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www.janitza.com

Expansion module

20CM-CT6

Operating and residual current measurement

User Manual and Technical Data



Janitza electronics GmbH
Vor dem Polstück 6
35633 Lahnau, Germany
Support tel. +49 6441 9642-22
info@janitza.com
www.janitza.com

Janitza®

20CM-CT6
Expansion module for operating and residual current measurement
Doc. no.: 2.050.011.1.e
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The german version is the original version of the documentation

Subject to technical changes.
The content of our documentation has been compiled with the utmost care and is based on the latest information available to us. Nevertheless, we would like to point out that the updating of this document cannot always be performed simultaneously with the further technical development of our products. Information and specifications can be changed at any time.
Please consult www.janitza.com for information on the current version.

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1. General information

1.1 Disclaimer

It is essential that the information products for the devices are observed to ensure safe operation and achieve the specified performance characteristics and product features.

Janitza electronics GmbH assumes no liability for personal injuries, property damage and financial losses resulting from the failure to observe the information products.

Make sure that your information products are legible and accessible.

1.2 Copyright notice

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All rights reserved.

Any duplication, processing, distribution and any other kind of use, even in part, is prohibited.

All trademarks and any resulting rights belong to the respective holders of these rights.

1.3 Technical changes

Make sure that the user manual matches your device.
First, make sure you have read and understood the document accompanying the product.
Keep the documents accompanying the product accessible through its service life and hand them over to the subsequent owner where applicable.
Refer to www.janitza.com for information concerning device revisions and the associated adjustments to the documentation accompanying the product.

1.4 About this user manual

Please send us any questions, comments or suggestions for improvement about the user manual via e-mail to info@janitza.com.

1.5 Defective device/disposal

Send **defective devices** back to the manufacturer for inspection (complete with accessories). Do not attempt to independently open or repair the device since otherwise the warranty claim will expire!

Please observe the national and international regulations for the **disposal** of the device!
In Germany, the 20CM-CT6 module is to be recycled as an electrical device. It may not be disposed with the household waste or as residual waste.
Dispose of individual parts, where necessary, depending on the properties and existing country-specific regulations, e.g. as:
Electronic waste
Batteries and accumulators
Plastic
Metal
or commission a certified disposal company with the scrapping.

Used devices are taken back and disposed by Janitza electronics GmbH upon request.

2. Safety

The safety chapter contain notes that must be observed for your personal safety and to prevent property damage.

2.1 Presentation of warning notices and safety instructions

The warning notices listed below
- can be found in the complete documentation.
- can be found on the devices themselves.
- point out potential risks and dangers.
- confirm information which clarifies or simplifies procedures.



The additional symbol on the device itself indicates an electrical danger that can result in serious injuries or death.



The general warning symbol calls attention to possible risks of injury. Observe all the instructions listed under this symbol in order to prevent injuries or even death.

2.2 Danger levels

Warning notices and safety instructions are highlighted by a warning symbol and the danger levels are presented as follows depending on the level of risk:

⚠ DANGER

Indicates an imminently dangerous situation that will result in serious or fatal injuries in the event of noncompliance.

⚠ WARNING

Indicates an imminently dangerous situation that can result in serious or fatal injuries in the event of noncompliance.

⚠ CAUTION

Indicates an imminently dangerous situation that can result in minor injuries in the event of noncompliance.

ATTENTION

Malfunction or damage to the device due to improper connection.
Indicates an imminently dangerous situation that can result in property damage or environmental damage in the event of noncompliance

NOTE
Points out procedures during which a danger of injuries or property damage does **not** exist.

2.3 Product safety

The device corresponds to the state of the art and complies with the generally accepted safety rules; nevertheless, dangers may arise.
Observe the safety requirements and warning notices. Failure to observe the notices can result in personal injury and/or damage to the product.
Any impermissible modification or use of this device

- exceeding the specified mechanical, electrical or other operating limits can result in personal injury and/or damage to the product.
- applies as "misuse" and/or "negligence" with respect to the product warranty and thus voids the warranty for coverage of potentially resulting damages.

Read and understand the user manual before installation, operation, maintenance and use of the device.

Only operate the device in flawless condition in compliance with this user manual and the accompanying documents. Send defective devices back to the manufacturer taking into consideration the transport conditions.
Keep the user manual through the entire service life of the device and always have it readily available for reference.

Also observe the applicable legal and safety requirements for your system for the respective application when using the device.

2.4 Dangers when handling the device

When operating electrical devices, specific parts of these devices can carry dangerous voltage. Therefore, property damage and personal injuries up to death can occur if they are not handled correctly.
Therefore, when handling our devices, always observe the following:

- Do not exceed the threshold values stated in the user manual and on the rating plate; this must also be observed during inspection and commissioning.
- Observe the safety instructions and warning notices in all documents that accompany the devices.

⚠ WARNING

Risk of injury due to electric voltage!
Serious personal injuries or death may occur!
Therefore, please observe the following:

- Before starting work on your system, disconnect the system from the power supply! Secure it against being switched back on! Determine that there is no current! Ground and short-circuit! Cover or block off neighboring parts that are under voltage!
- Also make sure to check the surrounding area for dangerous voltage and switch it off if necessary during the operation and troubleshooting (especially with top hat rail devices)!
- For work on electrical systems, wear protective clothing and safety equipment according to applicable directives!
- Before connection, ground the device/ components at the ground wire connection, if available!
- Do not touch exposed or stripped cores that are under voltage! Fit wire end ferrules on the conductors made of individual wires!
- Dangerous voltages may be present in all circuit parts connected to the voltage supply.

⚠ WARNING

Please observe the following:

- Secure the supply voltage with a suitable circuit breaker/fuse (for dimensioning, see documentation for the device)!
- Never switch off, dismantle or manipulate safety devices!
- There may still be dangerous voltages present in the device or in the components even after disconnection of the supply voltage (capacitor storage).
- Do not operate equipment with open current transformer circuits.
- Only connect screw-type terminals with the same numbers of poles and same type!
- Do not exceed the threshold values stated in the user manual and on the rating plate; this must also be observed during inspection and commissioning.
- Safety instructions and warning notices in the documents that accompany the devices and their components!

ATTENTION

Changes to the settings and control commands influence the evaluation behavior of the monitoring device. These changes are only to be carried out if the effects are known and desired.
Changes to the commissioning settings for monitoring systems as well as the replacement of an individual 20CM-CT6 are reserved for electrically qualified personnel!
Changes carried out are to be documented!

ATTENTION

The residual current monitoring function of the 20CM-CT6 may only be used for reporting purposes. The 20CM-CT6 is not an independent protective device.

ATTENTION

Observe documentation!
The documentation at hand as well as the device-specific documentation for connected devices must be strictly observed.

2.5 Electrically qualified personnel

To prevent personal injuries and property damage, only electrically qualified personnel may work on the devices and their components, assemblies, systems and circuits. They must also have knowledge

- of the national and international accident prevention regulations.
- of safety technology standards.
- in installation, commissioning, operation, enabling, grounding and labeling of electrical equipment.
- of the requirements for personal protective equipment.
- Electrically qualified personnel, in terms of the safety-related notes in all documents accompanying the device and its components, are persons who can prove a professional qualification as an electrician.

⚠ WARNING

Warning against impermissible manipulations or improper use of the device or its components!
Opening, dismantling or impermissible manipulation of the device and its components, which exceeds the specified mechanical, electrical or other operating limits, can result in property damage or injuries up to death.

- Only electrically qualified personnel may work on the devices and their components, assemblies, systems and circuits!
- Always use your device or components as described in the associated documentation.
- Send the device or components back to the manufacturer in the event of visible damage!

2.6 Warranty in the event of damage

Any impermissible manipulation or use of the device applies as "misuse" and/or "negligence" with respect to the product warranty and thus voids the warranty for coverage of potentially resulting damages. Observe chap. „3.1 Purpose - Intended use“ on page 13 for this.

3. Product description

3.1 Purpose - Intended use

The current and consumption monitoring module 20CM-CT6 (subsequently called 20CM-CT6) is, in connection with UMG 20CM,

- intended for use in industrial and residential sectors
- intended for measurement and calculation of electric values such as operating and residual currents, power, energy, harmonics etc. in the building installation, on distributors, circuit breakers and busbar trunking systems

The 20CM-CT6 is an expansion module for the current and consumption monitoring module (head unit) UMG 20CM. The two devices form a complete current and consumption monitoring system with the indicating instruments or devices for data coupling on third-party systems. This monitoring system increases the system and operational safety. For example, faults or an increase (usually creeping) of residual currents are detected early on, thus allowing preventative maintenance.
Any use of the 20CM-CT6 which differs from the description in this manual is deemed improper use.

3.2 Incoming goods inspection

The prerequisites for smooth and safe operation of this device and its components include proper transport, storage, setup and assembly, operation and maintenance, as well as observance of the safety instructions and warning notices.

Exercise caution when unpacking and packing the device, without using force and only using suitable tools.
Please check

- the devices through a visual inspection to ensure a flawless mechanical condition
- the scope of delivery for completeness

before beginning the installation.

3.3 Storage

Temporary storage of the 20CM-CT6 may only take place in enclosed spaces with adherence to the storage temperature. Furthermore, the 20CM-CT6 is to be stored protected against direct effects of dust, moisture and water.

3.4 EC declaration of conformity

Product designation:
Current and consumption monitoring module
Type: 20CM-CT6 module

The EC declaration of conformity and the accompanying CE mark indicate that Janitza electronics GmbH has manufactured the device according to the directives and standards which apply for the device. The laws, standards and directives applied for the devices by Janitza electronics GmbH can be found in the EC declaration of conformity at www.janitza.de.

3.5 Scope of delivery

The following components are part of the scope of delivery of an individual device:

Number	Item no.	Designation
1	14.01.626	20CM-CT6 module 1 CAN bus cable (20cm) incl.
1	33.03.797	Operating instructions
optional		
1	08.02.447	includes: 1 LCAN-RS45 including 2 CAN bus cable

3.6 Accessories (optional)

3.6.1 GridVis®

If the 20CM-CT6 is programmed and read with the GridVis® software, the 20CM-CT6 must be connected to a UMG 20CM head unit via the CAN bus interface.
The head unit itself can be connected to a superordinate master device, e.g. UMG 96RM-E, via the RS485 interface

GridVis® performance characteristics:
- Configuration of the 20CM-CT6
- Storing of data in a database
- Graphic presentation of the measured values

With the GridVis® software the identity, current measurement transformer, current monitoring, input/output configuration, time, serial interface, name of the inputs and online recording can be set.

With the GridVis® software, the following values, e.g., can be set on the 20CM-CT6:

- Operating mode of the respective measuring channels (residual or operating current monitoring)
- Upper and lower warning threshold for each individual channel
- Upper and lower response threshold for each individual channel
- Hysteresis for all warning and response thresholds for each individual channel
- Delay times for all warning and response messages for each individual channel
- Reset delay times for all warning and response messages for each individual channel

3.6.2 LCAN-RS45

The LCAN-RS45 add-on module (LCAN adapter) is used for the voltage feed to the 20CM-CT6 devices bus (CAN bus). The CAN bus must be provided with a termination resistor at the start and end to prevent reflections (termination). The LCAN-RS45 is installed between the devices of the 20CM-CT6 series.
Thus the voltage coming from the power supply can be fed into the device bus via the LCAN-RS45 and the termination of the CAN bus can occur.

ATTENTION
Observe documentation! Observe the associated documentation when using the adapter.

4. Design of the device

4.1 Device view

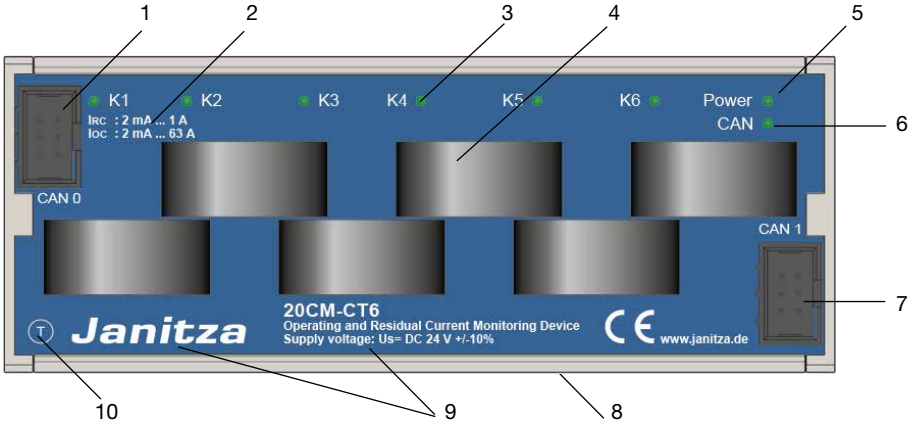


Fig. 1: 20CM-CT6 front view

1	CAN bus input connection (CAN0)	6	CAN LED
2	Metering range	7	CAN bus output connection (CAN1)
3	LEDs for the measuring channels	8	Rating plate with serial number and item number
4	Current measurement transformer (six in total)	9	Manufacturer and technical data (short form)
5	Power LED	10	Key [T]

4.2 Device dimensions

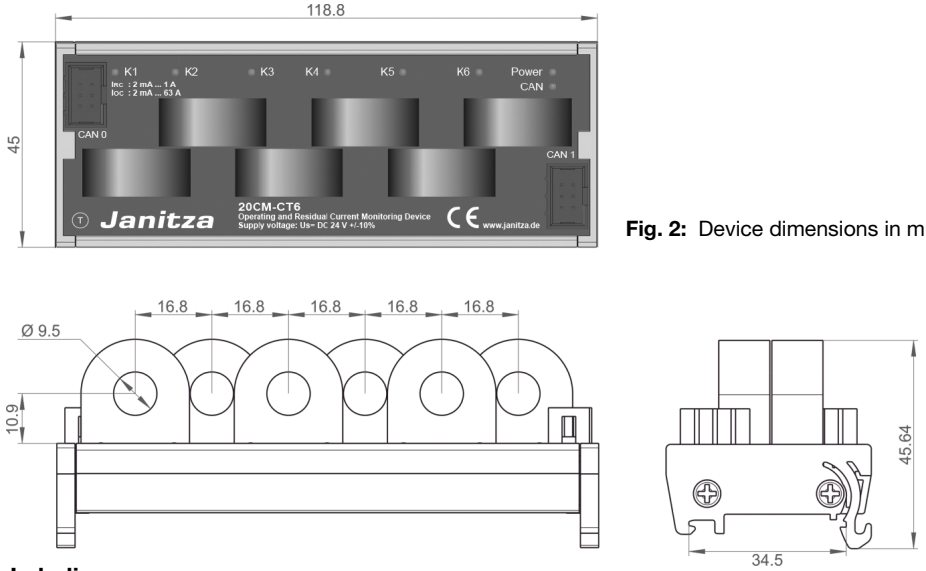


Fig. 2: Device dimensions in mm

4.3 Labeling

The rating plate (label) is attached on the bottom of the device (see item 8, fig. front view) with the following information:

- Device type
- Serial number
- Item number
- Bar code

5. Functional description

5.1 Functional description

The 20CM-CT6 is used as an expansion module for the UMG 20CM head unit. The key functions of the 20CM-CT6 are:

- Operating and residual current measurement
- Parallel measurement value recording via six integrated current measurement transformers
- Automatic switching between the metering ranges
- Historical memory
- Communication and power supply via CAN bus, e.g. receipt of the measured voltages from UMG 20CM
- Parameterization via GridVis®

The 20CM-CT6 does **not** perform any voltage measurement, so stand-alone operation is not possible.

Additional functions of the 20CM-CT6 are:

- Measurement in TN, TT and IT systems
- Evaluation of fault currents (residual currents) type A according to IEC 62020
- Monitoring of the currents for adherence to the configurable threshold values
- Generation of warning and response messages when the threshold value is exceeded
- Display of the threshold value monitoring status with 6 LEDs
- Measurement uncertainty class 1 (IEC/EN 61557-12)

Measurement and calculation:

- Operating currents of the consumer
- Amount and phase angle of the mains frequencies of currents
- Active, reactive and apparent power
- Active energy
- Power factor
- cos(φ)
- Crest factor of currents
- Distortion factor of currents
- 1st to 63rd harmonics of currents
- Fault currents of consumers

Storage of the minimum and maximum values with time stamp:

- Residual and operating current
- Active power

5.1.1 Operating current monitoring principle

Operating currents can be measured via the integrated 20CM-CT6 current measurement transformers.

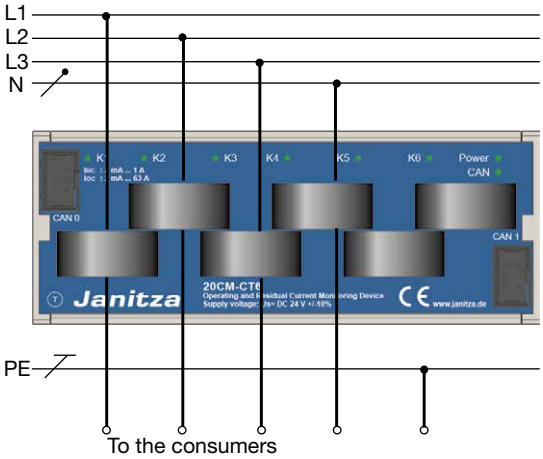


Fig. 3: Simplified presentation of an operating current measurement

A response threshold between 2 mA and 1 A as well as a warning threshold for the respective messages can be set for each measuring channel.

NOTE

The running direction of the integrated current measurement transformer must be observed.

5.1.2 Residual current monitoring principle

The fault currents (residual currents) according to IEC 62020 type A flowing to ground or other paths are recorded via the integrated current measurement transformers. Residual currents can be measured via each channel of the 20CM-CT6, for example:

- Outflow-related fault currents (consumers and systems)
- Stray currents in TN-S systems (PEN and N conductors)

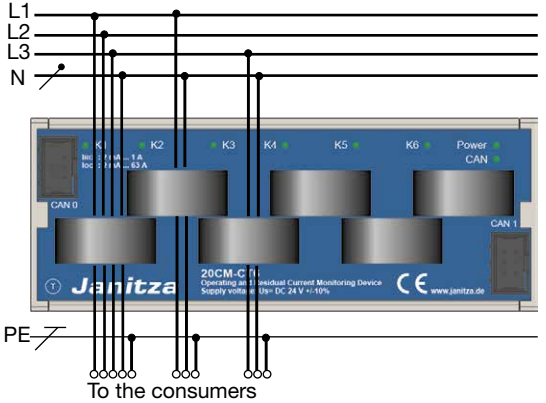


Fig. 4: Simplified presentation of a residual current measurement

A response threshold between 2 mA and 1 A as well as a warning threshold for the respective messages can be set for each measuring channel.

⚠ WARNING

Do not route the PE conductor through the current measurement transformer!

ATTENTION

The residual current monitoring function of the 20CM-CT6 (RCM function) may only be used for reporting purposes. The 20CM-CT6 is not an independent protective device.

5.2 Parameterization options

The parameters are described in the following chapters, which can be changed e.g. using the GridVis® software.

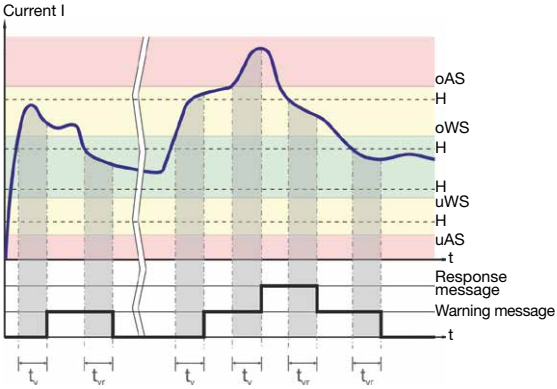


Fig. 5: Parameters for the current monitoring

For abbreviations, see tab. 13.2 "Abbreviations used"

5.2.1 Warning and response thresholds

Warning and response thresholds are parameterizable thresholds, which can be adapted to the currents to be monitored. They can be adjusted separately for each channel.
When reaching these thresholds, warning or response messages are sent. The LEDs for the measuring channels and the digital outputs 1 and 2 of the UMG 20CM warn or alarm the exceeding or falling below of the respective thresholds (See chapter 5.3. Threshold value monitoring).

5.2.2 Hysteresis

Warning and response thresholds have a parameterizable hysteresis. It can be separately defined for each channel and applies for both the warning threshold and the response threshold.
If the measured residual or operating current, for example, exceeds the upper response threshold and thus triggers a response message, this message is only reset after the hysteresis for the upper response threshold is fallen below and the parameterized reset delay time has passed.

5.2.3 Delay times

The following delay times can be set for the residual and operating current monitoring:

1. Delay time for warning and response messages (tv)

Messages for temporary threshold violations are hidden through the parameterization of delay times for warning and response messages. They are only displayed if the delay time has elapsed and the current path is still above the upper threshold or below the lower threshold. The delay times can be adjusted separately for each measuring channel.

2. Reset delay time for response and warning messages (tvr)

If no more messages are pending after a warning or response threshold is exceeded/fallen below, the 20CM-CT6 resets the warning or response threshold.
The reset delay time for the response and warning messages can be parameterized and is required to ignore brief fluctuations. The reset delay times can be adjusted separately for each measuring channel.

Messages are only reset after expiration of the reset delay time if the current path falls below/exceeds the hysteresis of the upper/lower response or warning threshold.

5.3 Threshold value monitoring

The 20CM-CT6 performs a threshold value monitoring for all currents, which can be adjusted via the following parameters:

- Overcurrent response threshold (upper response threshold)
- Overcurrent warning threshold (upper warning threshold)
- Undercurrent warning threshold (lower warning threshold)
- Undercurrent response threshold (lower response threshold)
- Hysteresis for warning and response thresholds
- Delay time for warning and response messages
- Reset delay time for response and warning messages

If a current exceeds the upper response threshold after expiration of the delay time for response messages, the 20CM-CT6 outputs a response message. If the current subsequently falls below the upper response threshold and hysteresis after expiration of the reset delay time, the 20CM-CT6 resets the message again.

The warning messages for exceeding and falling below the warning threshold are generated in the same way based on the settings. Digital output 1 switches in the event of warning messages. Digital output 2 switches when the current levels are exceeded/fallen below (overcurrent/undercurrent error). The threshold values must be set via the GridVis.
The summing channels also supply these four messages. If, e.g., the upper response threshold is set for one of the summed current channels, the 20CM-CT6 outputs a response message for the summing channel.

5.4 Storage function for the messages of the threshold value monitoring

NOTE

The GridVis® software is required to activate the storage function. The storage function is set to "off" by default.

Warning and response messages for the overcurrent and undercurrent can be stored. The messages remain even if the measured current lies within the set threshold value (required range) again. They can only be reset via the Modbus for the connected head unit (UMG 20CM) if the current lies in the required range (including hysteresis) again and the reset delay time has expired.

5.5 Low-pass filter for the RCM function

The upper cut-off frequency for the current measurement of the 20CM-CT6 is 3.3 kHz. If high ohmic or inductive loads are expected, the option exists in RCM operation to activate an additional low-pass filter with a cut-off frequency of 100 Hz. In the range of high frequencies which arise in the capacitive leakage current, the 20CM-CT6 thus reacts less sensitively.
The following figure shows the damping factor (ratio of the current input I_{IN} to the current output I_{OUT}) according to the frequency.

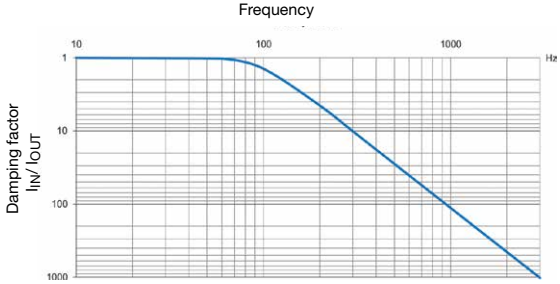


Fig. 6: Damping factor according to the frequency

The current with a frequency of e.g. 300 Hz is damped with a ratio of 10 to 1 (damping factor of 10). Thus, if a response value of 30 mA is set, a current of 300 mA must flow so that the 20CM-CT6 even responds.

NOTE

The low-pass filter only affects the effective value of the current, but not the remaining measured values of the current and analysis channel.
Activation of the low-pass filter occurs via the GridVis® programming software (as of GV 7.3).

5.6 Extreme value storage

The 20CM-CT6 stores the minimum and maximum values of apparent current and active power that arose for each current channel with a time stamp.
The stored extreme values are reset by channel via the head unit (UMG 20CM) through commands via Modbus®. The battery-backed clock of the 20CM-CT6 is set via the head unit via Modbus® .

5.7 Measured value memory/historical data

The 20CM-CT6 files cyclical data sets of measured values in the internal memory. This enables a later evaluation/report generation. The device-internal memory serves as a buffer for the measured value database of the evaluation software, e.g. GridVis®, which connects to the 20CM-CT6 according to a schedule (e.g. monthly) in order to read out the data sets. During a connection, the data collected is read and sorted in the database so that a complete history exists.
The measured value memory is described circularly (circular buffer principle). If the memory is full, the oldest data is overwritten. The period of time until the stored, historical data is overwritten is dependent on the measurement interval. The measurement interval is set via the evaluation software, e.g. GridVis®.

Measurement interval	Period of time available
1 min	8 days
5 min	42 days
10 min	85 days
15 min	127 days
30 min	254 days
60 min	509 days

Tab. 1: Available memory as a period of time depending on the measurement interval

The data set contains the following values, which are calculated via the measurement interval:

- Start and end time of the interval
- Voltages U (strand and phase conductor), arithmetic mean of the effective values
- Current I, arithmetic mean of the effective values

NOTE

The voltages U are sent from the head unit (UMG 20CM) via CAN bus to the 20CM-CT6.

- Active power P, arithmetic mean
- Apparent power S, arithmetic mean
- Active energy W, consumption during measurement interval

NOTE

The summing channels are not recorded.

The measured value memory is not deleted during operation. Data read is not lost, except it is overwritten during the circulation of the memory. Therefore, multiple databases (even on different computers) can be kept current. When updating, a database only reads out the data that has been newly stored since its last updating.

5.8 Measurement method

The 20CM-CT6 measures effective values, powers, etc. continuously. The settling time constant for the measured values is 0.2 s, wherein the measured values are updated every 15 ms. The 20CM-CT6 calculates the characteristic values for the curve shape using an analysis channel. It is possible to program the analysis channel to a current channel in order to calculate the distortion factor, crest factor and harmonics.
The calculation occurs cyclically every second based on the sampled values of a mains period.

5.9 Fault current monitoring

The 20CM-CT6 is used as an expansion module for the UMG 20CM head unit for pulse current sensitive fault current monitoring (type A RCM), among other things.

NOTE

Smooth direct currents cannot be measured.

For each measuring channel, a response value between 2 mA and 1 A and a warning threshold for the respective fault current messages can be set.

ATTENTION

Observe documentation!
Observe the associated documentation for the UMG 20CM head unit.

6. CAN bus interface

The CAN Low/CAN High data line of a bus segment must always be provided with a termination resistor of 120 Ω at the start and end to prevent reflections (termination). The termination of the first and last CAN bus participant occurs via the connection of the LCAN-RS45 (see fig. 8, page 28).

NOTE

The CAN bus interface is reserved exclusively for the communication of the 20CM-CT6 with the head unit (UMG 20CM), as well as the voltage supply of the 20CM-CT6.

ATTENTION

Observe documentation!
Read and observe the respective associated documents (e.g. for the LCAN-RS45 adapter).

6.1 Application example

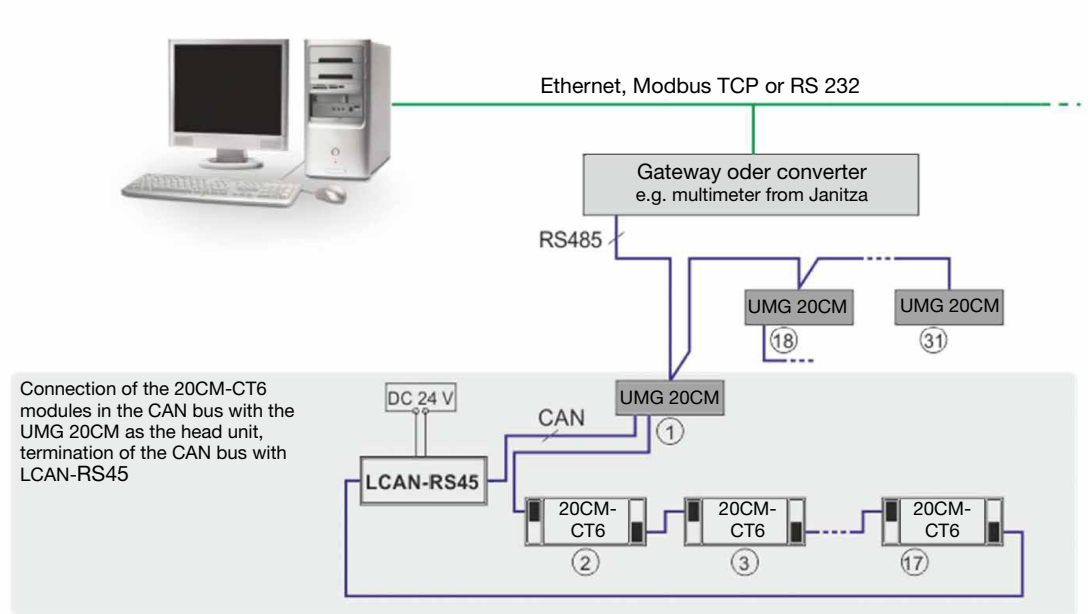


Fig. 7: Schematic overview for the use in the GridVis® monitoring system

6.2 Connection assignment

The first 20CM-CT6 in the bus segment and the last 20CM-CT6 are separately connected to the LCAN-RS45 via the CAN bus input (CAN0) and the CAN bus output (CAN1), respectively, for this.

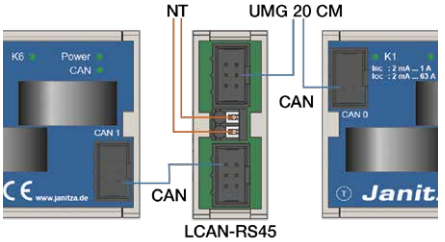


Fig. 8: Schematic presentation of the termination using the LCAN-RS45



Fig. 9: Pin assignment of the CAN bus connections

CAN bus connection assignment (item 1 and 7 in fig. 1 on page 16)	
Pin	**Use**
1	GND (supply voltage)
2	CAN Low
3	Screen
4	CAN High
5	DC 24 V (supply voltage)
6	Screen

Tab. 2: CAN bus connection assignment

7. Assembly, commissioning and configuration

⚠ ATTENTION

Assembly, connection and commissioning may only take place through qualified electrical personnel in compliance with the existing safety regulations and standards.

NOTE

The CAN bus address of the 20CM-CT6 is automatically assigned by the head unit.

7.1 Assembly (initial installation)

⚠ ATTENTION

- The voltage supply of the bus segment must cover the power consumption of the 20CM-CT6.
- The PE conductor is not to be routed through the current measurement transformer.
- The overcurrent protection device must have a nominal value which is rated for the short-circuit current at the connection point.

ATTENTION

Observe documentation!
The documentation for the head unit and the data sheet "LCAN-RS45" are to be observed.

- The 20CM-CT6 is installed in switch cabinets or in small installation distributors according to DIN 43880. The installation position is vertical/ horizontal.
- The assembly occurs on a top hat rail of 35 mm according to DIN EN 60715. The 20CM-CT6 is fastened to the back with the top hat rail clip.
- The 20CM-CT6 is operated via the CAN bus. The CAN bus connection (termination) occurs using the LCAN-RS45.

1. Visually check the 20CM-CT6 for damages.
2. Snap the 20CM-CT6 onto the top hat rail.
3. Check the 20CM-CT6 for tight fit.
4. Lead the lines to be monitored through the integrated current transformers (measurement options according to chapter 5.1.1 and 5.1.2 are to be observed)
5. Connect the CAN bus via the Y-cable to the CAN bus connection of the head unit (4-pin Weidmüller plug) and the CAN bus output of the LCAN-RS45 (6-pin Molex plug).

NOTE
The termination of the first and last CAN bus participant occurs via the connection of the LCAN-RS45.

6. Connect the CAN bus via the second 6-pin Molex connector of the Y-CAN bus cable to the CAN bus input (CAN0) of the first 20CM-CT6 in the bus segment.
7. Connect the CAN bus to the CAN bus output (CAN1) of the 20CM-CT6 via the Molex connector of the supplied CAN bus cable.
8. If necessary, connect the CAN bus to the CAN bus input (CAN0) of the subsequent 20CM-CT6 via the second Molex connector of the supplied CAN bus cable.
9. Repeat work steps 5 and 6 for each additional 20CM-CT6 in the bus segment.

⚠ ATTENTION
A max. of 16 CAN bus participants of type 20CM-CT6 may be connected in one bus segment.

10. Using a 2-way CAN bus cable (scope of delivery of the LCAN-RS45) or a self-assembled CAN bus cable (max. length: 3 m), connect the CAN bus to the CAN bus output (CAN1) of the last 20CM-CT6 in the bus segment and the CAN bus input of the LCAN-RS45.
11. Connect the voltage supply of the LCAN-RS45 to the power supply via the plug connector. The power LEDs of the connected 20CM-CT6 simultaneously light up green and red during the starting process. The 20CM-CT6 is ready for operation as soon as the power and CAN LEDs light up green.

7.2 Commissioning

ATTENTION

Observe documentation!
The documentation for the head unit (UMG 20CM) is to be observed.

Parameterize the head unit (UMG 20CM) with the connected 20CM-CT6 according to the requirements.

7.3 Configuration (parameterization)

No configuration is possible on the 20CM-CT6 itself. Settings are only possible via the additional software (GridVis®).

8. Display and operating elements

The following display and operating elements are on the front side:

- Power LED
- CAN LED
- LEDs K 1 … K 6
- Key [T]

8.1 LEDs for the operating and communication status



Fig. 10: Power and CAN LED

Power LED	
Off	20CM-CT6 has no supply voltage or is defective
Green	20CM-CT6 ready for operation
Flashing yellow	20CM-CT6 starting procedure - no measured values available yet
Red	Fault of the 20CM-CT6
CAN LED	
Green	The communication is ensured.
Red or flashing red	The communication is disrupted
Flashing green	The settings carried out in the GridVis® software are being transmitted to the 20CM-CT6

Tab. 3: Meaning of the power and CAN LEDs

NOTE

The two-color CAN LED signals the CANopen® status according to CiA 303 – part 3 (CAN in automation).

8.2 LEDs for the measuring channels

In each case, one LED (K 1 … K 6) per measuring channel displays the status of the residual or operating current to be monitored.



Fig. 11: LEDs for the measuring channels

Color	Signal	Meaning
Green	Lights up	Current is in the required range Lower warning threshold < current < upper warning threshold
Yellow	Lights up	Warning message (upper warning threshold exceeded)
	Lights up with breaks	Warning message (lower warning threshold fallen below)
Red	Flashing (4 Hz)	Metering range exceeded
	Flashing (1 Hz)	Fault of the measuring amplifier
	Lights up	Response message (upper response threshold exceeded)
	Lights up with breaks	Response message (lower response threshold fallen below)
Off		Current < upper warning threshold AND lower warning threshold = 0 (no lower threshold value set)

Tab. 4: Meaning of the power LEDs for the measuring channels (K 1 … K 6)

8.3 Key [T]

ATTENTION

The key [T] is reserved exclusively for the authorized service technicians of Janitza electronics GmbH.



Fig. 12: Key [T]

9. Operation

No operation is necessary for the 20CM-CT6.

10. Servicing

10.1 Periodic inspection

A visual inspection is to be performed in the course of the maintenance and inspection cycle for stationary electrical systems. This includes adherence to the installation conditions, tight fit of the plug connector and a check for visible damages.

ATTENTION

The applicable national and international standards which require regular inspections of electrical systems are to be observed.

10.2 Maintenance

NOTE

The 20CM-CT6 is maintenance-free as an individual device.
However, it is recommended to perform maintenance on the system and the connections on the 20CM-CT6 annually.

11. Troubleshooting

⚠ ATTENTION

Faults that arise can be relevant to safety.

They must be eliminated immediately by using approved spare parts or devices from the manufacturer, if necessary. Contact Janitza electronics GmbH support for this.

NOTE

Fault messages and device errors are displayed by the LEDs.
Measured values and current operating and error conditions can be transmitted to the head unit (UMG 20CM) via the communication interface (CAN). This information can then be transmitted to the display and evaluation devices via the communication interface of the head unit, as well as be connected to the building control system.

ATTENTION

Observe documentation!
Please observe the documentation for the "LCAN-RS45" adapter

Error pattern:
All LEDs are off (20CM-CT6 is not ready for operation).

Cause:
Power supply interrupted or 20CM-CT6 defective
Remediation:

1. Check the plug for the CAN bus connections on the 20CM-CT6 for tight fit.

NOTE

The voltage supply for the 20CM-CT6 occurs via the CAN bus.

2. Check the supply voltage for the CAN buses on the LCAN RS45.
3. Make sure that the CAN bus on the CAN bus input (CAN0) of the first 20CM-CT6 is connected in the bus segment and the LCAN-RS45.

4. Make sure that the CAN bus to the CAN bus output (CAN1) of the last 20CM-CT6 is connected in the bus segment and the LCAN-RS45.
5. Contact support in order to replace the 20CM-CT6, if necessary.

Error pattern:
Power LED lights up red or flashes yellow.

Cause:
Fault of the 20CM-CT6
Remediation:
1. Contact support in order to replace the 20CM-CT6, if necessary.

Error pattern:
CAN LED lights up or flashes red.

Cause:
CAN bus disrupted
Remediation:
1. Check the plugs for the CAN bus connections on all 20CM-CT6 in the bus segment for tight fit.
2. Make sure, for each 20CM-CT6 in the bus segment, that the CAN bus on the CAN bus output (CAN1) is connected to the CAN bus input (CAN0) of the subsequent 20CM-CT6.
3. Make sure that the CAN bus input (CAN0) of the first 20CM-CT6 in the bus segment is connected to the UMG 20 CM and the LCAN-RS45 CAN bus module using a Y-cable.
4. Make sure that the CAN bus to the CAN bus output (CAN1) of the last 20CM-CT6 is connected in the bus segment and the LCAN-RS45.
5. Contact support in order to replace the 20CM-CT6, if necessary.

Error pattern:
One or more LEDs K 1... K 6 are flashing red.

Cause:
Metering range exceeded
Remediation:
1. When possible, check the currents to be measured with a multimeter.
2. Contact support in order to replace the 20CM-CT6, if necessary.

12. Technical data

General information	
Device dimensions in mm (W x H x D)	119 x 47 x 45
Net weight	170g
Operating mode	Continuous operation
Protection type per DIN EN 60529	IP20
Protection class	III
Flammability rating	UL-V0
The device fulfills the requirements according to the standards	EN 62020:1998+A1:2005, (VDE 0663):2005

Ambient conditions	
Temperature range (operation)	-10°C .. +55 °C
Storage temperature	-25°C .. +70 °C
Altitude	0 .. 2000m above sea level
Relative humidity (operation)	5 to 95 % (at 25 °C)
Pollution degree	3
Installation position	vertical/horizontal
Assembly	35 mm top hat rail per DIN EN 60175
Supply voltage	
Supply voltage Us (via internal bus)	DC 24 V (± 10 %, PELV)
Power consumption (internal consumption)	2 W

Measurement	
Type of measurement	Continuous true effective value measurement up to the 63rd harmonic
Measurement in quadrants	4
Systems	TN, TT, IT
Measurement in single-phase/multi-phase networks	1 ph, 2 ph, 3 ph and up to 6 times 1 ph
Number of measuring channels	6
Number of measuring channels in the bus segment	max. 96
Measured value recording	Parallel, effective value measurement (true RMS)
Rated voltage (current measurement transformer)	AC 250 V
Rated frequency (current measurement transformer)	50 Hz
Operating trigger current	AC 2 mA … 63 A
Residual trigger current	AC 2 mA … 1 A
Resolution 2 mA … 1 A 1 A … 63 A	0.5 mA 35 mA
Cut-off frequency	3.3 kHz
Relative deviation (metering range)	± 0,5 %
Frequency range	45 … 65 Hz
Monitoring function	
Response function	0 … 650 s [10 ms]
Reset delay	0 … 650 s [10 ms]
Resolution of the delay	10 ms

Communication interface/protocol	
Interface	2 x CAN/CAN 2.0 (according to ISO 11898)
Protocol	CANopen
CAN bus connection type (CAN bus connector)	2 x 6-pin Molex tray connector; Type 901301106
Connection cross section (single core/fine-stranded)	max. 9.3 mm (all cables and individual cores)
Displays and messages	
Displays (operating and communication status) (power of the measuring channels)	2 x multi-color LEDs 6 x multi-color LEDs
Messages	LED/CAN bus
Electromagnetic compatibility (EMC)	Per IEC/EN 61326-1
Immunity from interference	
Basic standard	IEC/EN 61326-1
Electrostatic discharges	IEC/EN 61000-4-2
High frequency electromagnetic fields	IEC/EN 61000-4-3
Rapid transient disturbances	IEC/EN 61000-4-4
Surge voltages	IEC/EN 61000-4-5
Conducted disturbances, induced by high frequency fields	IEC/EN 61000-4-6
Magnetic fields with power frequencies	IEC/EN 61000-4-8
Emissions	
Basic standard	IEC/EN 61326-1
RFI field strength 30 ... 1000 MHz	IEC/CISPR11/EN 55011
Radiated interference voltage 0.15 ... 30 MHz	IEC/CISPR11/EN 55011

Order information (item no.)	
20CM-CT6 module	14.01.626
LCAN-RS45 including cable and plug (optional)	08.02.447
Power supply (optional)	16.05.011

13. Appendix

13.1 Measurement function

The head unit transmits the effective values of the star voltages L-N and the phase conductor voltages L-L to the 20CM-CT6. The 20CM-CT6 outputs the effective value of the operating current I, the active power P and the active energy W for each current channel.
From this, it calculates:

- Apparent power $S = U \cdot I$
- Reactive power $Q = \sqrt{S^2 - P^2}$
- Power factor $\lambda = \frac{|P|}{S}$ (ideal: λ =0.95)
- Power factor of the mains frequency $cos\,(\Phi) = \frac{P1}{S1}$

The 20CM-CT6 measures the amount and the phase angle of the mains frequency for all currents. The amount is specified as the effective value.

The phase angle of a current channel relates to the voltage channel assigned to it.
A phase angle is positive if the measured variable of the reference value hurries ahead. A positive angle for a current channel means a capacitive load.
In addition to the phase angle φ of a current channel, the device calculates the cos(φ).

From the temporal evolvement of the current over a period, it determines:

- Crest factor $K_S = \frac{I_S}{I}$

  with peak value of the current I_S
- Harmonic content $H_n = \frac{I_n}{I} \cdot 100$

  with effective value of the harmonic I_n for n = 1 … 63
- Distortion factor $Kf = \frac{\sqrt{\sum_{n=2}^{63} I_n^2}}{I}$

The characteristic values are determined using an analysis channel, which is configured on any current channel (GridVis®).
The 20CM-CT6 has three summing channels, with which the active power and active energy of any current channels can be added.

13.2 Abbreviations used

Abbreviation	Meaning
H	Hysteresis
I	Current (residual or operating current)
I_{IN}	Current input
I_{OUT}	Current output
L1…3	Phase 1…3
N	Neutral conductor
oAS	Upper response threshold
oWS	Upper warning threshold
PE	Protective Earth (protective conductor)
PEN	Protective Earth Neutral (combined protective and neutral conductor)
RCM	Residual Current Monitoring
t	Time
t_V	Delay time for warning and response messages
t_{Vr}	Reset delay time for response and warning messages
uAS	Lower response threshold
uWS	Lower warning threshold

13.3 Notes on terminology

Only the names of the respective device series are specified in the documentation, but not all the associated types.
In the manual at hand, the standard-compliant designation of the not grounded power supply system "IT system" is used. Technically equivalent is the colloquial term "IT network". The same applies for the grounded power supply system with transformer "TN system" and the grounded power supply system with transformer and separately grounded protective conductor "TT system".
Furthermore, the term "current" is used in the manual for residual and operating current, and the term "RCM operation" is used for the operation of the 20CM-CT6 when using the residual current monitoring function.

13.4 Function characteristics

Function	Symbol	Accuracy class/relative measurement error	Metering range
Total active power	P	2 (EN 61557-12)	- 90 … + 90 kW
Active power for phase conductor p	Pp	2 (EN 61557-12)	-15 … +15 kW
Total reactive power	QA, QV	-	-
Reactive power for phase conductor p	Qp	2 (EN 61557-12)	0 … 15 kvar
Total apparent power	SA, SV	-	-
Apparent power for phase conductor p	Sp	1 (EN 61557-12)	0 … 15 kVA
Total active energy	Ea	2 (EN 61557-12)	- 429 … + 429 GWh
Active energy for phase conductor p	Ep	2 (EN 61557-12)	- 22.9 … + 22.9 GWh [1)]
Total reactive energy	ErA, ErV	-	-
Total apparent energy	EapA, EapV	-	-
Frequency	f	-	-
Phase current	I	0.5 (EN 61557-12)	0 … 63 A_{eff}
Measured neutral conductor current	IN	0.5 (EN 61557-12)	0 … 63 A_{eff}
Residual current	IDiff	± 0.5 %	2 … 1000 mA_{eff}
Voltage	UL-N (Vp)	-	-
Voltage		-	-
Total power factor	PFA, PFV	-	-
Power factor for phase conductor p	PFp	1 (EN 61557-12)	-1 … +1
Short-term/long-term flicker	Pst, Plt	-	-
Voltage dips	Udip	-	-
Voltage swells	Uswl	-	-

Function	Symbol	Accuracy class/relative measurement error	Metering range
Transient voltage swell	Utr	-	-
Voltage interruption	Uint	-	-
Voltage unbalance	Unba	-	-
Voltage unbalance	Unb	-	-
Voltage harmonics	Uh/U	-	-
THD of the voltage	THDu	-	-
THD of the voltage	THD-Ru	-	-
Current harmonics	Ih/I	± 2 %	0 … 100 %, up to 1.8 kHz [2])
THD of the current	THDi	-	-
THD of the current	THD-Ri	± 2 %	0 … 100 %
Mains signal voltage	Msv	-	-

[1]) When the maximum value is reached, the display jumps to the opposite end of the metering range.
[2]) Large measurement errors must be expected above the specified frequency.
At 3.2 kHz, up to ± 20 % can arise.

Janitza®

Janitza electronics GmbH
Vor dem Polstück 6 | 35633 Lahnau
Germany

Tel. +49 6441 9642-0
info@janitza.com | www.janitza.com