae} + t_{on1/2}$ |
| Scanning time for all measuring channels (current measurement) | ≤ 180 ms |
| Recovery time $t_b$ | 500…600 ms |

### Displays, memory

| | |
|---|---|
| Display range, measuring value | < 10 mA…125 A (CT type A) |
| | < 10 mA…30 A (measuring current transformer Flex) |
| Operating uncertainty | ± 10 % |
| LEDs | ON/ALARM |
| LC display | backlit graphical display |
| History memory | 300 data records |
| Data logger | 300 data records per measuring channel |
| Password | off/0…999 (off)* |
| Language | D, GB, F (GB)* |
| Fault memory alarm relay | on/off (off)* |

### Inputs/outputs

| | |
|---|---|
| Test/reset button | internal/external |
| Cable length for external test/reset button | 0…10 m |

### Interface

| | |
|---|---|
| Interface/protocol | RS-485/BMS |
| Baud rate | 9.6 kbit/s |
| Cable length | 0…1200 m |
| Recommended cable (shielded, shield connected to PE on one side) | min. J-Y(St) min. 2x0.8 |
| For UL applications: | Copper lines at least 60/70 °C |
| Terminating resistor | 120 Ω (0.25 W) connectable via DIP switch |
| Device address, BMS bus | 1…90 (2)* |

### Cable lengths for W…, WR…, WS…, WF… series measuring current transformers

| | |
|---|---|
| Single wire ≥ 0.75 mm2 | 0…1 m |
| Single wire, twisted ≥ 0.75 mm2 | 0…10 m |
| Shielded cable ≥ 0.5 mm2 | 0…40 m |
| Recommended cable (shielded, shield connected to terminal l at one end, must not be earthed) | J-Y(St)Y min. 2x0.8 |

### Switching elements

| | |
|---|---|
| Number of changeover contacts | 2 x 1 changeover contacts |
| Operating principle | N/C or N/O operation (N/O operation)* |
| Electrical endurance, number of cycles | 10,000 |

### Contact data acc. to IEC 60947-5-1

| Utilisation 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 (common alarm relay) | 5 A | 3 A | 1 A | 0.2 A | 0.1 A |
| Rated operational current (alarm relay) | 2 A | 0.5 A | 5 A | 0.2 A | 0.1 A |
| Minimum contact rating | 1 mA at AC/DC ≥ 10 V | | | | |

## Technical data (continued)

**Environment/EMC**

| | |
|---|---|
| EMC | IEC 61326-1 |
| Operating temperature | -25 °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-term storage (IEC 60721-3-1) | 1K4 (except condensation and formation of ice) |

**Classification of mechanical conditions acc. to IEC 60721**

| | |
|---|---|
| Stationary use (IEC 60721-3-3) | 3M4 |
| Transport (IEC 60721-3-2) | 2M2 |
| Long-term storage (IEC 60721-3-1) | 1M3 |

**Connection**

| | |
|---|---|
| Connection | screw-type terminals |
| Connection properties: | |
| Rigid/flexible/conductor sizes | 0.2…4/0.2…2.5 mm²/AWG 24…12 |
| Multi-conductor connection (2 conductors with the same cross section): | |
| Rigid/flexible | 0.2…1.5/0.2…1.5 mm² |
| Stripping length | 8…9 mm |
| Tightening torque | 0.5…0.6 Nm |

**Other**

| | |
|---|---|
| Operating mode | continuous operation |
| Mounting | display-oriented |
| Degree of protection, internal components (IEC 60529) | IP30 |
| Degree of protection, terminals (IEC 60529) | IP20 |
| Enclosure material | polycarbonate |
| Flammability class | UL94V-0 |
| Screw fixing | 2 x M4 |
| DIN rail mounting acc. to | IEC 60715 |
| Power consumption | ≤ 10 VA |
| Weight | ≤ 360 g |

( )* Factory setting

## Ordering information

| Supply voltage [1] $U_S$ | | Type | Art. No. | |
|---|---|---|---|---|
| **AC** | **DC** | | **Screw-type terminal** | **Push-wire terminal** |
| 24…60 V, 50/60 Hz | 24…75 V | CMS460-D-1 | B94053017 | B74053017 |
| 100…240 V, 50/60 Hz | 100…240 V | CMS460-D-2 | B94053018 | B74053018 |

[1] For UL applications: Us max = DC 250 V/AC 250 V, 50/60 Hz

## Accessories

| Description | Art. No. |
|---|---|
| XM460 mounting frame, 144 x 82 mm | B990995 |

## Suitable system components

| Description | Version | Type | Art. No. |
|---|---|---|---|
| Power supply unit | RS-485 repeater | DI-1 | B95012015 |
| | | DI-1PSM | B95012044 |
| | for DI-1 | AN471 | B924189 |
| Condition Monitor | Condition Monitor with integrated gateway: Bender system/Ethernet AC/DC 24…240 V, DC, 50…60 Hz | COM465IP | B95061065 |
| | Condition Monitor with integrated gateway: Bender system/Ethernet DC 24 V | COM465IP-24 V | B95061066 |
| | Individual text messages for all devices/channels, device failure monitoring, email in the event of an alarm | COM465IP Function package A | B75061011 |
| | Modbus TCP server for max. 98 * 139 BMS nodes as well as BCOM and universal measuring devices, SNMP server | COM465IP Function package B | B75061012 |
| | Parameter setting of BMS devices as well as BCOM and universal measuring devices | COM465IP Function package C | B75061013 |
| | Visualisation of Bender systems, System visualisation | COM465IP Function package D | B75061014 |
| | Condition Monitor for the connection of Bender BMS devices and universal measuring devices to TCP/IP networks | CP700 | B95061030 |
| | BMS Modbus RTU gateway AC/DC 76…276 V[1]/ AC 42…460 Hz/DC | COM462RTU | B95061022 |
| Alarm indicator and test combination | Alarm indicator and test combination in accordance with IEC 60364-7-710, with BMS bus and USB interface, 16 digital inputs, one relay output, alarm texts programmable via interfaces and personal computer, standard text display. Version: surfacemounting enclosure; menu languages: German English. | MK800A-11 [2] | B95100102 |
| | Alarm indicator and test combination in accordance with IEC 60364-7-710, with BMS bus and USB interface, alarm texts programmable via interfaces and personal computer, standard text display. Version: surfacemounting enclosure; Menu languages: German, English. | MK800A-12 [2] | B95100103 |
| | Alarm indicator and test combination in accordance with IEC 60364-7-710, with BMS bus and USB interface, 12 digital inputs, one relay output, alarm texts programmable via interfaces and personal computer, standard text display. Version: Flush-mounting enclosure | MK2430-11 | B95100001 |
| | Alarm indicator and test combination in accordance with IEC 60364-7-710, with BMS bus and USB interface, alarm texts programmable via interfaces and personal computer, standard text display. Version: Flush-mounting enclosure | MK2430-12 | B95100002 |
| | As MK2430-11, but factory-programmed | MK2430P-11 | B95100003 |
| | As MK2430-12, but factory-programmed | MK2430P-12 | B95100004 |
| | As MK2430-11, but with surfacemounting enclosure | MK2430A-11 | B95100005 |
| | As MK2430-12, but with surfacemounting enclosure | MK2430A-12 | B95100006 |
| | As MK2430A-11, but factory-programmed, surface-mounting enclosure version | MK2430PA-11 | B95100007 |
| | As MK2430A-12, but factory-programmed, surface-mounting enclosure version | MK2430PA-12 | B95100008 |
| | As MK2430-11, but front plate with screw fixing | MK2430S-11 | B95100011 |
| | As MK2430-12, but front plate with screw fixing | MK2430S-12 | B95100012 |

[1] Absolute values
[2] Other versions on request

**Measuring current transformer**

## Pulsed current sensitive measuring current transformer

| Type of construction | Inside diameter/mm | Type | Art. No. |
|---|---|---|---|
| circular | 20 | W20 | B98080003 |
| | 35 | W35 | B98080010 |
| | 60 | W60 | B98080018 |
| | 120 | W120 | B98080028 |
| | 210 | W210 | B98080034 |
| rectangular | 70 x 175 | WR70x175 | B98080609 |
| | 115 x 305 | WR115x305 | B98080610 |
| split-core | 20 x 30 | WS20x30 | B98080601 |
| | 50 x 80 | WS50x80 | B98080603 |
| | 80 x 120 | WS80x120 | B98080606 |

Other measuring current transformer types on request

## Accessories measuring current transformers

| Description | Art. No. |
|---|---|
| Snap-on mounting for W20…/W35… | B98080501 |
| Snap-on mounting for W60… | B98080502 |

## Flexible measuring current transformers (pulsed current sensitive)

| Inside diameter/mm | Type | Art. No. |
|---|---|---|
| 170 | WF170-1 | B78080201 |
| | WF170-2 | B78080202 |
| 250 | WF250-1 | B78080203 |
| | WF250-2 | B78080204 |
| 500 | WF500-1 | B78080205 |
| | WF500-2 | B78080206 |
| 800 | WF800-1 | B78080207 |
| | WF800-2 | B78080208 |
| 1200 | WF1200-1 | B78080209 |
| | WF1200-2 | B78080210 |

WF… series measuring current transformers consist of one flexible W…F series measuring current transformer and one RCC420 signal converter.