

# LINETRAXX® SmartDetect RCMS425-D

Four-channel residual current monitor sensitive to  
AC, pulsed DC, and smooth DC





### Product description

The LINETRAXX® SmartDetect RCMS425-D is an AC, pulsed DC, and smooth DC sensitive residual-current monitor for earthed power-supply systems. It measures residual currents between 2 mA and 70 A with direct voltage as well as alternating voltage in a frequency range from 15 Hz to 20 kHz.

Corresponding measuring-current transformers (e.g. CTUB100 and CTAC series) must be connected to the residual-current inputs.

Individual response values for prewarning and main alarm can be set for each channel, and the response value can be chosen from the RMS value of AC and DC or the individual AC and DC components.

The alarm is indicated on a display. Alarm signalling is also possible via the digital outputs Q and M+ and simultaneously via the Modbus RTU interface. In addition, the alarm is output via the two alarm relays K1 (prewarning) and K2 (main alarm).

Alarms can also be triggered via message assignment for device errors and transformer connection monitoring errors.

Digital inputs and outputs I, Q and M+ can be used in a variety of ways. Q can be used either as a digital input or digital output.

The test and/or reset functions can be triggered by external buttons or remote control via the digital inputs I and Q. This is also possible directly on the device using the T/R button.

Outputs Q and M+ can be used for prewarning or main alarm signalling. Alternatively, the residual current can be output as an analogue signal via M+.

The RCMS425-D can be operated with a supply voltage of either DC 24 V or AC/DC 100...240 V.

The TFT display enables convenient operation and configuration.

The RCMS425-D has a Modbus RTU interface for communication with higher-level systems. The parameters required for electrical systems can be set either via Modbus RTU or via the NFC interface using the Bender Connect App (which is also possible even when the device is powered off). It is also possible to preset the operating parameter ex factory.

Various functions can be added to the devices using function modules. These include harmonic analysis (FFT) up to the 400th harmonic (function module A), AC/DC sensitive measurement and evaluation of values (function module B) and the connection of external type A current transformers (function module C).

## Device features

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### Special features

- Four measuring channels for AC, pulsed DC, or AC/DC sensitive measuring
- Configurable frequency response
- TFT display for convenient operation and configuration
- Expansion/retrofit or change of functions in the event of changed monitoring requirements
- Simple configuration with Bender Connect App via NFC interface
- Customer-specific factory settings possible

### Residual current measurement

- Residual current measurement device (RCM) in accordance with DIN EN 62020-1 (IEC 62020-1)
- Four channels for residual current measurement
- Every channel can alternatively also be configured as digital input
- Either AC, pulsed DC, or AC/DC sensitive measuring for every channel
- Type A, type F, type B and type B+ characteristics can be set in accordance with IEC 60755 (or VDE 0664-400)
- Measurement of AC/DC (r.m.s. value) and AC and DC components
- Frequency range: DC, 15 Hz...20 kHz
- Frequency analysis up to the 400th harmonic, calculation of the THD value

### Response value monitoring

- Main alarm with adjustable residual response value  $I_{\Delta n}$
- Prewarning: 10...100 % of the residual response value  $I_{\Delta n}$
- Separate evaluation of AC/DC (RMS) or AC and DC components
- Response value
  - Type A: 6 mA...30 A
  - Type F: 6 mA...30 A (15 Hz...20 kHz)
  - Type B/Type B+: 10 mA...10 A (only with function module B "AC/DC sensitive measuring and evaluation of values")
- Configurable frequency response
- Measurement modes for each channel: overcurrent (standard), undercurrent, or window mode (out-of-range-values)
- Adjustable time delays (response delay and delay on release)
- Fault-memory behaviour per channel selectable
- Preset function
- Reload function
- Starts in alarm status and start-up delay configurable
- Continuous CT-connection monitoring

### Display and operation

- NFC interface for parameter setting with the Bender Connect App
- TFT display
  - Device status LED
  - Alarm LED
  - Full text menu
  - 4-button navigation
- Integrated combined test/reset button, connection for external buttons
- Sealable transparent cover (optional)

### Interfaces

- One digital input (I), one digital input/output (Q), and one multifunctional digital/analogue output (M+)
- Alarm relays K1 and K2
- Modbus RTU (RS-485)
- NFC interface for device parameter setting via Bender Connect App with the device energised or de-energised

### Supply voltage

- Supply voltage DC 24 V
- Wide range power supply AC/DC 100...240 V

## NFC interface



The NFC interface can be used to transmit a previously configured device parameter setting directly to the device.



This function is available only via the Bender Connect App. You can find this app in the Appstores for [iOS](#) and [Android](#).



In the Bender Connect app the device first needs to be made known. Then the device-specific setting options are shown so that they can be configured. When the data is transferred, feedback is given whether the parameter configuration has been successful.

Parameter settings can be transmitted to the device via the Bender Connect app by holding the mobile phone close to the device.

To a **de-energised** device, a parameter setting can be transferred via the Bender Connect app. This setting is then activated automatically when the device is connected to the current supply.

When a device is **plugged in**, too, parameters can be configured via the Bender Connect App. To this end, the NFC interface first needs to be activated in the device.

The NFC interface is activated via the T/R button at the front of the device or via the Modbus interface.

## Function modules

To expand its application range, optionally function modules can be enabled for the RCMS425-D. These function modules can be ordered and activated both when first ordering the device and also later on.

### Function module A: Harmonic analysis (FFT)

Function module A permits analysing harmonics.



With ordering number B84606042 the harmonic analysis is already enabled as a default.

### Function module B: AC/DC sensitive measuring and evaluation of values


All RCMS425-D devices evaluate measuring-current transformers of the types "A" and "F". With function module B also measuring-current transformers of the types "B" and "B+" can be used.



With ordering numbers B84606041 and B84606042 the AC/DC-sensitive measuring and evaluation of values is already enabled as a default.



#### ADVICE

If the function module B is activated at a later date, the settings for each channel under  Settings > Measuring points > Channel must be checked and adjusted.

### Function module C: Connection of Type A external current transformers

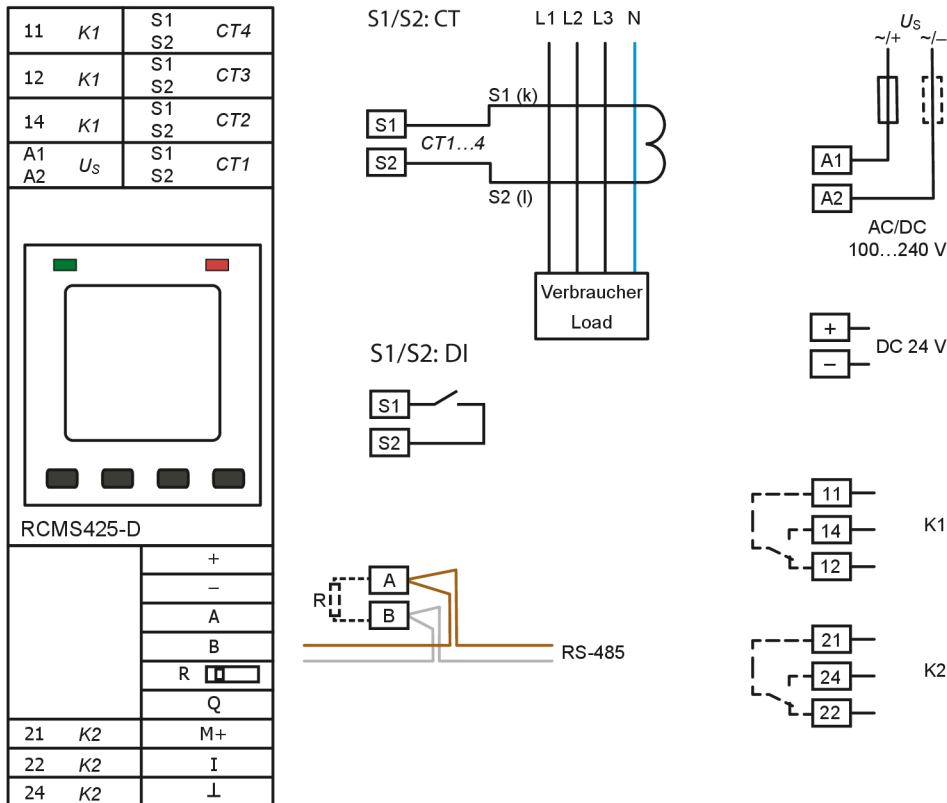
Function module C permits the use of measuring-current transformers by manufacturers other than Bender. When an external current transformer is used, a number of turns must be selected in the corresponding Modbus register (33104...33107).



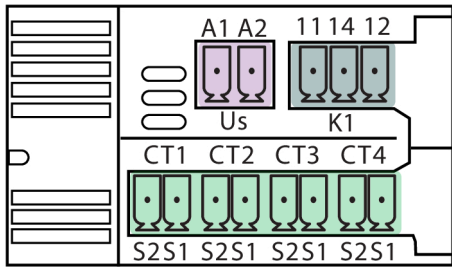
With ordering number B84606042 the connection of external current transformers is already enabled as a default.

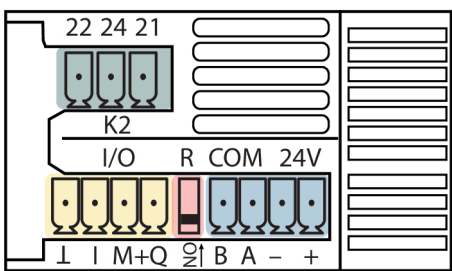
### Function module D: History memory (in preparation)

## Wiring diagram



## Connections overview

Top	Terminal	Description
	A1, A2	Supply voltage AC/DC
	11, 14, 12	Relay K1
	S1, S2 (CT1)	Measuring-current transformer CT1
	S1, S2 (CT2)	Measuring-current transformer CT2
	S1, S2 (CT3)	Measuring-current transformer CT3
	S1, S2 (CT4)	Measuring-current transformer CT4

Bottom	Terminal	Description
	21, 24, 22	Relay K2
	$\perp$	GND
	I	Digital input
	M+	Multifunctional output
	Q	Digital input/output
	ON (R)	Termination of RS-485 interface
	A, B	RS-485 interface: Modbus RTU
	+, -	Supply voltage DC

## Technical data

()\* = Factory setting

### Insulation coordination (IEC 60664-1/ IEC 60664-3)

#### Definitions

Supply circuit (IC1)	A1, A2
Measuring circuit (IC2)	+, -, A, B, M+, Q, I, GND, CT1...4
Control circuit (IC3)	11, 12, 14
Control circuit (IC4)	21, 22, 24

Rated voltage	250 V
Overvoltage category	III
Operating altitude	≤ 2000 m AMSL

#### Rated impulse voltage

IC1/(IC2-4)	6 kV
IC2/(IC3-4)	6 kV
IC3/IC4	6 kV

#### Rated insulation voltage

IC1/(IC2-4)	250 V
IC2/(IC3-4)	250 V
IC3/IC4	250 V
Pollution degree	2

#### Protective separation (reinforced insulation) between

IC1/(IC2-4)	300 V
IC2/(IC3-4)	300 V
IC3/IC4	300 V

### Voltage test (routine test) acc. to IEC 61010-1

IC1/(IC2-4)	AC 2.2 kV
IC2/(IC3-4)	AC 2.2 kV
IC3/IC4	AC 2.2 kV

### Supply voltage (+, -)

Connection	+, -
Supply voltage $U_s$	DC 24 V
Protection class of power supply unit	2 or 3
Permissible tolerance	-30...+25 %
Permissible ripple	5 %
Power consumption	≤ 2 W
Inrush current (< 5 ms)	< 10 A

### Supply voltage (A1, A2)

Connection	A1, A2
Supply voltage $U_s$	AC/DC 100...240 V
Tolerance of $U_s$	-30...+15 %
Frequency range of $U_s$	DC/47...460 Hz
Power consumption	≤ 15 VA at 50 Hz
Inrush current (< 5 ms)	< 25 A

## Measuring circuit

Burden (internal)	33 $\Omega$
Frequency range	DC, 15 Hz...20 kHz
Measuring range (peak)	3 mA...100 A
Measuring range rms	2 mA...70 A
Rated residual operating current	
Type A, Type F	30 A
Type B, Type B+	10 A
Response value main alarm $I_{\Delta n}^{1)}$	
Type A, Type F	6 mA...30 A (30 mA)*
Type B, Type B+	10 mA...10 A (30 mA)*
Prewarning	10...100 % $\times I_{\Delta n}$ (50 %)*
Operating uncertainty	$\pm 10$ % (at 0.5...5 $\times I_{\Delta n}$ )
Relative response uncertainty	
Type A, Type F	6 mA...20 A: -20...0 % 20...30 A: -50...0 %
Type B, Type B+	-20...0 %
Hysteresis	10...25 % (15 %)*
Fault-memory alarm messages	on/off (on)*
Permissible continuous residual current with	
single-channel use	85 A
dual-channel use	60 A
use of three channels	49 A
use of four channels	42 A

1) The requirements of the respective standards are only met with a response value from 30 mA to 9.9 A.

## Measuring-current transformers

Connection	CT1...4 (S1, S2)
Measuring-current transformer series	
Type A	CTAC, CTAS, W, WR, WS
Type F	CTAC
Type B, Type B+	CTUB-CTBC, CTBS
CT connection monitoring	yes
Rated voltage $U_n$	see measuring-current-transformer manual
Connecting wires	see measuring-current-transformer manual
Cable length	
CT Type B	$\leq 10$ m
CT Type A (single wire $\geq 0.75$ mm <sup>2</sup> )	$\leq 10$ m
CT Type A (shielded cable $\geq 0.75$ mm <sup>2</sup> )	$\leq 40$ m
For UL applications	60/75 °C copper conductors
External transformers	
Permissible continuous secondary current with	
Single-channel use	140 mA
Dual-channel use	100 mA
Use of three channels	80 mA
Use of four channels	70 mA
Permissible number of windings	100...2000

## Time response

Start-up delay $t$	0...999 s (0 s)*
Response delay $t_{on}$	0...10 s (0 s)*
Delay on release $t_{off}$	0...999 s (1 s)*
Operating time $t_{ae}$	
with 1 $\times I_{\Delta n}$	$\leq 260$ ms
with 5 $\times I_{\Delta n}$	40...100 ms
Response time $t_{an}$	$t_{an} = t_{ae} + t_{on}$
Recovery time $t_b$	$\leq 500$ ms
Response time for CT connection monitoring	$\leq 10$ s

## RS-485 interface

Connection	A, B
Protocol	Modbus RTU
Baud rate	Max. 115.2 kbits/s (19.2 kbits/s)*
Parity	even, no, odd (even)*
Stop bits	1/2/auto (auto)*
Cable length (at 9.6 kbits/s)	$\leq 1200$ m
Recommended lines, shield on one side connected to PE	
CAT6/CAT7	Min. AWG23
min. J-Y(St)Y 2 $\times 0.6$ mm <sup>2</sup>	Twisted pair
Device address	1...247 (100 + last two digits of serial number)*

## NFC interface

Frequency	13.56 MHz
Transmitting power**	0 W

\*\* EMC influences may lead to communication interruptions at the NFC interface.

## Input I

Connection	$I, \perp$
Max. cable length (recommended)	10 m
External connections	Potential-free contact

## Input/output Q

Connection	$Q, \perp$
Max. cable length (recommended)	10 m
Max. load	20 mA
Low voltage level (output)	0...2 V
High voltage level (output)	10 V... $U_S$
External voltage (passive mode)	DC 0...( $U_S - 1$ V)

## Output M+

Connection	M+, ⊥
Max. cable length (recommended)	10 m
Max. load	20 mA
Burden	
Current output	≤ 600 Ω
Voltage output	≥ 10 kΩ
Tolerance with respect to final current/voltage value	±20 %
External voltage (passive mode)	DC 0...U <sub>S</sub>

## Switching elements

Relays	2 changeover contacts
Connection	11, 12, 14 21, 22, 24
Operating principle	N/C or N/O operation (N/C operation)*
Maximum permitted voltage	AC 380 V / DC 30 V
Switching capacity	1250 VA / 150 W
Minimum current	10 mA at DC 10 V
Electrical endurance, number of cycles	10000

## Connections (A1, A2, relays)

Terminals	Plug-in screw-type terminals
Terminal series	Phoenix Contact MSTBT 2,5/...-ST-5,08 BK
Connection properties	
Rigid	0.2...2.5 mm <sup>2</sup>
Flexible, without plastic sleeve	0.25...2.5 mm <sup>2</sup>
Flexible, with plastic sleeve	0.25...2.5 mm <sup>2</sup>
Stripping length	7 mm
Tightening torque	0.5...0.6 Nm
Conductor cross section AWG	24...12

## Connections (other)

Terminals	Plug-in screw-type terminals
Terminal series	Phoenix Contact MC 1,5/ -ST-3,5 BK
Connection properties	
Rigid	0.14...1.5 mm <sup>2</sup>
Flexible, without plastic sleeve	0.25...1.5 mm <sup>2</sup>
Flexible, with plastic sleeve	0.25...0.5 mm <sup>2</sup>
Stripping length	7 mm
Tightening torque	0.22...0.25 Nm
Conductor cross section AWG	28...16

## EMC/Environment

EMC	DIN EN IEC 62020-1
Operating temperature	-25...+55 °C
Transport	-40...+85 °C
Long-time storage	-40...+70 °C

### Classification of climatic conditions acc. to IEC 60721 (except condensation and formation of ice)

Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

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

Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

## Other

Operating mode	Continuous operation
Mounting	Vertical
Degree of protection (DIN EN 60529)	
terminals	IP20
internal components	IP30
Enclosure material	Polycarbonate
DIN rail mounting acc. to	IEC 60715
Flammability class	UL94 V-0
Weight	≤ 125 g



## Approvals

### Standards & certifications

The RCMS425-D device has been developed in accordance with the following standards:

- DIN EN IEC 62020-1
- UL508



### Licences

For a list of the open-source software used see our [Homepage](#).

### Declaration regarding the radio system

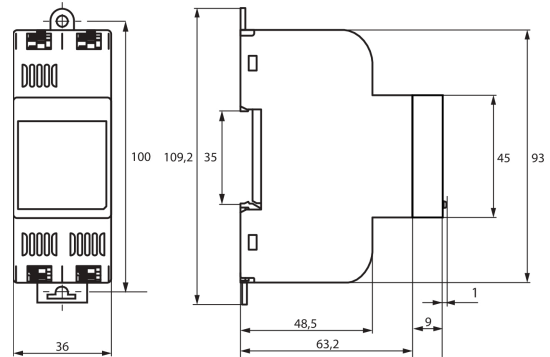
#### EU declaration of conformity

Bender GmbH & Co. KG hereby declares that the device covered by the Radio Equipment Directive complies with Directive 2014/53/EU. The full text of the EU Declaration of Conformity is available at the following internet address:

[EU declaration of conformity](#)

## Dimension diagrams

Dimensions in mm



## Ordering information

Type	Supply voltage $U_s$	Measuring current transformers that can be used		Configurable at the factory	Enabled function modules *	Art. No.
		Type A Type F	Type B Type B+			
RCMS425-D-2	DC 24 V AC/DC 100...240 V	X	(X) with function module B	In preparation	In preparation: Customised ex factory (A, B, C can be bought later)	B84606040
		X	X	-	B (A and C can be bought later)	B84606041
		X	X	-	A, B, C	B84606042

\* Function modules

A: Harmonic analysis (FFT)

B: AC/DC sensitive measuring and evaluation of values

C: Connection of type A external current transformers

Accessories	Art. No.
Sealable transparent cover	B80609299



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Subject to change!

The specified standards take into account the edition valid until 05.2025 unless otherwise indicated.