# TM-CB M

1/5-006-00
2/7-006-01
3/7-112-01
4/12-112-04
5/20-112-04
6/26-112-07
6/28B-112-07
7/33-112-07

8/40-220-07
8/45-220-07
8/55-220-07
8/65-220-07
8/75h-220-07
8/80-220-07
8/90-220-07
8/100h-220-07
8/120h-220-07
8/134-220-07

9/55-220-15
9/65-220-15
9/75-220-15
9/80-220-15
9/90-220-15
9/100h-220-15
9/120h-220-15
9/134-220-15

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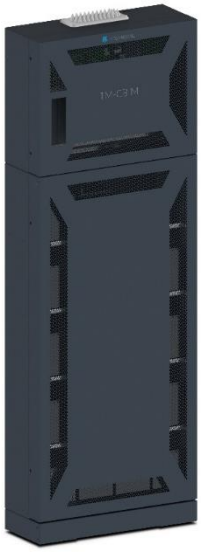
10/150-220-15

# CENTRAL BATTERY SYSTEM

Operation and Maintenance Documentation 1.04.005/22.10.2024/IP30



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## 1. Introduction

Emergency lighting comprises a set of fire safety devices that, in the event of a threat, allow for the safe evacuation of individuals in a building.

Legal requirements regarding the automatic activation of emergency power supplies and guidelines concerning the scope of emergency lighting usage mandate building owners or users to check the condition of these devices and maintain them in proper working order. Proper operation and maintenance require a significant investment of time and, in many cases, can be challenging work, which may lead to tragic oversights or neglect.

TM Technologie has developed the TM-CB M central battery system, enabling supervision of circuits and luminaires that are part of the system. The control and power supply unit of the TM-CB M system designed for powering, controlling, and monitoring emergency lighting circuits and luminaires in public utility buildings. It determines their status by automatically performing functional tests and runtime tests, along with verifying parameter correctness. Thanks to this solution, users can quickly and easily receive information about all circuits and luminaires installed in the facility from a single location.

Each control and power supply unit can operate as a standalone device and is intended for indoor use.

## 2. Name decoding

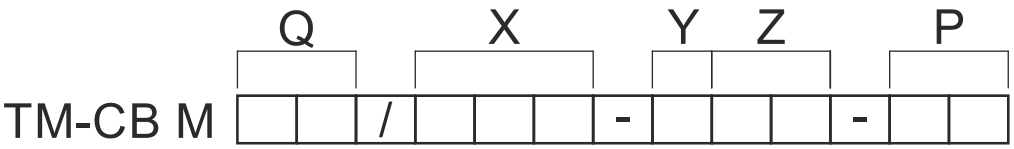



Table 1. Name decoding

| TM-CB | M | Q<br>Closed enclosure | X<br>Battery Capacity [Ah] | Y<br>Main Board Type | Z<br>Maximum Number of Circuits in the Station | P<br>Maximum Number of Sub-distributions |
|---|---|---|---|---|---|---|
| Product family | 230 AC / 216 DC | 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10 | 5<br>7.2<br>12<br>18<br>20<br>26<br>28<br>34<br>40<br>45<br>55<br>65<br>75<br>80<br>90<br>100<br>120<br>130<br>150 | 0<br>1<br>2 | 06<br>12<br>20<br>40 | 0<br>1<br>4<br>7<br>15 |

Table 2. Parameters for the TM-CB M models

| Model | Power* [W] | | | | The minimum number of sub-distributions required to optimally utilize the system power for 1 hour. | Maximum number of sub-distributions | Maximum number of circuits (main station ZG + sub-distribution ZPR) | Maximum number of luminaires | Cross-section of DC cables for sub-distribution power supply [mm²] | Required external AC type B protection [A] |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1h | 2h | 3h | 8h | | | | | | |
| 1/5-006-00 | 690 | 380 | 300 | 140 | 0 | 0 | 6 (6 + 0) | 120 | 2.5 | 10 |
| 2/7-006-01 | 980 | 500 | 380 | 170 | | 1 | 26 (6 + 20) | 520 | | |
| 3/7-112-01 | 980 | 500 | 380 | 170 | | | 32 (12 + 20) | 640 | | |
| 4/12-112-04 | 1800 | 970 | 700 | 320 | | 4 (1 + 3) | 92 (12 + 80) | 1840 | | 16 |
| 5/18-112-04 | 2390 | 1350 | 990 | 450 | | | | | | |
| 5/20-112-04 | 2630 | 1600 | 1060 | 470 | 1 | 7 (1 + 2 x 3) | 152 (12 + 140) | 3040 | | |
| 6/26-112-07 | 3160 | 1710 | 1390 | 640 | | | | | | |
| 6/28B-112-07 | 3490 | 2170 | 1440 | 670 | | | | | | |
| 7/33-112-07 | 4320 | 2640 | 1830 | 840 | | | | | | |
| 8/40-220-07 | 5080 | 3150 | 2150 | 990 | 2 | 7 (1 + 6) | 160 (20 + 140) | 3200 | 2.5 | 40 |
| 8/45-220-07 | 5770 | 3200 | 2430 | 1110 | | | | | | |
| 8/55-220-07 | 7480 | 3900 | 3150 | 1410 | | | | | 4 | |
| 8/65-220-07 | 7970 | 4560 | 3580 | 1530 | 3 | | | | 6 | |
| 8/75h-220-07 | 9820 | 5630 | 4140 | 1890 | | | | | | |
| 8/80-220-07 | 10280 | 5940 | 4560 | 1640 | 4 | | | | 10 | |
| 8/90-220-07 | 11390 | 6580 | 5050 | 2100 | | | | | | |
| 8/100h-220-07 | 13300 | 7410 | 5650 | 2580 | 5 | | | | 16 | |
| 8/120h-220-07 | 13780 | 8460 | 6280 | 2870 | 6 | | | | | |
| 8/134-220-07 | 16850 | 10460 | 7150 | 3190 | | | | | | |
| 9/55-220-15 | 7480 | 3900 | 3150 | 1410 | 2 | 15 (7 + 8) | 320 (20 + 300) | 6400 | 4 | 40 |
| 9/65-220-15 | 7970 | 4560 | 3580 | 1530 | 3 | | | | 6 | |
| 9/75-220-15 | 9820 | 5630 | 4140 | 1890 | | | | | | |
| 9/80-220-15 | 10280 | 5940 | 4560 | 1640 | 4 | | | | 10 | |
| 9/90-220-15 | 11390 | 6580 | 5050 | 2100 | | | | | | |
| 9/100h-220-15 | 13300 | 7410 | 5650 | 2580 | 5 | | | | 16 | |
| 9/120h-220-15 | 13780 | 8460 | 6280 | 2870 | 6 | | | | | |
| 9/134-220-15 | 16850 | 10460 | 7150 | 3190 | | | | | | |
| 10/120-240-15 | 14740 | 8820 | 6300 | 2880 | 6 | 15 (7 + 8) | 320 (20 + 300) | 6400 | 16 | 40 |
| 10/150-240-15 | 18340 | 11910 | 8150 | 3760 | 7 | | | | | |

*NOTE! The power calculated for Ta = 20 °C - in the case of extreme device operating temperatures, this power is subject to correction according to the battery performance characteristics (For example, at 0 °C, it should be reduced to 80% level).

NOTE! For the list of batteries used in TM-CB M models, see Table 18.

The manufacturer reserves the right to note that due to the use of equivalent battery packs from different manufacturers, the designated power of the system may vary within a range of +/- 5%.

Table 3. TM-CB M SUB Sub-distribution Parameters Table

| Model | Design power [W] | Maximum number of circuits | Maximum number of luminaires | Required external AC type B protection [A] |
|---|---|---|---|---|
| TM-CB M SUB PR12 | 2500 | 12 | 240 | 16 |
| TM-CB M SUB PR20 | 2500 | 20 | 400 | 16 |

## 3. Device Description

The TM-CB M central battery system allows, depending on the modules used, the connection of LED, halogen, and fluorescent luminaires. The station supports 6/12/20 circuits, depending on the version. Sub-distributions can be connected to the main station (excluding TM-CB M1). Depending on the version, the sub-distribution allows the system to be expanded by an additional 12/20 circuits. The TM-CB M supports up to 15 sub-distributions. The maximum number of supported circuits is 320, which enables the connection and monitoring of up to 6,400 luminaires, provided their total power does not exceed the system's maximum power.

Table 4. Compatible system components

| Model | Housing, batteries, accessories | ZG6 | ZG12 | ZL5 | ZPR12 | ZPR20 | VTM |
|---|---|---|---|---|---|---|---|
| TM-CB M1 | + | + | - | - | - | - | option |
| TM-CB M2 | + | + | - | - | - | - | option |
| TM-CB M3 | + | - | + | - | - | - | option |
| TM-CB M4 | + | - | + | - | - | - | option |
| TM-CB M5 | + | - | + | - | - | - | option |
| TM-CB M6 | + | - | + | - | - | - | option |
| TM-CB M7 | + | - | + | - | - | - | option |
| TM-CB M8 | + | - | - | + | - | + | + |
| TM-CB M9 | + | - | - | + | - | + | + |
| TM-CB M10 | + | - | - | + | - | + | + |
| TM-CB M SUB PR12 | Only housing | - | - | - | + | - | - |
| TM-CB M SUB PR20 | Only housing | - | - | - | - | + | - |

✓ The main kit (ZG6 / ZG12) consists of the following components:

- Coordinator main station CU-C (address 0) - quantity 1;
- Power module PWU-C - quantity 1 (model according to table point 8.5);
- Circuit controller MCL-x - quantity 6 or 12 (default installation includes 1 unit);
- Charger PSU2-C – quantity 1;
- Charging control module CHC-C version 1-7 - quantity 1

✓ The charger set (ZL5) consists of the following components:

- Charging control module CHC-C version 8-10 - quantity 1;
- Charger PSU2-C - quantity 1 to 5 depending on the model.

✓ The sub-distribution kit (ZPR12 / ZPR20) consists of the following components:

- Sub-distribution coordinator CU-C (address 1 - 15) - quantity 1;
- Power module PWU-C - quantity: 1 (model according to table point 8.5);
- Circuit controller MCL-x - quantity: 12 or 20 (default installation includes 1 unit);

Optionally, the following can be connected to the device:

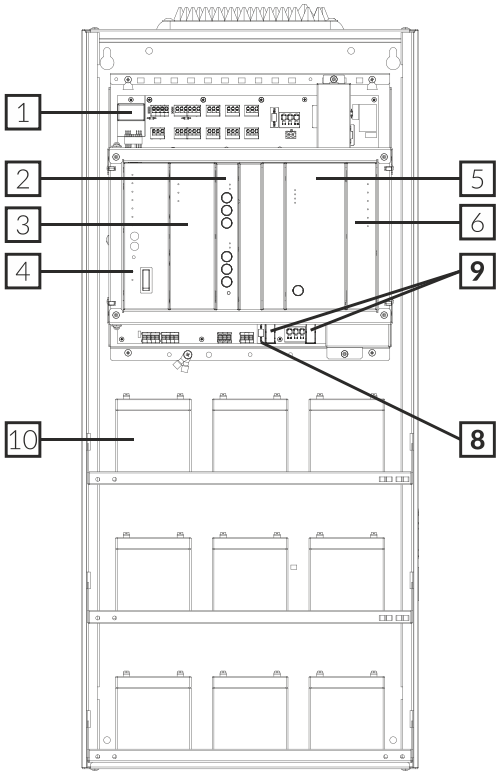
- Luminaires designed for DC power supply,
- Universal addressable modules TM-AM 01M, TM-AM 01SM, TM-AM 01M MICRO(MINI), see point 8.10 and point 8.11,
- Dedicated addressable modules TM-AM 02HM, TM-AM 02VM, TM-AM 03M, luminaires produced by TM Technologie, see point 8.9,
- VTM modules monitoring batteries status (accessory TM-MN.CB02Mx, see point 6.2 and point 8.7),
- TM-I/O modules (IN SW, IN 24, IN 230, OUT, and IN/OUT models) + power supply (accessory TM-MN.CB03x), see point 6.3 and point 8.8,
- External phase monitor.

For TM-CB M SUB PR12 or PR20 sub-distributions, it is necessary to supply local (e.g., from the floor sub-distribution) primary AC power, RS-485 communication cable for communication with the main station, and DC battery power from the main station.

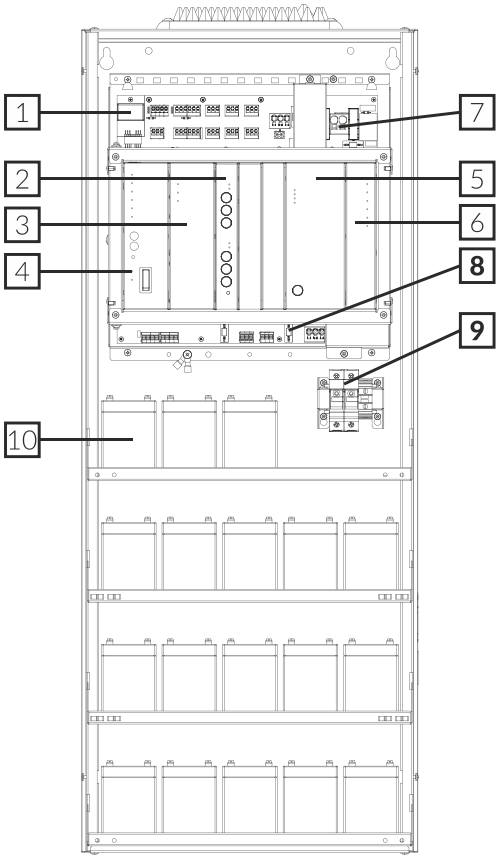
Circuit controllers can be installed in any configuration, mixing single and dual-circuit versions in all stations and sub-distributions. For example, the main kit ZG6 has three slots where circuit controllers can be installed in the following combinations: (2, 2, 2); (2, 1, 2); (1, 2, 2); (2, 2, 1); (2, 1, 1); (1, 1, 2); (1, 1, 1); (2, 2, 0); (2, 1, 0); (2, 0, 0); (2, 0, 2); (2, 0, 1); (1, 2, 0); (1, 1, 0); (1, 0, 0); (1, 0, 1); (1, 0, 2); (1, 2, 1).

The default factory combination is (2, 0, 0) - meaning a dual-circuit MCL-C controller installed and two empty slots.

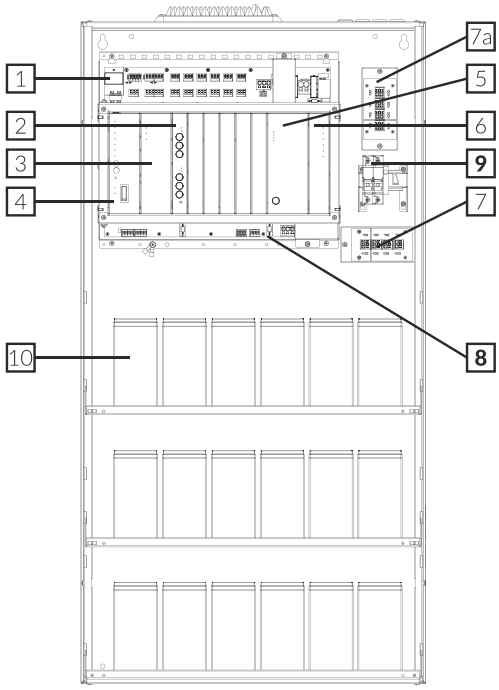
### 3.1. List of elements



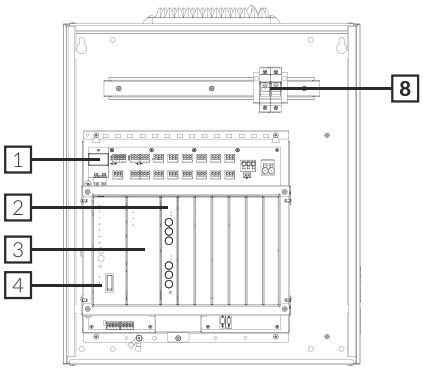

TM-CB M1 station



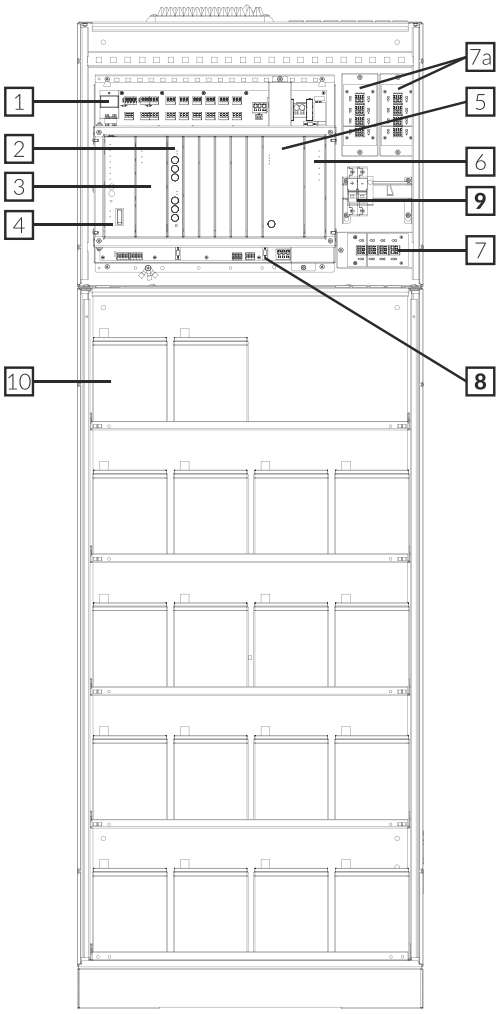

TM-CB M2 / 3 station



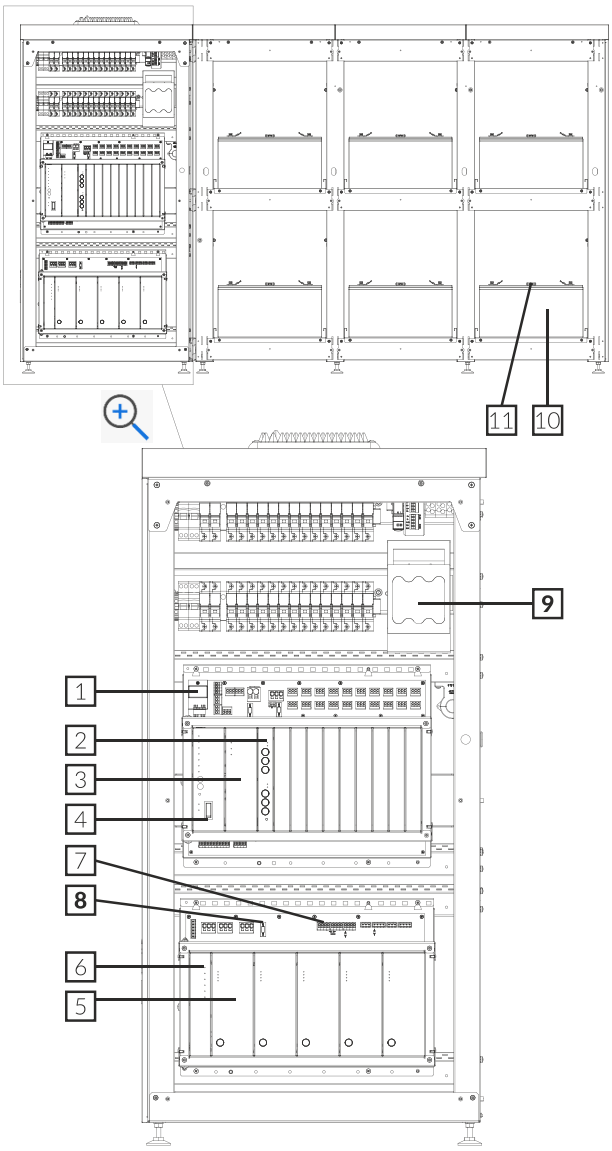

TM-CB M4 / 5 station




TM-CB SUB ZPR12 / 20 sub-distribution




TM-CB M6 / 7 station




TM-CB M8 / 9 / 10 station

| Nr | Description |
|---|---|
| 1 | Total Stop power supply (see point 3.5) (only in TM-CB M1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 stations) |
| | Power supply, optionally as an accessory (TM-AKC.CB03x, see point 6.3) with TM-I/O module (in the TM-CB SUB ZPR12/20 sub-distribution board) |
| 2 | Circuit controllers (up to 3 or 6 units in a station; up to 6 or 10 units in a sub-distribution) MCL-C, MCL-H, MCL-A, MCL-B |
| 3 | Power module PWU-C |
| 4 | Coordinator CU-C |
| 5 | Charger(s) PSU2-C |
| 6 | Charger controller CHC-C |
| 7 | DC outputs to the sub-distribution board (not applicable to TM-CB M1 station) |
| 7a | DC outputs to the sub-distribution board as an accessory (TM-MN.CB01MS, see point 6.1) for TM-CB M4 / 5 / 6 / 7 stations |
| 8 | Battery fuses (symmetry) ("+/-") |
| 9 | Battery fuses ("B-"; "B+") |
| 10 | Batteries 12V (18 pieces) |
| 11 | Single battery control module VTM (by default for TM-CB M8 / 9 / 10 stations), optionally as an accessory (TM-MN.CB02Mx, see point 6.2) for TM-CB M1 / 2 / 3 / 4 / 5 / 6 / 7 stations |

### 3.2. System Characteristics

System General description

The TM-CB M central battery system, unlike the previous generation TM-CB A, can operate within a much wider load power range (up to 17.5 kW for 1 hour), and its basic topology has changed. Instead of a main station and multiple substations, the new system uses a main station and multiple sub-distribution boards. In the TM-CB A system, the substations have installed batteries, whereas in the TM-CB M system, the sub-distribution boards do not have them. This topology facilitates easier maintenance of the facility.

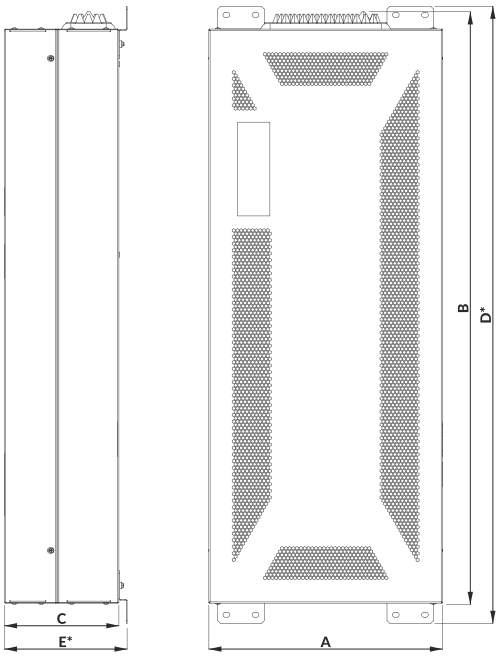
Features and Functions of the TM-CB M System

- ✓ Modular construction
- ✓ Auto-detection of installed cards.
- ✓ Status signaling (supervision state, emergency operation state, fault state, lockout state, testing state).
- ✓ Outputs for fault signaling (capability to relay fault information to other systems or devices).
- ✓ Ability to lock luminaires to prevent unauthorized configuration changes.
- ✓ Changing operating mode and configuration of addressable luminaires from the central unit.
- ✓ Easy wire installation, requiring no specialized tools.
- ✓ Capability to use sub-distributions.
- ✓ Programmable operation mode for individual circuits (M, NM, OFF).
- ✓ Maximum supported circuit count: 320.
- ✓ Monitoring circuit and luminaire status, error detection, communication break detection.
- ✓ Insulation state monitoring (ground fault indication).
- ✓ Mixed luminaire operation mode on a single circuit (M, NM).
- ✓ Checking light source status during luminaire testing (fault indication in case of light source disconnection or short circuit).
- ✓ Up to 20 circuits per station and sub-distribution.
- ✓ Up to 20 luminaires on a single circuit (regulatory requirement).
- ✓ Up to 6,400 connected luminaires.
- ✓ RFID-based wireless address change capability for VTM battery monitoring modules.
- ✓ RFID-based wireless address change capability for luminaires.
- ✓ CC/CV charging for battery lifespan improvement, fast charging mode.
- ✓ Intuitive and easy configuration.
- ✓ Protection against unauthorized access.
- ✓ Daily and annual tests controlled by microprocessor.
- ✓ Storage of test result reports.
- ✓ Ethernet network connection capability (Modbus registers).
- ✓ Report download to USB drive via USB port.

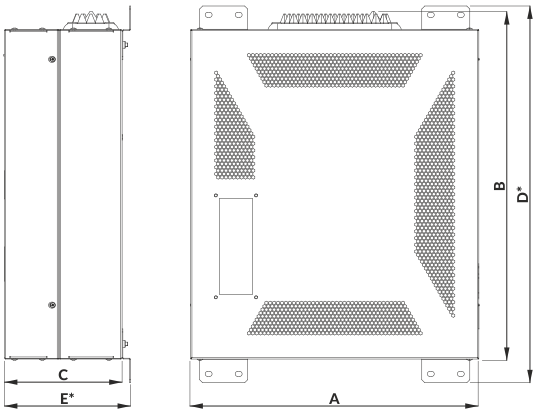
- ✓ Quick and easy configuration and system status preview via USB port using intuitive VisualBase software.
- ✓ System visualization (optional) using VisualSite device and application.
- ✓ Total Stop functionality (optional), requires power supply module with Total Stop function.
- ✓ Support for schedules (up to 128) and external triggers allowing full system configuration.
- ✓ Night and fire groups (up to 64) facilitating control of daylight and emergency lighting.
- ✓ Detection of duplicated luminaires on circuits.
- ✓ Ability to assign circuits to night group.
- ✓ Ability to assign luminaires to night and fire groups.
- ✓ Repeater function, which can be activated if necessary in installed addressable luminaires to extend transmission range.
- ✓ Reading hardware and software version and ERP codes from individual system components to facilitate servicing.
- ✓ Selected addressable luminaires have the ability to adjust light intensity in AC, DC mode, or during activation of assigned night group in the range of 0 – 100% (DIMM function).
- ✓ Logging of system and VTM logs, and test history.
- ✓ Configuration export and restore.
- ✓ Working time configuration (unlimited, 1h, 2h, 3h, 8h) for individual circuits and luminaires.

Table 5. System characteristics

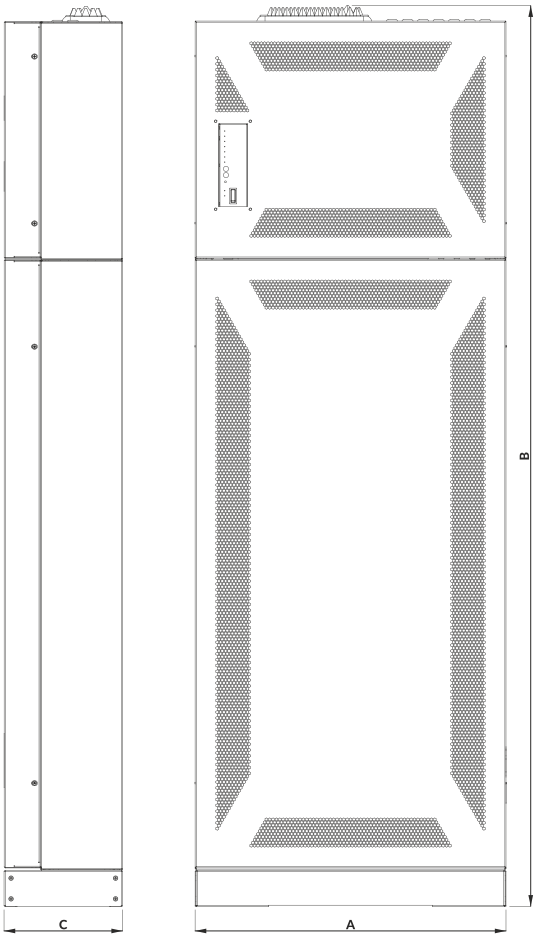
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Power supply | 230 V AC / 50 ÷ 60 Hz | | | | | | |
| Nominal voltage | 216 V DC for batteries | | | | | | |
| Batteries [12 V] | Station | Maintenance-free batteries | | | | | |
| | TM-CB M1 | 5 Ah | | | | | |
| | TM-CB M2 | 7.2 Ah | | | | | |
| | TM-CB M3 | 7.2 Ah | | | | | |
| | TM-CB M4 | 12 Ah | | | | | |
| | TM-CB M5 | 18 / 20 Ah | | | | | |
| | TM-CB M6 | 26 / 28B Ah | | | | | |
| | TM-CB M7 | 34 Ah | | | | | |
| | Battery cabinet | Maintenance-free batteries | | | | | |
| | TM-CB M8 | 40 / 45 / 55 / 65 / 75h / 80 / 90 / 100h / 120h / 130 Ah | | | | | |
| | TM-CB M9 | 65 / 75 / 80 / 90 / 100h / 120h / 130 Ah | | | | | |
| | TM-CB M10 | 120 / 150 Ah | | | | | |
| Number of circuits | Station: 6 / 12 with freely programmable operating mode | | | | | | |
| | Sub-distribution board: 12 / 20 with freely programmable operating mode | | | | | | |
| Cable entry | From above | | | | | | |
| Insulation class | I | | | | | | |
| Degree of tightness | IP30 | | | | | | |
| Enclosure material | Sheet steel | | | | | | |
| Geometric dimensions [mm]<br><br>*dimensions include additional wall mounts | Station | Main Set (ZG) | A | B | C | D* | E* |
| | TM-CB M1 | ZG6 | 400 | 911 | 196 | 950 | 210 |
| | TM-CB M2 | | | 1012 | | 1054 | |
| | TM-CB M3 | ZG12 | 480 | 972 | | 1014 | |
| | TM-CB M4 | | 600 | 1182 | 216 | 1224 | 230 |
| | TM-CB M5 | | | | | | |
| | TM-CB M6 | | 600 | 1740 | 229 | - | - |
| | TM-CB M7 | | | | | | |
| | Station | Sub-distribution Set (ZPR) + Charging Set (ZL) | A | B | C | D* | E* |
| | TM-CB M8 | ZPR20 + ZL2 / 3 / 4 | 1980 | 1204 | 600 | - | - |
| | TM-CB M9 | | | | | | |
| | TM-CB M10 | | 2370 | | | | |
| | Sub-distribution | Sub-distribution Set (ZPR) | A | B | C | D* | E* |
| | TM-CB M SUB PR12 | ZPR12 | 480 | 582 | 196 | 629 | 210 |
| | TM-CB M SUB PR20 | ZPR20 | | | | | |
| Standards | EN IEC 62485-2 | | | | | | |
| Heat dissipated [W] | Main kit ZG6 | (3x20+10+5+65)140+traces | | | | | |
| | Main kit ZG12 | (6x20+10+5+65)210+traces | | | | | |
| | Charger set ZL5 | (65x5)325 | | | | | |
| | Sub-distribution kit ZPR12 | (6x20 + 10)150+traces | | | | | |
| | Sub-distribution kit ZPR20 | (12x20 + 10)270+traces | | | | | |
| NOTE! The heat dissipated for the entire system is the sum of the heat dissipated by individual system components. | | | | | | | |



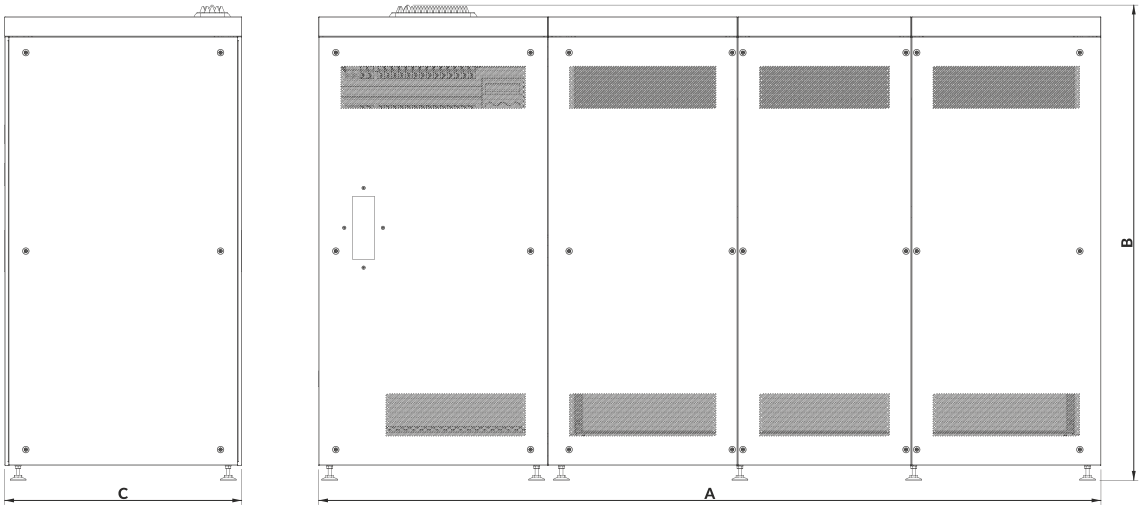

Station TM-CB M1 / 2 / 3 / 4 / 5




Sub-distribution TM-CB M SUB PR12 / PR20




Station TM-CB M6 / 7




Station TM-CB M8 / 9 / 10

### 3.3. System Versions

The central battery system can be implemented in two versions:

a) Basic - circuit monitoring only.

b) Extended - monitoring of individual luminaires.

Basic Version

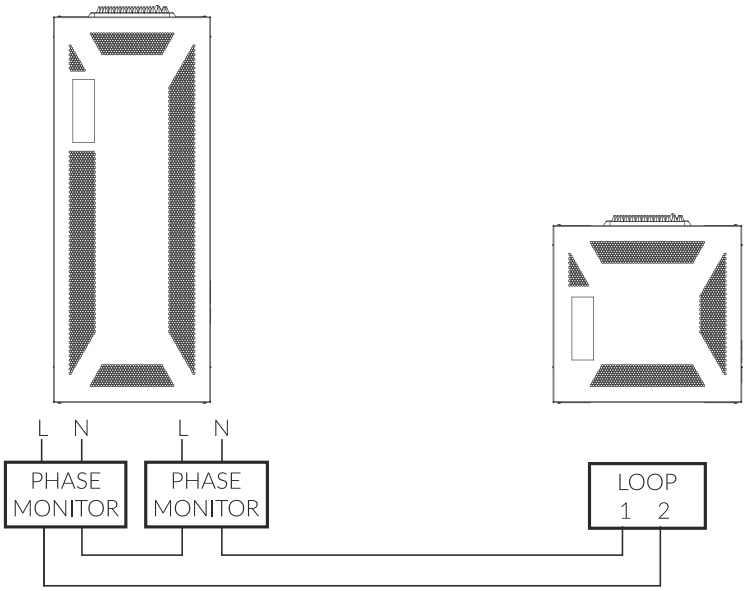
Only the current of individual circuits is monitored. During the initial setup, a calibration test of the output circuits is performed. The currents measured during this test are considered as reference values. Circuit errors are reported after a deviation defined by the user occurs (5-50%). The system informs the user of any faults by indicating the circuit number where the failure occurred, such as a ballast malfunction or a light source burnout. It may happen that only the failure of 2-3 luminaires is reported – if the powers of the luminaires on the circuit are different. Therefore, it is recommended not to install luminaires with different powers on a single line for the basic version.

Extended Version

In each luminaire, an addressable module is installed to monitor the current. This allows the system to precisely inform the user which luminaire is faulty. For example, if we receive an error message for luminaire 01/02A/20, it means that in sub-distribution 01, luminaire with address 20 is faulty on circuit 02A. Additionally, thanks to the use of addressable modules, any configuration of the luminaire operating mode on a single circuit is possible (circuits must be configured as M - "maintained"). Moreover, no additional modules are needed to manage luminaires operating in emergency mode, powered by the primary network via a switch. Because in this mode, each luminaire has its control module, it is possible to mix different versions (power) of luminaires on a single circuit.

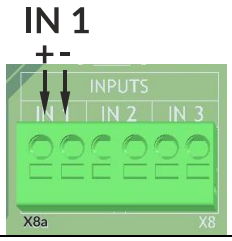
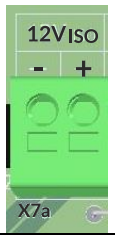
### 3.4. Current Loop (critical circuit)

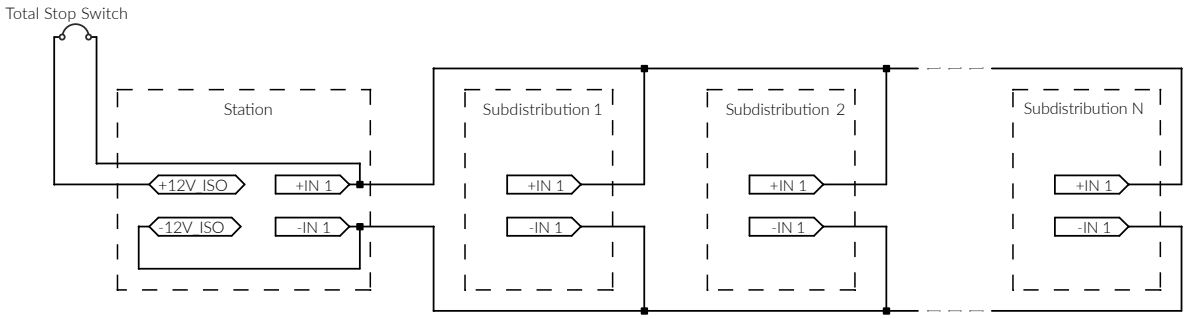
Opening a LOOP circuit activates all CB+ luminaires, CBM luminaires, or those connected through the TM-AM 01M, TM-AM 01SM, TM-AM 01M MINI module operating in NM mode. The luminaires are powered by AC voltage and operate according to the configuration for DC mode (dimming percentage during DC operation). Each main station and each sub-distribution has a current loop. In the station configuration, you can set the system's global or local response to a critical circuit.




### 3.5. Total Stop

The Total Stop input is configurable (like external trigger). It can function as either a Total Stop input or Phase Monitor input. The function selection can be made through the control interface (see the TM-CB M interface user manual). In the case of using the Total Stop function, below are the descriptions of the connectors and the connection diagram for the main station and sub-distribution board.

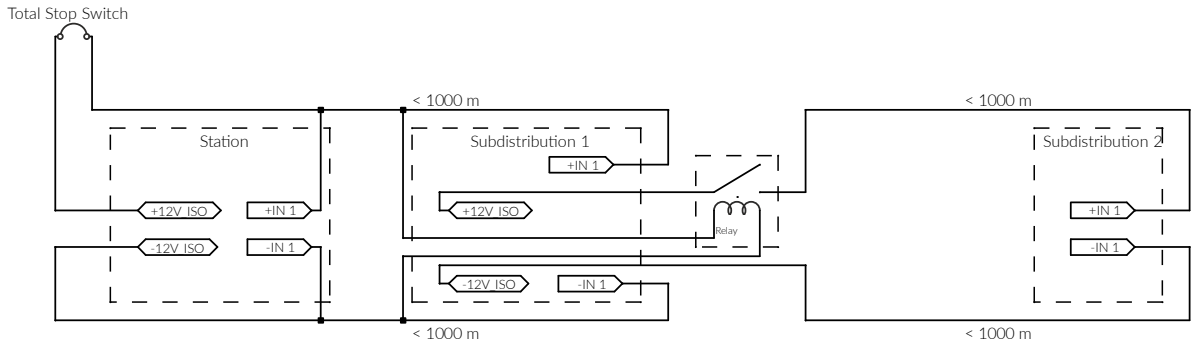
| Input IN 1 pins: "-" and "+" (connector X8a) | Output of isolated 12V voltage pins: "-" and "+" (connector X7a) |
|---|---|
|   |   |
| **NOTE!** Also refer to section 3.6 | |




Circuit operating voltage: 12 V.

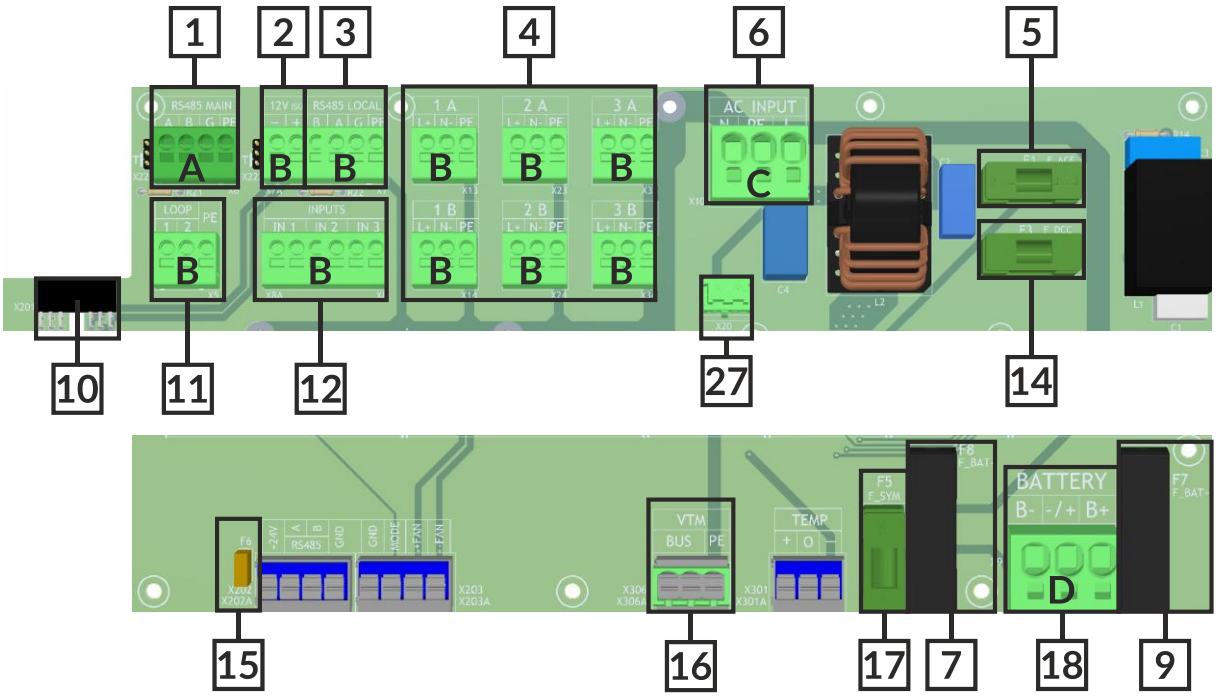
The assumed load current of the line is approximately 0.3 mA for each main station and each sub-distribution board. Connecting 15 sub-distribution boards to one pair of 12V_ISO contacts is permitted.

Each Total Stop input tolerates 230 V AC voltage. Incorrectly connected potentials will not damage the input. The Total Stop installation should be made using a wire with a minimum cross-section of 0.5 $mm^2$ and a total circuit length of up to 2000 m. This allows a maximum distance of 1000 m between the Total Stop switch and sub-distribution board N. If it is necessary to increase the circuit length, an additional relay and power source for the sub-distribution should be used according to the diagram below. However, it should be noted that the relay causes additional current consumption from the sub-distribution board power supply.

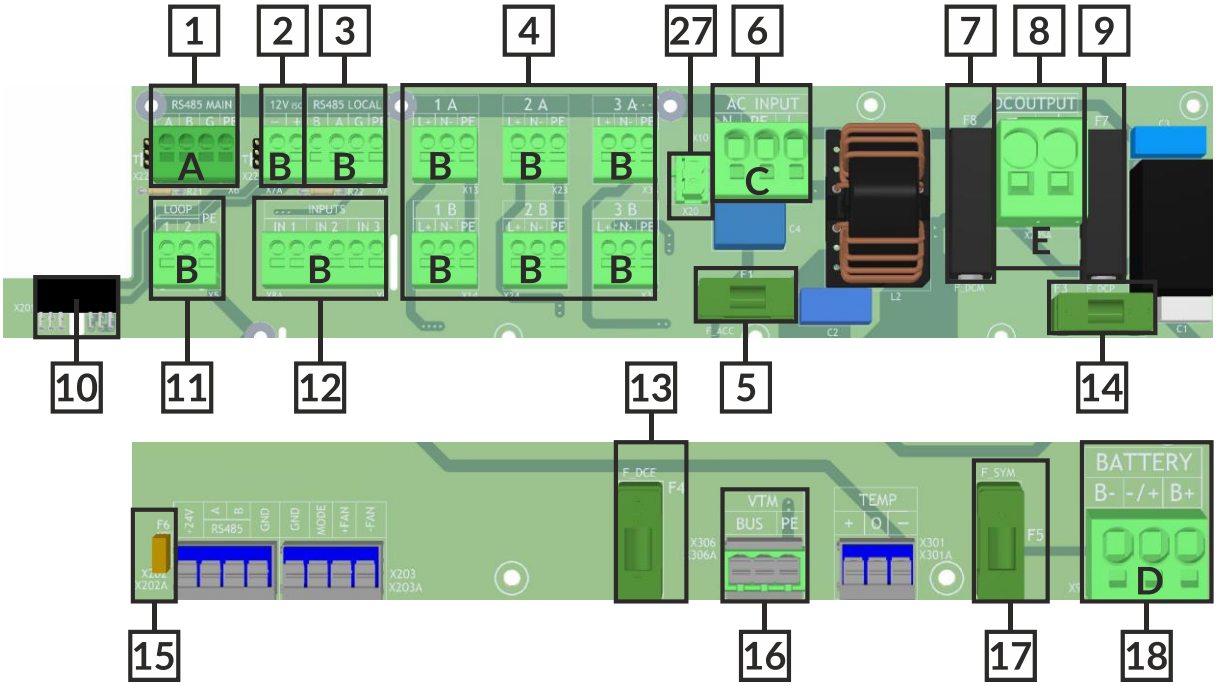



## 3.6. Pin Description

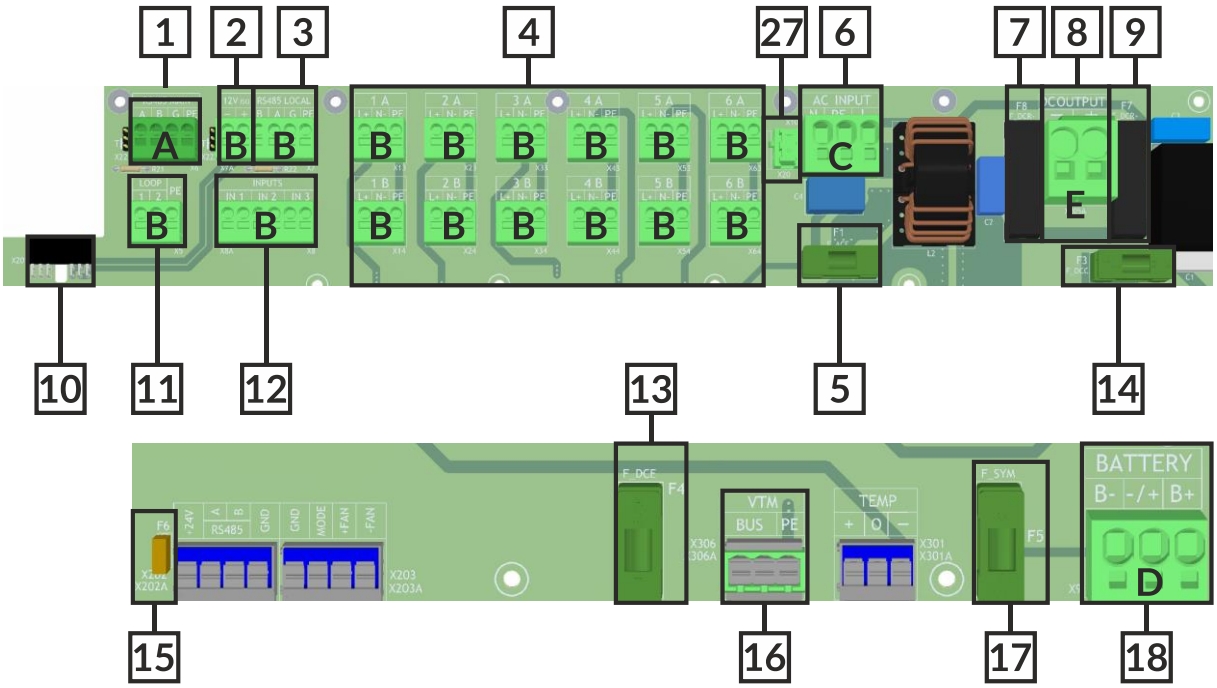
### 3.6.1. Main Board ZG6 (station TM-CB M1)



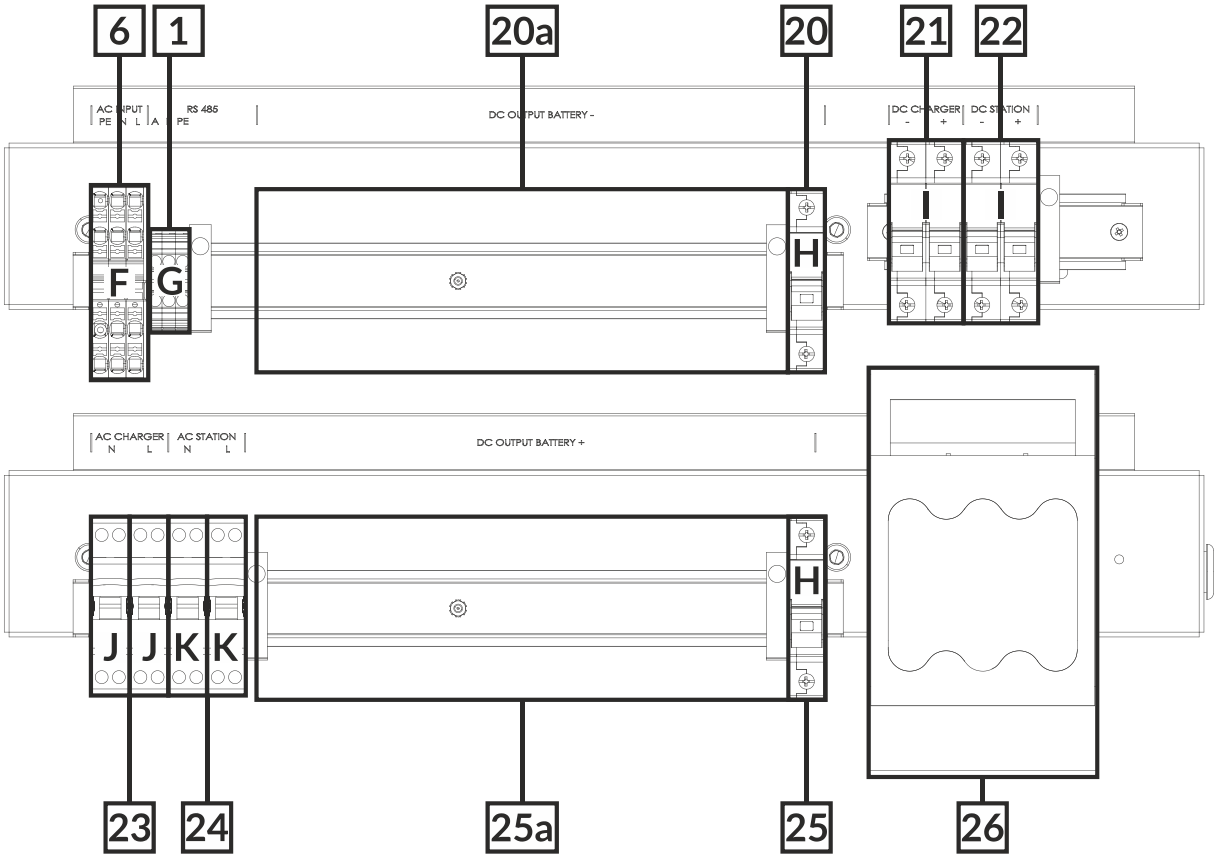
### 3.6.2. Main Board ZG6 (station TM-CB M2)



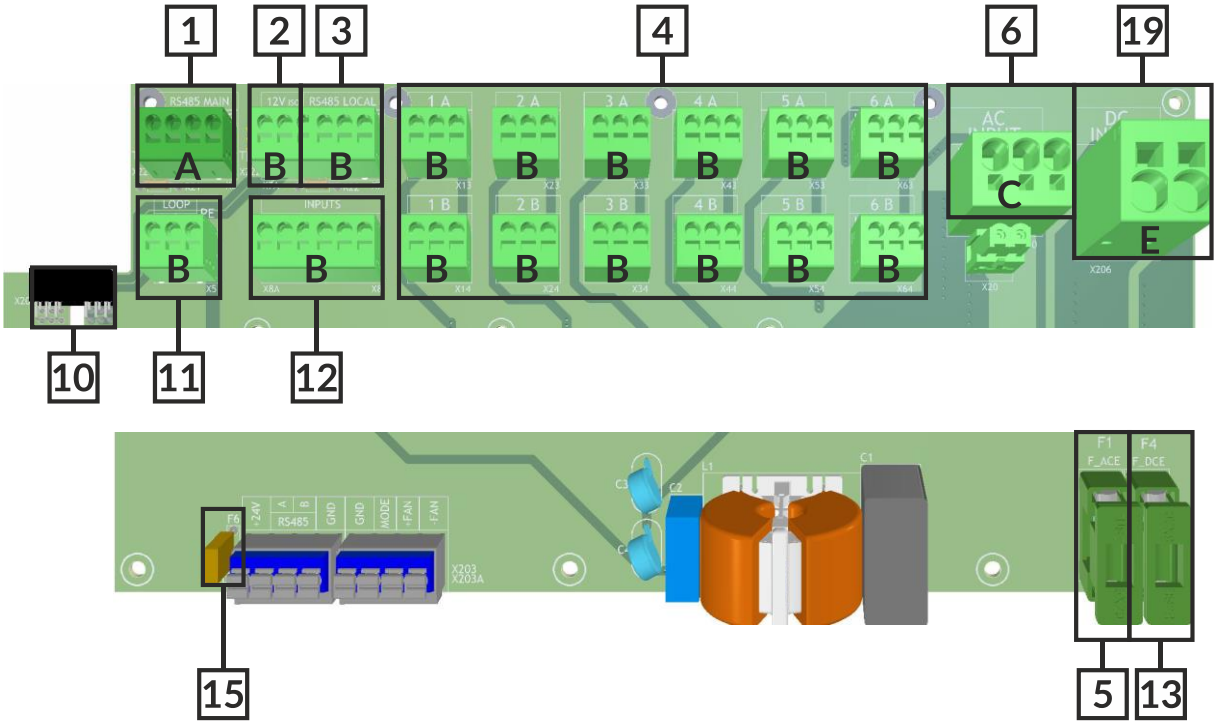

### 3.6.3. Main Board ZG12 (stations TM-CB M3, M4, M5, M6, M7)



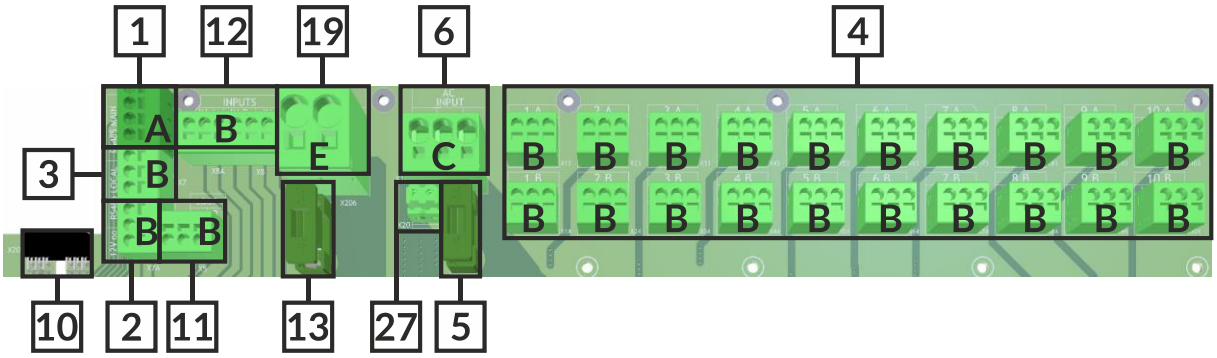
### 3.6.4. Main connections (stations TM-CB M8, M9, M10)




### 3.6.5. Main Board ZPR12 (sub-distribution TM-CB M SUB PR12)



### 3.6.6. Main Board ZPR20 (sub-distribution TM-CB M SUB PR20 and stations TM-CB M8, M9, M10)

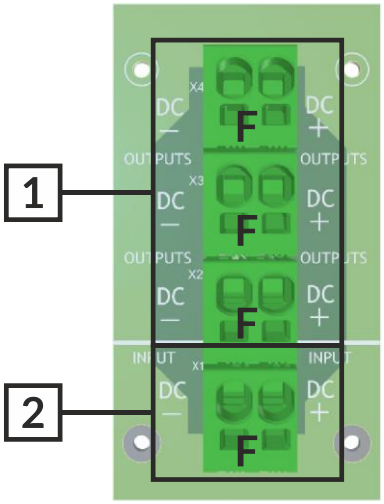



| Nr | Designation on the PCB | Description |
|---|---|---|
| 1 | RS-485 MAIN | Connection between sub-distribution panels and the main station (the last connected sub-distribution panel must be terminated with a 120 ohm resistor) |
| 2 | 12V ISO | Isolated 12V voltage outputs, load capacity 0.5 A |
| 3 | RS-485 LOCAL | Connection to the TM I/O module (optional accessory TM-MN.CB03x; see section 6.3) |
| 4 | 1A÷3A, 1B÷3B | Circuit controller outputs (stations TM-CB M1-2) |
| | 1A÷6A, 1B÷6B | Circuit controller outputs (stations TM-CB M3-7; sub-distribution TM-CB M SUB PR12) |
| | 1A÷10A, 1B÷10B | Circuit controller outputs (stations TM-CB M8-10; sub-distribution TM-CB M SUB PR20) |
| 5 | F1 | AC power fuse for charger (PSU2-C) and charger activation circuit in the charging control module (CHC-C) (stations TM-CB M1-7) |
| | | AC power fuse for PWU-C power supply unit (sub-distribution TM-CB M SUB PR12 / PR20 and stations TM-CB M8-10) |
| 6 | AC INPUT Power Supply | Connection socket for main AC power supply: L - phase wire connection; PE - protective wire connection; N - neutral wire connection |
| 7 | F8 | Battery fuse (B-) (station TM-CB M1) |
| | | Output fuse (DC-) to sub-distribution (stations TM-CB M2-7) |
| 8 | DC OUTPUT - / + | DC output to sub-distribution |
| 9 | F7 | Battery fuse (B+) (station TM-CB M1) |
| | | Output fuses (DC+) to sub-distribution (stations TM-CB M2-7) |
| 10 | 12V ISO Power Supply | Connection to the 12V ISO power supply (optional accessory TM-MN.CB03x; see section 6.3), powers external I/O modules |
| 11 | LOOP | Critical loop - input with isolated potential 5V; used to connect outputs (normally closed relay NC) of external phase monitors, fire protection control panels, etc.; the outputs of cooperating devices should be connected in series (creating so-called "loops"); if the loop is interrupted, the system switches to AC mode (modified); if additional phase monitors are not used, the output terminals (terminals 1 and 2) should be connected/shorted |
| 12 | IN 1, IN 2, IN 3 | Internal phase monitor (used only to control circuit operation); IN 1 - Total stop (optional, depends on the model of the PWU-C power supply used) |
| 13 | F4 | power supply fuse for PWU-C (stations TM-CB M2-10; sub-distribution TM-CB M SUB PR12 / PR20) |
| 14 | F3 | AC charger output fuse (PSU2-C) |
| 15 | F6 | (+24V) RS-485 communication fuse |
| 16 | VTM | connection for VTM control modules monitoring batteries (voltage and temperature measurement), optional accessory (TM-MN.CB02Mx; stations TM-CB M1-7; see section 6.2) |
| 17 | F5 | Battery symmetry fuse |
| 18 | BATTERY B-, B+/-, B+ | Battery connections |

| | | |
|---|---|---|
| 19 | DC INPUT power supply | input, connection of DC voltage leaving the station - protection outside the main board (in the station) (stations TM-CB M8-10; sub-distribution TM-CB M SUB PR20) |
| 27 | X20 | service power connector / connection of the power supply for the hardware module used for communication with the VisualSite website (see section 8.12), optional accessory (TM-MN.VSxxx; TM-CB M1-10 stations; see section 6.5) |

| Nr | Marking on the frame | Description |
|---|---|---|
| 20 | DC OUTPUT BATTERY - | Output (-) to the sub-distribution, DC fuse, default installation of one piece (stations TM-CB M8-10) |
| 20a | | Expansion possibility up to a maximum of 7 (stations TM-CB M8) or 15 (1+14) (stations TM-CB M9-10) sub-distributions; optional accessory (TM-MN.CB04M0; see section 6.4) |
| 21 | DC CHARGER - / + | Output to the sub-distribution, DC fuse (stations TM-CB M8-10) |
| 22 | DC STATION - / + | Station, DC fuse (stations TM-CB M8-10) |
| 23 | AC CHARGER N / L | Internal protection for AC chargers type B (stations TM-CB M8-10) |
| 24 | AC STATION N / L | Internal protection for AC stations type B (stations TM-CB M8-10) |
| 25 | DC OUTPUT BATTERY + | Output (+) to the sub-distribution, DC fuse, default installation of one piece (stations TM-CB M8-10) |
| 25a | | Expansion possibility up to a maximum of 7 (stations TM-CB M8) or 15 (1+14) (stations TM-CB M9-10) sub-distributions; optional accessory (TM-MN.CB04M0; see section 6.4) |
| 26 | DC FUSE - / + | Station, output fuse (DC -/+) to the sub-distribution (stations TM-CB M8-10) |

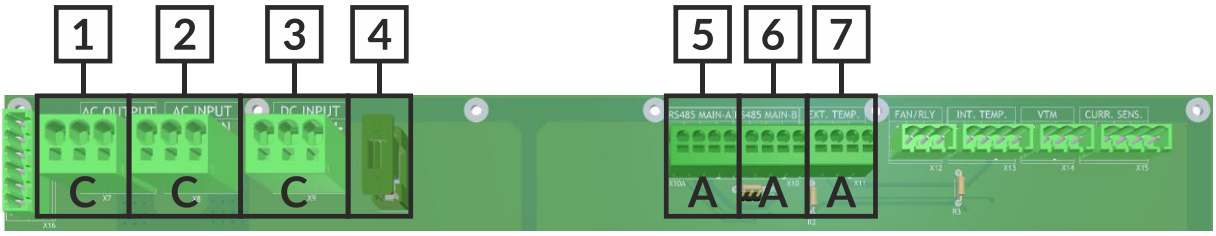
### 3.6.7. DC splitter (applies only to TM-CB M4, M5, M6, M7 stations)




NOTE! The DC splitter is also available as the TM-MN.CB01MS accessory (see point 6.1).

| Nr | PCB Marking | Description |
|---|---|---|
| 1 | DC OUTPUTS | DC outputs to sub-distribution panels |
| 2 | DC INPUT | DC input |

### 3.6.8. Main board of the charger set ZL2 / ZL3 / ZL4 / ZL5 (applies to stations TM-CB M8, M9, M10)




| Nr | PCB Marking | Description |
|---|---|---|
| 1 | AC OUTPUT | Output of AC power |
| 2 | MAIN AC | Input of AC power |
| 3 | DC INPUT | Input of DC power, connections of DC voltage outgoing from the station - protections outside the main board (in stations TM-CB M8-10) |
| 4 | F5 | Battery symmetry fuse |
| 5 | RS485 MAIN-A | Output to external, e.g., sub-distribution |
| 6 | RS485 MAIN-B | Output to sub-distribution set (ZPR20) |
| 7 | EXT. TEMP | Temperature measurement inside the battery cabinet |
| 8 | FAN/RLY | Fan connection |
| 9 | INT. TEMP | Temperature measurement inside the main station |
| 10 | VTM | Connection of VTM control modules monitoring batteries (voltage and temperature measurement) |
| 11 | CURR. SENS. | Current sensor connection |

Table 6. Connector parameters

| Nr | Connector type | Connector parameters* | Cross-section of rigid wire* | Cross-section of flexible wire* |
|---|---|---|---|---|
| A | PHOENIX CONTACT 1991118 | 24 A / 400 V | 0.2 ÷ 4 mm$^2$<br>24 ÷ 11 AWG | 0.2 ÷ 2,5 mm$^2$<br>24 ÷ 12 AWG |
| B | PHOENIX CONTACT 1991105 | 24 A / 400 V | 0.2 ÷ 4 mm$^2$<br>24 ÷ 12 AWG | 0.2 ÷ 2,5 mm$^2$<br>24 ÷ 12 AWG |
| C | PHOENIX CONTACT 1719325 | 41 A / 1 kV | 0.2 ÷ 10 mm$^2$<br>24 ÷ 7 AWG | 0.2 ÷ 6 mm$^2$<br>24 ÷ 8 AWG |
| D | PHOENIX CONTACT 1128610 | 41 A / 1 kV | 0.2 ÷ 10 mm$^2$<br>24 ÷ 7 AWG | 0.2 ÷ 6 mm$^2$<br>24 ÷ 8 AWG |
| E | PHOENIX CONTACT 1735875 | 76 A / 1 kV | 0.75 ÷ 16 mm$^2$<br>20 ÷ 4 AWG | 0.75 ÷ 16 mm$^2$<br>20 ÷ 4 AWG |
| F | PHOENIX CONTACT 3212934 | 41 A / 1 kV | 0.5 ÷ 10 mm$^2$<br>20 ÷ 7 AWG | 0.5 ÷ 6 mm$^2$<br>20 ÷ 8 AWG |
| G | POKÓJ A11-8203 | 32 A / 690 V | 0.5 ÷ 4 mm$^2$<br>20 ÷ 11 AWG | 0.5 ÷ 4 mm$^2$<br>20 ÷ 11 AWG |
| H | ABB 2CSM204713R1801 | 32 A / 1 kV | 1.5 ÷ 25 mm$^2$<br>16 ÷ 3 AWG | 1.5 ÷ 16 mm$^2$<br>16 ÷ 5 AWG |
| I | ABB 2CSM204703R1801 | 32 A / 1 kV | 1.5 ÷ 25 mm$^2$<br>16 ÷ 3 AWG | 1.5 ÷ 16 mm$^2$<br>16 ÷ 5 AWG |
| J | SCHNEIDER A9F94116 | 16 A / 400 V | 1 ÷ 25 mm$^2$<br>17 ÷ 3 AWG | 1 ÷ 16 mm$^2$<br>17 ÷ 5 AWG |
| K | SCHNEIDER A9F94120 | 20 A / 400 V | 1 ÷ 25 mm$^2$<br>17 ÷ 3 AWG | 1 ÷ 16 mm$^2$<br>17 ÷ 5 AWG |
| L | PHOENIX CONTACT 1738144 | 24 A / 400 V | 0.2 ÷ 4 mm$^2$<br>24 ÷ 11 AWG | 0.2 ÷ 2.5 mm$^2$<br>24 ÷ 12 AWG |

***NOTE!** If necessary, check the additional technical data in the manufacturer's connector datasheet.

### 3.7. Fuse table

**NOTE!**
**The following fuses can be replaced with others, also certified, with equivalent properties!**

**NOTE!**
**Unauthorized repairs of fuses are prohibited, as it may damage the device and cause a fire!**

**NOTE!**
**Always replace burnt fuses with new ones!**

Table 7. Fuse table: TM-CB M1 Station (ZG6 main set)

| PCB marking | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| F1 (F_ACC) | 10A; time-lag; glass; extinguishing agent; 5x20mm | ESKA | 522.027 |
| F3 (F_DCC) | 5A; time-lag; ceramic; extinguishing agent; 5x20mm | ESKA | 522.724 |
| F5 (F_SYM) | 1A; fast-acting; ceramic; extinguishing agent; 5x20mm | ESKA | 520.517 |
| F7 (F_BAT+) | 6.3A; fast-acting, ceramic; 6.3x32mm | SCHURTER | 8020.5076 |
| F8 (F_BAT-) | 6.3A; fast-acting, ceramic; 6.3x32mm | SCHURTER | 8020.5076 |

Table 8. Fuse table: TM-CB M2 station (ZG6 main set) and TM-CB M3, M4, M5, M6, M7 (ZG12 main set)

| PCB marking | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| F1 (F_ACC) | 10A; time-lag; glass; extinguishing agent; 5x20mm | ESKA | 522.027 |
| F3 (F_DCC) | 5A; time-lag; ceramic; extinguishing agent; 5x20mm | ESKA | 522.724 |
| F4 (F_DCE) | 5A; fast-acting; glass; 5x20mm | ESKA | 520.624 |
| F5 (F_SYM) | 1A; fast-acting; ceramic; extinguishing agent; 5x20mm | ESKA | 520.517 |
| F7 (F_BAT+) | 8A; fast-acting; ceramic; 6.3x32mm | SCHURTER | 8020.5077 |
| F8 (F_BAT-) | 8A; fast-acting; ceramic; 6.3x32mm | SCHURTER | 8020.5077 |

Table 9. Fuse table: Station TM-CB M8, M9, M10

| Marking on the frame | Amount | Technical data | Manufacturer | Manufacturer Code |
|---|---|---|---|---|
| Common for cabinets: TM-CB M8; TM-CB M9; M10 | | | | |
| DC OUTPUT BATTERY - / + | 2 | 20 A, gPV; ceramic; 10,3x38mm | SIBA | 5022526.20 |
| DC CHARGER - / + | 2 | 20 A, gPV; ceramic; 10,3x38mm | SIBA | 5022526.20 |
| Applies to cabinets: TM-CB M8/x; TM-CB M9/55; M9/65; M9/75 | | | | |
| DC STATION - / + | 2 | 20 A, gPV; ceramic; 10,3x38mm | SIBA | 5022526.20 |
| Applies to cabinets: TM-CB M9/80; M9/80h; M9/90; M9/100h; M9/120h; M9/134; TM-CB M10/x | | | | |
| DC STATION - / + | 2 | 16 A; gPV; ceramic; 10,3x38mm | SIBA | 5022526.16 |

Table 10. Fuse table: TM-CB M8, M9, M10 station (ZPR20 sub-distribution set)

| PCB marking | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| F1 (F_ACE) | 5A; fast-acting; glass; 5x20mm | ESKA | 520.624 |
| F4 (F_DCE) | 5A; fast-acting; glass; 5x20mm | ESKA | 520.624 |

Table 11. Fuse table: TM-CB M8, M9, M10 station (ZL5 chargers set)

| PCB marking | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| F1 (F_SYM) | 1A; fast-acting; ceramic; axial lead; 5x20mm | ESKA | 520.517 |

Table 12. Fuse table: TM-CB M SUB PR12 sub-distribution

| PCB marking | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| F1 (F_ACE) | 5A; fast-acting; glass; 5x20mm | ESKA | 520.624 |
| F4 (F_DCE) | 5A; fast-acting; glass; 5x20mm | ESKA | 520.624 |
| | | | |
| 2 pieces on DIN rail | 10A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.10 |

Table 13. Fuse table: TM-CB M SUB PR20 sub-distribution

| PCB marking | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| F1 (F_ACE) | 5A; fast-acting; glass; 5x20mm | ESKA | 520.624 |
| F4 (F_DCE) | 5A; fast-acting; glass; 5x20mm | ESKA | 520.624 |
| | | | |
| 2 pieces on DIN rail | 16A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.16 |

Table 14. Fuse table: Charger (PSU2-C)

| Amount | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| 1 | 3.15A; time-lag; glass; 5x20mm | ESKA | 522.522 |

Table 15. Fuse table: Circuit controller (MCL-C, MCL-A)

| Amount | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| 6 | 4A; 250 V AC; 300 V DC; time-lag; ceramic; 5x20mm | SHURTER | 1.251 |

Table 16. Fuse table: Circuit controller (MCL-H, MCL-B)

| Amount | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|
| 3 | 8A; 500 V AC; 600 V DC quick-acting; ceramic; 6.3x32mm | SHURTER | 8020.5077 |

Table 17. Battery Fuses

| Station | Battery Capacity [Ah] | Technical Data | Manufacturer | Manufacturer Code |
|---|---|---|---|---|
| TM-CB M1 | 5 | 6.3A; fast-acting; ceramic; 6.3x32mm | SCHURTER | 8020.5076 |
| TM-CB M2 | 7.2 | 8A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.8 |
| TM-CB M3 | 7.2 | 8A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.8 |
| TM-CB M4 | 12 | 10A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.10 |
| TM-CB M5 | 18 | 16A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.16 |
| | 20 | | | |
| TM-CB M6 | 26 | 25A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.25 |
| | 28 | | | |
| TM-CB M7 | 33 | 30A; time-lag; ceramic; 10.3x38mm | SIBA | 5022526.30 |
| TM-CB M8 | 40 | 40A; top fuse link; NH00C; 440V DC | ETI | 004110203 |
| | 45 | 40A; top fuse link; NH00C; 440V DC | ETI | 004110203 |
| | 55 | 50A; top fuse link; NH00C; 440V DC | ETI | 004110204 |
| | 65 | 63A; top fuse link; NH00; 440V DC | ETI | 004110210 |
| | 75 | | | |
| | 80 | 80A; top fuse link; NH00; 440V DC | ETI | 004110211 |
| | 90 | | | |
| | 100 | 100A; top fuse link; NH00; 440V DC | ETI | 004110212 |
| | 120 | | | |
| | 134 | 125A; top fuse link; NH00; 440V DC | ETI | 004110213 |
| TM-CB M9 | 55 | 50A; top fuse link; NH00C; 440V DC | ETI | 004110204 |
| | 65 | 63A; top fuse link; NH00; 440V DC | ETI | 004110210 |
| | 70 | | | |
| | 75 | | | |
| | 80 | 80A; top fuse link; NH00; 440V DC | ETI | 004110211 |
| | 90 | | | |
| | 100 | 100A; top fuse link; NH00; 440V DC | ETI | 004110212 |
| | 120 | | | |
| | 134 | 125A; top fuse link; NH00; 440V DC | ETI | 004110213 |
| TM-CB M10 | 120 | 100A; top fuse link; NH00; 440V DC | ETI | 004110212 |
| | 150 | 125A; top fuse link; NH00; 440V DC | ETI | 004110213 |

## 4. Safety Instructions

Read before starting assembly and keep!

**NOTE!**
**This document contains important information to be followed during the installation, operation, and maintenance of the system and batteries. Read all instructions before operating the device. Keep this instruction manual for future reference.**

**Meaning of symbols used in the documentation and applied on the device:**

Dangerous voltage. Risk of electric shock.

Caution! Contains acid batteries connected to the charger. Risk of acid leakage and/or explosion when open flame is used.

Prohibited: Use of open flame, fire, or smoking.

Restricted access room.

Read before starting assembly:

- The system must be installed according to the recommendations contained in this document. Never install the central battery system in a sealed room where flammable gases may be present or in an environment exceeding specifications.
- The central battery system is powered by its own energy source (batteries). Output terminals may be live even when the device is disconnected from the AC power source and service mode is activated.
- Installation must be carried out with the power off, adhering to the safety regulations of building and electrical installations. Installation should only be performed by qualified personnel.
- During charging, maintenance charging, and overcharging in all cells and batteries, except for tightly sealed cells (secondary), gases are generated. This is the result of electrolysis of water caused by overcharging current. The gases produced are oxygen and hydrogen. When emitted into the atmosphere, they can create an explosive mixture if the hydrogen concentration in the air volumetrically exceeds 4%. To prevent this, adequate ventilation should be provided in the room where the central battery system is installed.

**WARNING:** For more information on ventilation requirements for the room where the batteries are installed, including calculations of necessary airflow, see: PN-EN IEC 62485-2: Safety requirements for secondary batteries and battery installations.

- Batteries can pose a risk of electric shock or burns due to short circuits and high current flow. Always observe the following precautions when working with batteries:
  - Remove watches, rings, chains, or other metal items.
  - Use tools with appropriate insulation.
  - Wear suitable protective clothing including gloves and shoes.
  - Do not place tools or metal parts on the batteries.
- The central battery unit and enclosure may only be opened by authorized personnel.
- The room where the battery is installed must be a locked room with limited access, marked with the following warning and prohibition signs. Keep unauthorized personnel away from the equipment.

„Dangerous voltage"

„No open flames, no smoking"

„Battery room" - warning of possible corrosive action of electrolyte, explosive gases, hazardous voltages, and currents.

- Do not connect the central battery power supply to circuits that may simultaneously be loaded with inductive loads - this may damage the electronic module of the luminaire or/and circuit card.
- The device is designed for indoor use.
- The manufacturer reserves the right to make design changes to the product.
- The manufacturer is not responsible for damage caused by connecting the product to a poorly executed electrical installation.
- Ambient temperature: $T_a$ = -5 °C ÷ +40 °C (relative air humidity 5 – 95%).
- The system should be checked after a prolonged power outage.
- Maximum allowable power outage time: up to 30 days.

## 5. Installation and startup instructions:

Operations such as installation, commissioning, and maintenance may only be carried out by the manufacturer, the manufacturer's service, or competent personnel. All applicable health and safety regulations must be followed.

Before installing the device, ensure that the CB system is supplied with AC power and output circuits.

Ensure proper ventilation and temperature at the installation site.

The control and power supply unit should be installed in locations that provide maintenance access. During installation, maintain a minimum distance from walls and ensure the minimum service space. The minimum service space should allow the enclosure or control and power supply unit doors to open at a 90° angle.

Power supply and output (operational) circuits should be made with cables having properties and class specified in § 187 of the Regulation of the Minister of Infrastructure dated April 12, 2002, on the technical conditions to be met by buildings and their location (Journal of Laws 2022, item 1225).

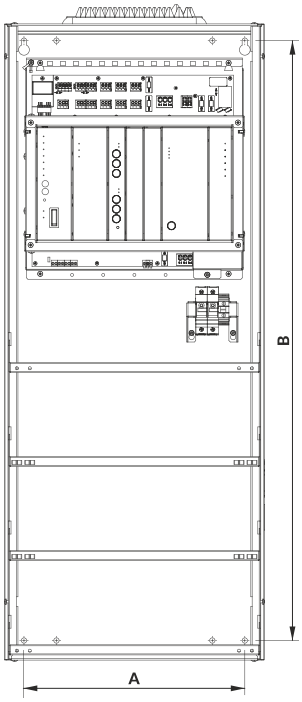
### 5.1. Unpacking and Placement

After unpacking, check if the product is not damaged and if all necessary accessories are included in the package, then place the central battery at the installation site.

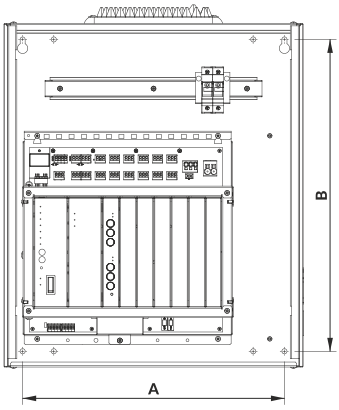
### 5.2. Cabinet and sub-distribution Installation

- Mounting of the cabinet and sub-distribution board by hanging it on the wall (applies to TM-CB M1 / 2 / 3 / 4 / 5 and Sub-Distribution TM-CB M SUB PR12 / PR20).

  Mount on four bolts with an ø8mm thread diameter (not included in the kit).



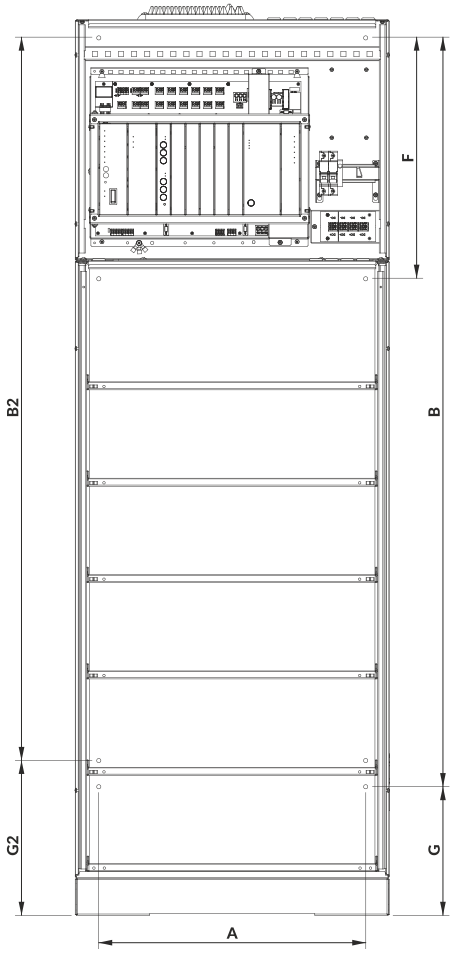

TM-CB M1 / 2 / 3 / 4 / 5




TM-CB M SUB PR12 / PR20 sub-distribution

➢ **Mounting of the cabinet on the ground** (applies to TM-CB M 6 / 7)

TM-CB M6/7 cabinets should be placed on a surface with appropriate load-bearing capacity and additionally attached to the wall with at least two screws with a diameter of 8 mm (not included in the kit).

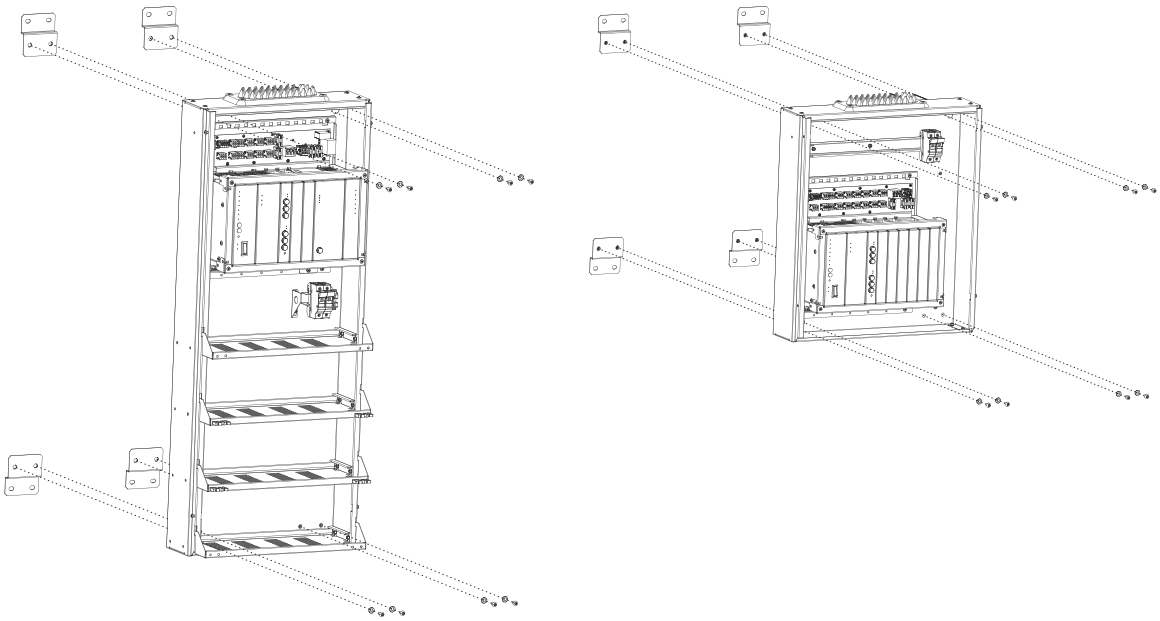



TM-CB M6 / 7

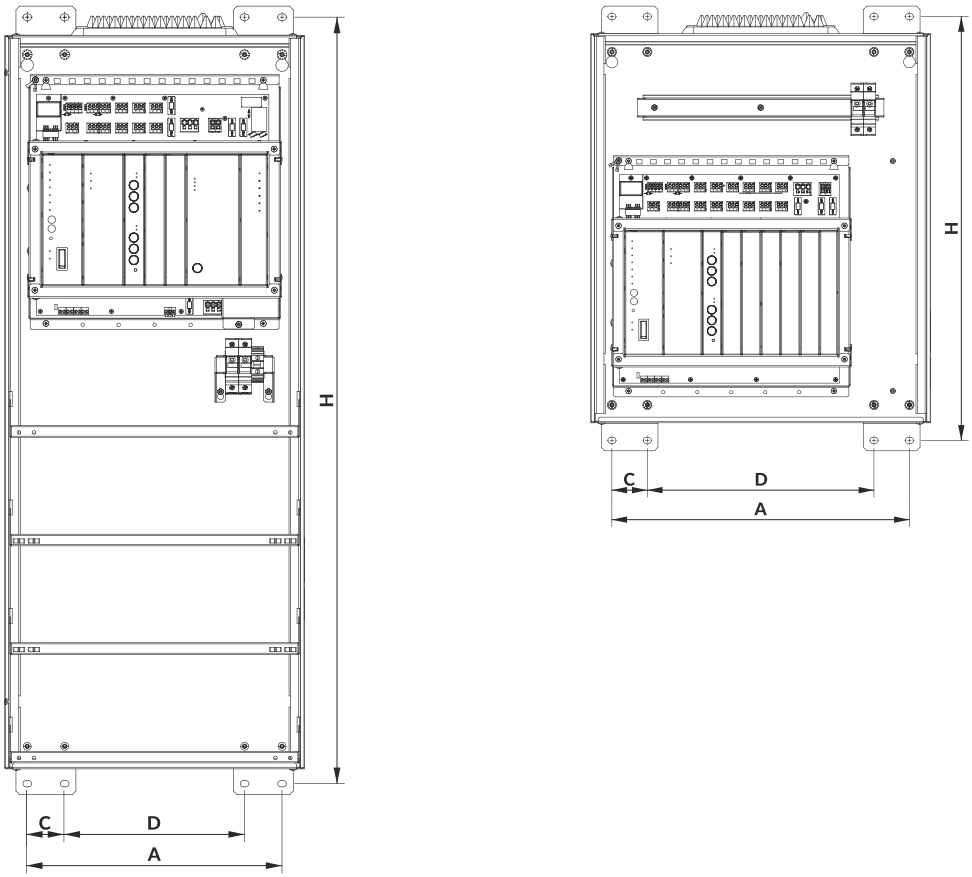
| Central battery system | | [mm] | | | | | |
|---|---|---|---|---|---|---|---|
| | | A | B | B2 | F | G | G2 |
| Station | TM-CB M1 | 340 | 820 | - | - | - | |
| | TM-CB M2 | | 924 | - | - | - | |
| | TM-CB M3 | 404 | 884 | - | - | - | |
| | TM-CB M4 | 484 | 1094 | - | - | - | |
| | TM-CB M5 | | | | | | |
| | TM-CB M6 | 510 | 1430 | - | 460 | 245 | - |
| | TM-CB M7 | | - | 1380 | | - | 295 |
| Sub-distribution | TM-CB M SUB PR12 | 420 | 499 | - | - | - | |
| | TM-CB M SUB PR20 | | | | | | |

- **Mounting of the cabinet and sub-distribution board by hanging it on the wall using additional brackets** (applies to TM-CB M1 / 2 / 3 / 4 / 5 and Sub-Distribution TM-CB M SUB PR12 / PR20). This is the second suspended mounting option. Handles with screws and washers are included in the set.

  In the first step, screw the handles to the cabinet using 8 screws.

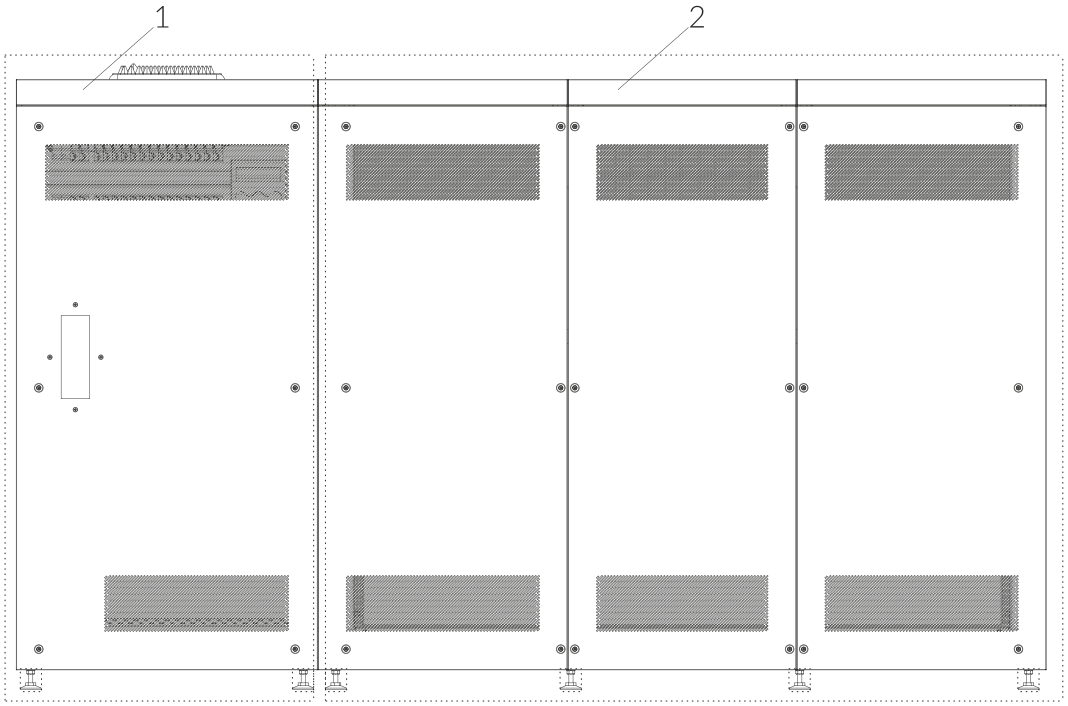


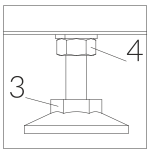
Wall-mounted installation on eight bolts with an ø8mm thread diameter (not included in the kit).



| Central battery system | | [mm] | | | |
|---|---|---|---|---|---|
| | | A | C | D | H |
| Station | TM-CB M1 | 340 | 50 | 240 | 920 |
| | TM-CB M2 | | | | 1024 |
| | TM-CB M3 | 404 | | 304 | 984 |
| | TM-CB M4 | 484 | | 384 | 1194 |
| | TM-CB M5 | | | | |
| | TM-CB M6 | 510 | - | - | - |
| | TM-CB M7 | | | | |
| Sub-distribution | TM-CB M SUB PR12 | 420 | 50 | 320 | 599 |
| | TM-CB M SUB PR20 | | | | |

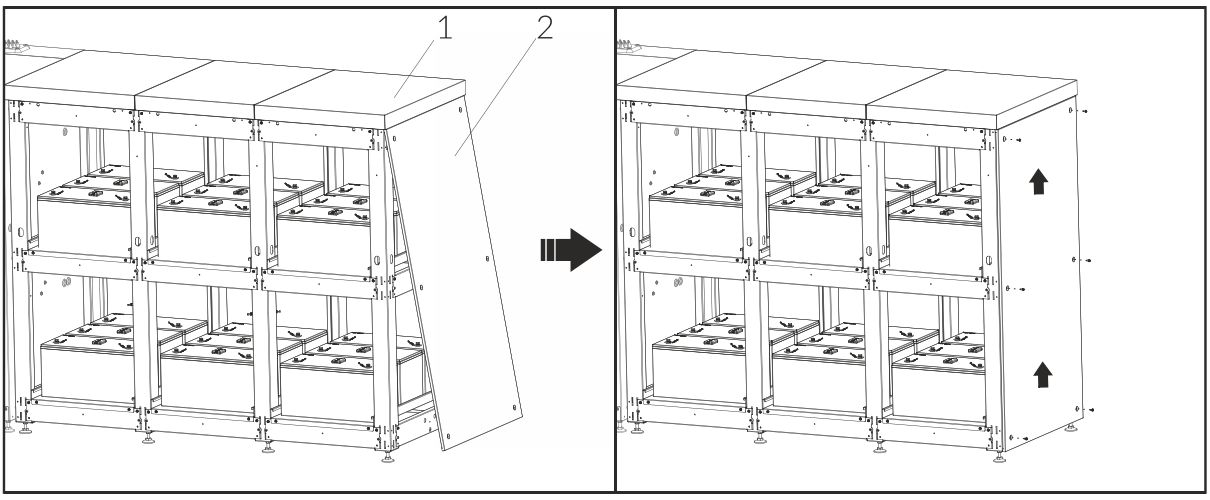
- **Installation of the cabinets with adjustable feet on the floor** (applies to TM-CB M8/9/10).
  Adjust the height of the feet (station (1) - four feet; battery cabinet (2) - eight feet) using a flat spanner 17 (3). Additionally, use a level to properly level the cabinet. After adjustment, tighten the locknut (4) to prevent the foot from screwing in. The maximum static load of one foot is 2500 N.



- **Installation of battery cabinet covers** (applies to TM-CB M8/9/10).

  Before tightening the covers (2), they should be pushed towards the upper covers (1). See the example below for installing the side cover.



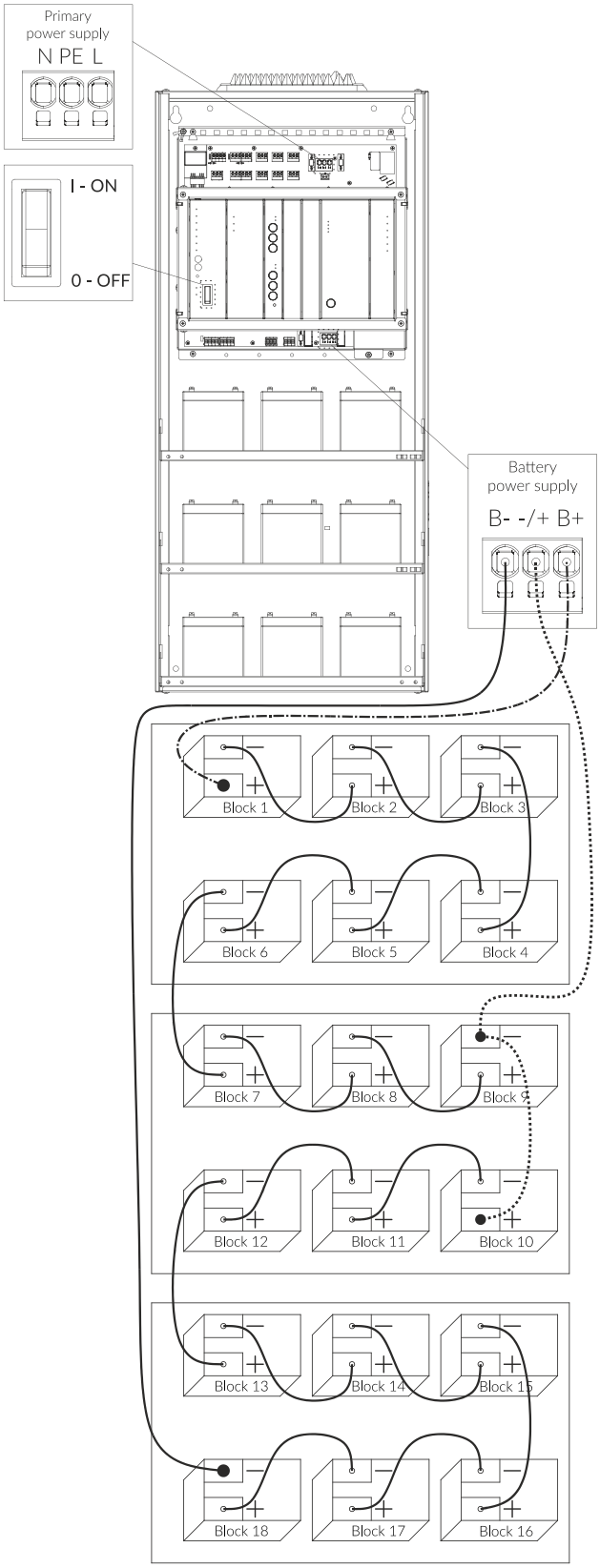

See attachments for details on the installation of the main station cabinet and the TM-CB M8 / 9 / 10 battery cabinet:

Attachment 1. Installation Manual for the TM-CB M8 / 9 / 10 Main Station Cabinet

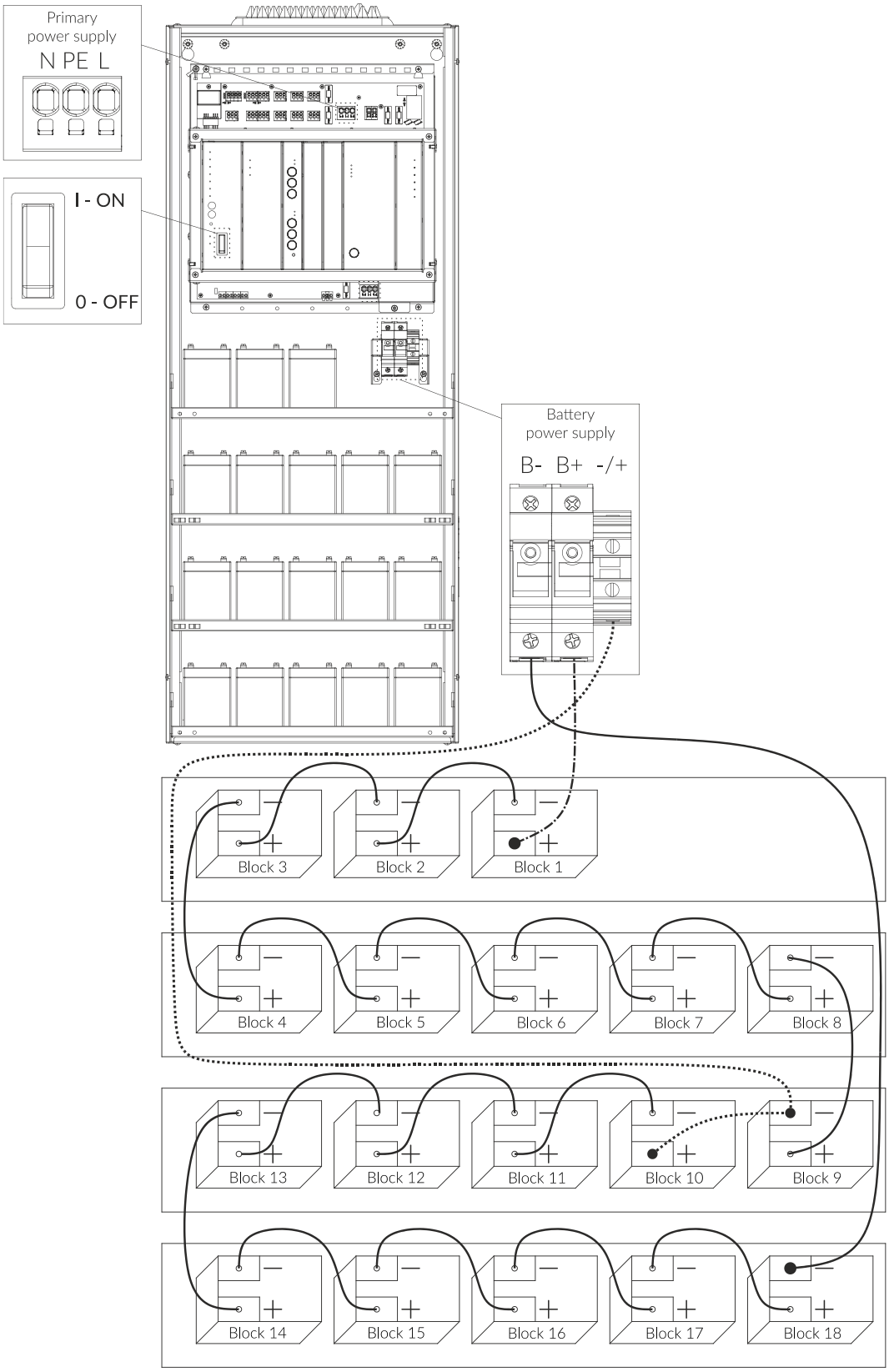
Attachment 2. Installation Manual for the TM-CB M8 / 9 / 10 Battery Cabinet

### 5.3. Battery Installation

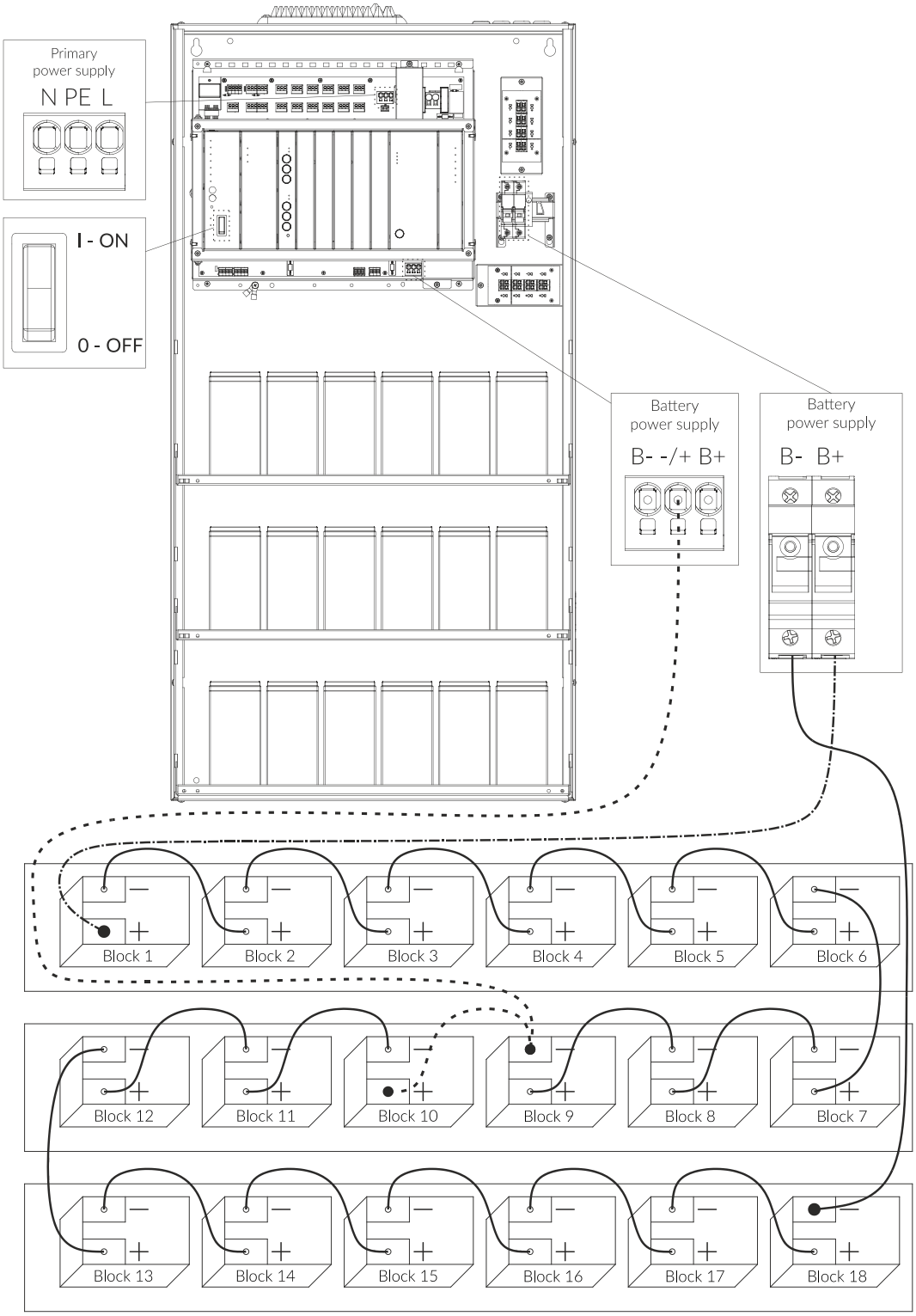
Batteries can only be installed with the fuses removed (B-), (B+). For details on their location, refer to section 3.1. Eighteen battery units should be connected in series. Below is an example for station TM-CB M1.



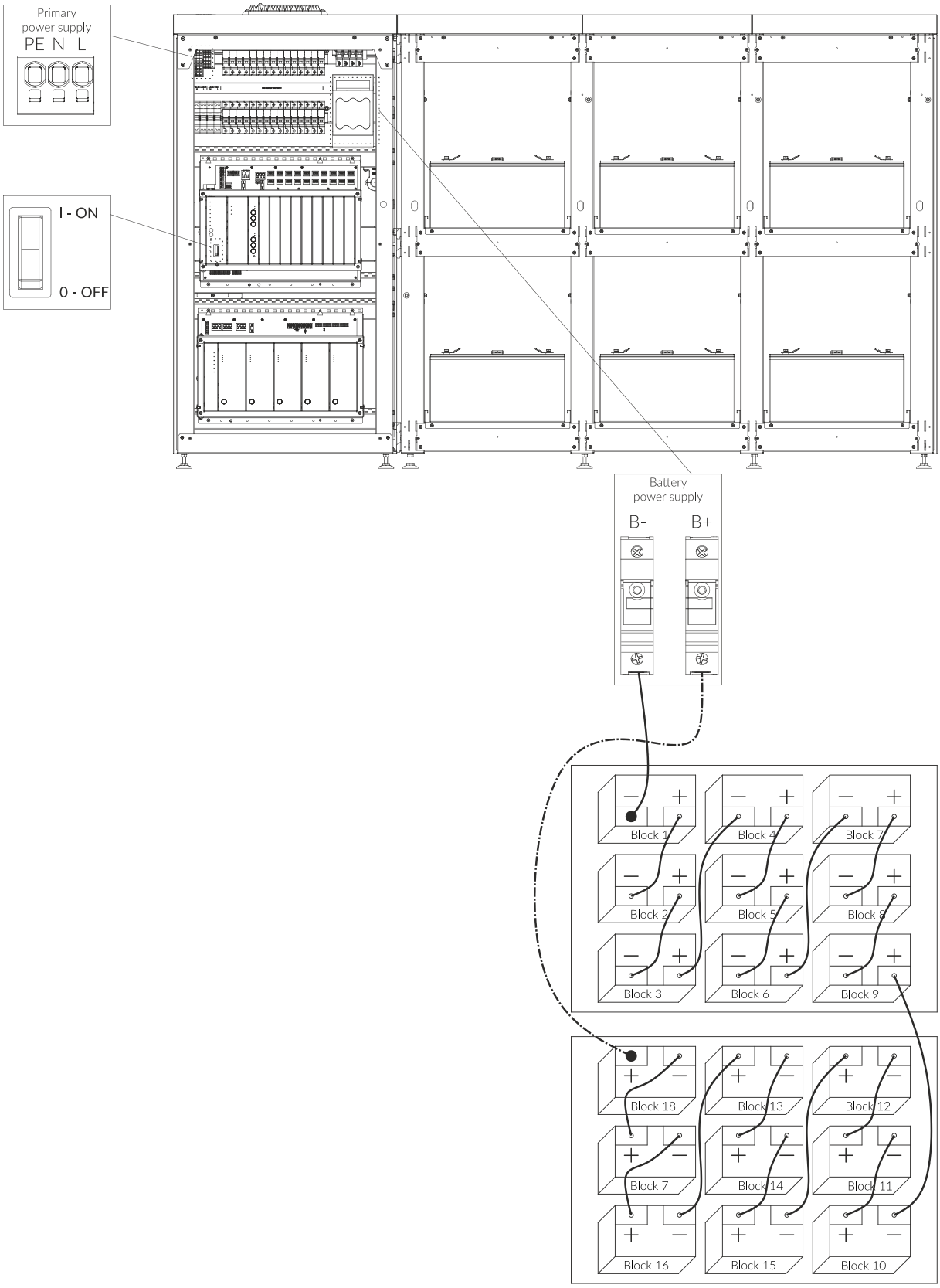
Below is an example for station TM-CB M2, M3.



Below is an example for station TM-CB M4, M5, M6, M7.



Below is an example for station TM-CB M8, M9, 10.

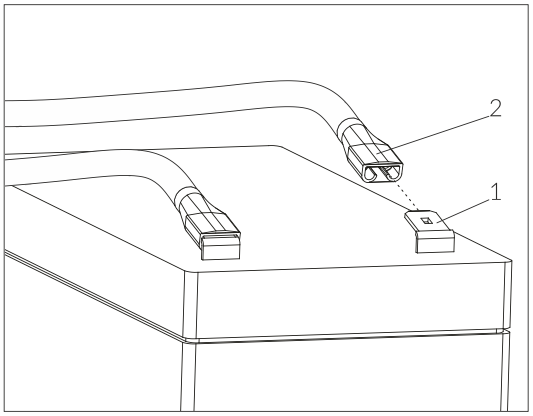



**WARNING!**
**Store removed battery fuses until final commissioning.**

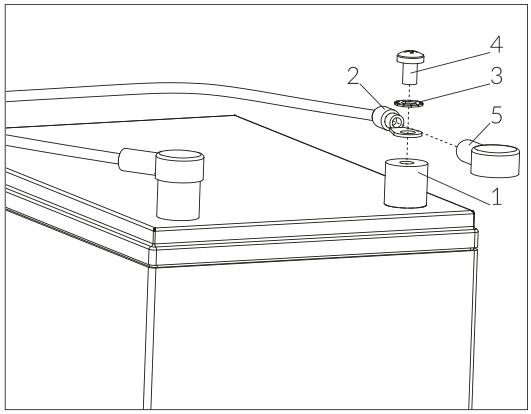
- ✓ Connect the batteries (18 blocks at 12V) in series, according to the diagram on the previous page.
- ✓ If system contains VTM modules, then it should be installed along the instruction (see section 8.7) during the batteries mounting
- ✓ During installation, ensure that the batteries are positioned to provide the best airflow.

**WARNING!**
**The distance between cells or valve-regulated lead-acid battery monoblocks should allow for adequate airflow and should not be less than 5 mm.**

**WARNING!**
**Connect the batteries only using the cables provided in the kit.**



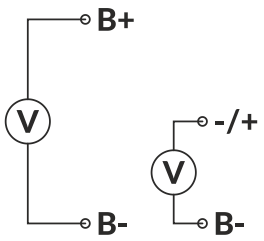

Attach the cables (2) to the battery terminals (1) by inserting them. The "plus" terminal should connect to the red end of the cable, while the "minus" terminal should connect to the black end of the cable.




Slide the covers (5) onto the cables (2) (included in the set). Attach the cables (2) to the battery terminals (1) using washers (3) and screws (4) (included in the set). Tighten the screws to the specified torque: for M5 - 3 Nm, and for M6 - 5.2 Nm. After tightening the screws (4), slide the covers (5) onto them.

- ✓ Connect the symmetry line of the monitored charging circuit from the appropriate battery block (block 9 (-)) to the symmetry voltage connector (-/+) according to the diagram on the previous page (does not apply to stations TM-CB M8/9/10).
- ✓ Connect the positive terminal (+) of Battery No. 1 to the (B+) terminal on the CB and the negative terminal (-) of Battery No. 18 to the (B-) terminal on the CB, following the diagram on the previous page.
- ✓ Label the batteries (blocks 1 to 18) with the provided labels numbered from 1 to 18.
- ✓ Affix a label with the name of the installation company/installer and the installation date in a visible location and fill it with the required data.

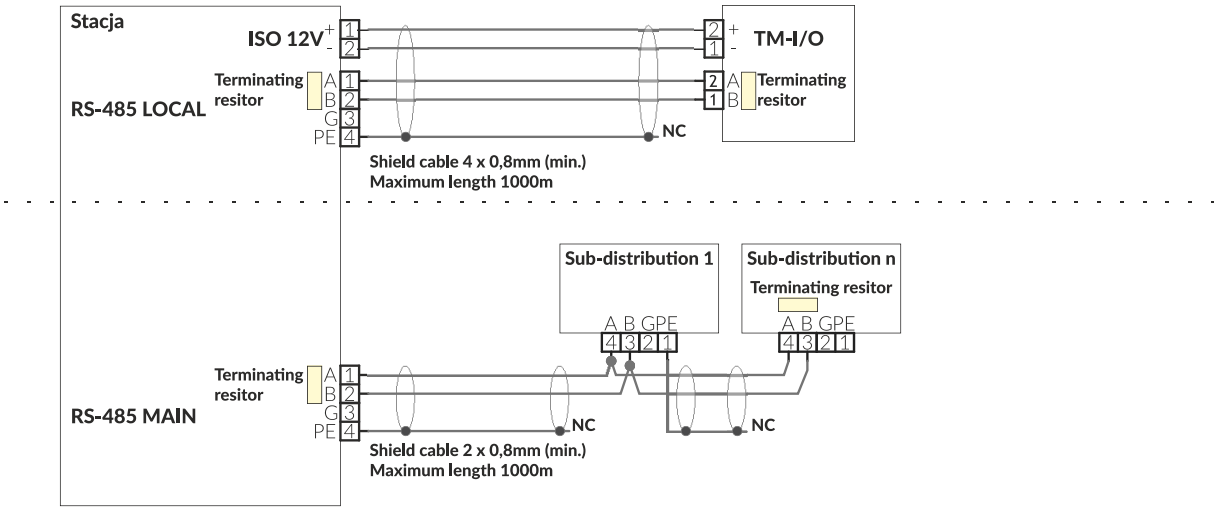
- ✓ Check the polarity of the voltage and batteries.
- ✓ Measure the battery voltage at the CB terminals according to the diagram below.




The voltage measured at the terminals (B+), (B-) should be positive, and its result, oscillating within the range of 216V DC ±30V, should be approximately twice the voltage of symmetry measured between terminals B(+/-)(1/2) and (B-).

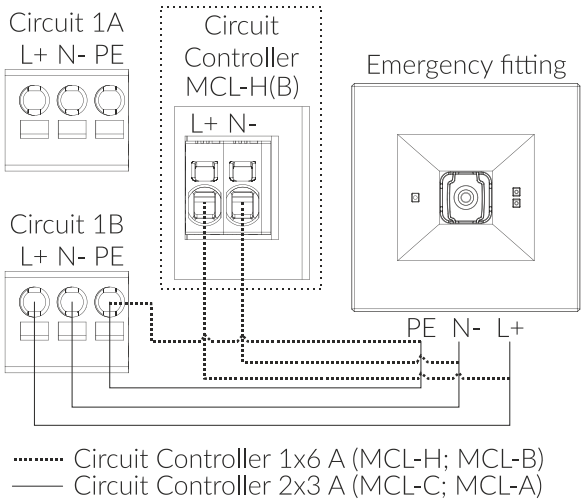
**NOTE!**
**The user, installation, and maintenance instructions provided with the batteries should be placed nearby.**

### 5.4. RS-485 bus connection - signal wires



### 5.5. Connection of receivers (luminaires)

Check the end of the wires for insulation damage. Connect the luminaires according to the diagram below. Halogen-free power cables with the appropriate reaction to fire class (B2ca) and with maintaining electrical functions during fire (if required) should be used, type HDGs cables, with a wire cross-section of 1.5 ÷ 2.5 mm$^2$ depending on the luminaire.




**NOTE!**
**The transmission range is up to 300 m, with the caveat that the maximum power installed on the luminaire circuit is 140 W for 1.5 mm$^2$ and 230 W for 2.5 mm$^2$.**
**It can be increased to 1000 m thanks to the Repeater function implemented in CBM luminaires.**

Detailed description in the attachments:

Attachment 3. TM-PROG programmer user manual

Attachment 4. Short user manual for TM-PROG Programmer

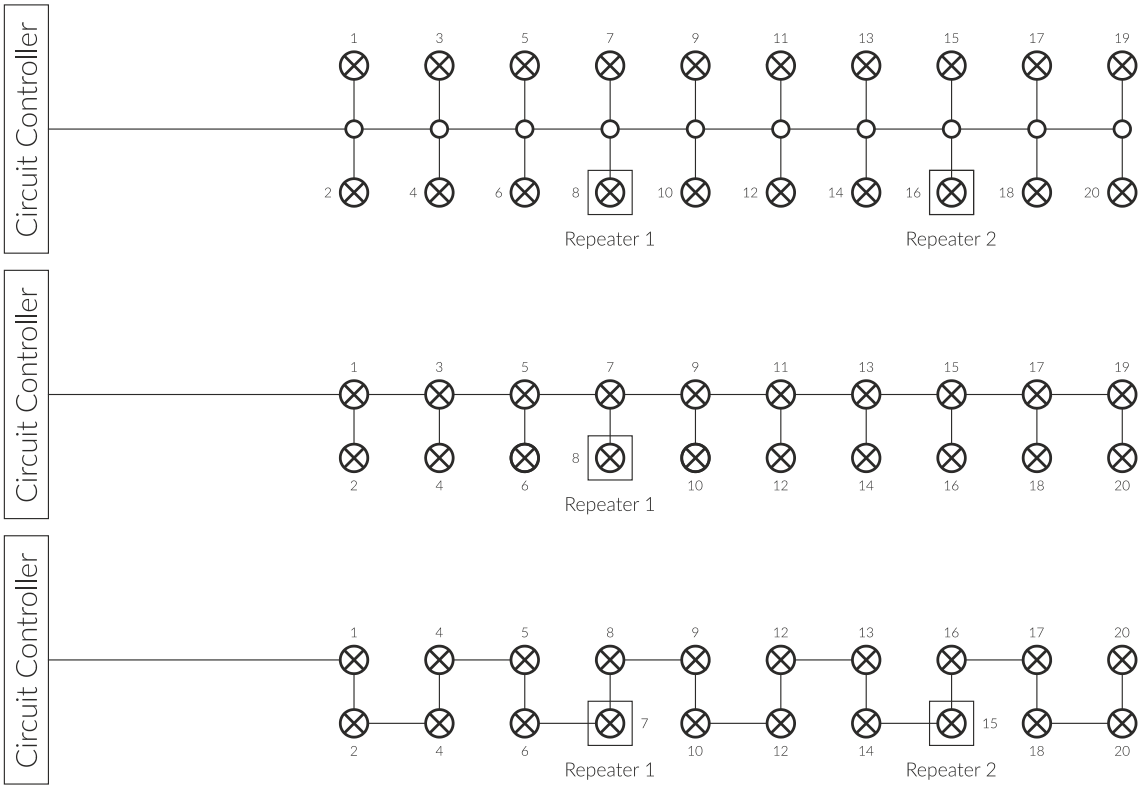
**ATTENTION!**
**In order to properly activate the Repeater function in the luminaires, "Service mode" must be activated in the main cabinet/subdistribution cabinet during configuration. After activating the Repeater function in the luminaires, the "Ready for operation" mode must be activated.**

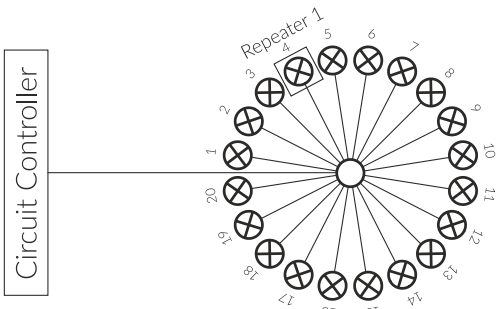
**NOTE!**
**A maximum of two Repeaters should be used per single circuit.**

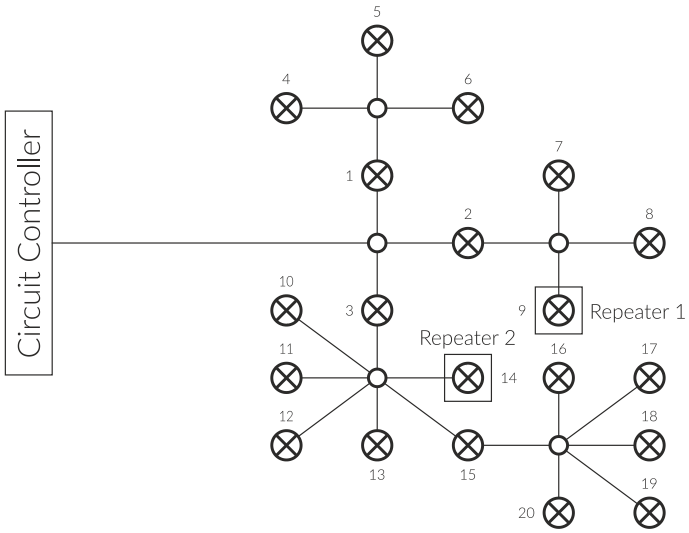
**NOTE!**
**The order in which the Repeaters are located is important for the proper functioning of the system in the circuit, Repeater 1 must be installed closer to the circuit card (station/substation) in the circuit than Repeater 2.**

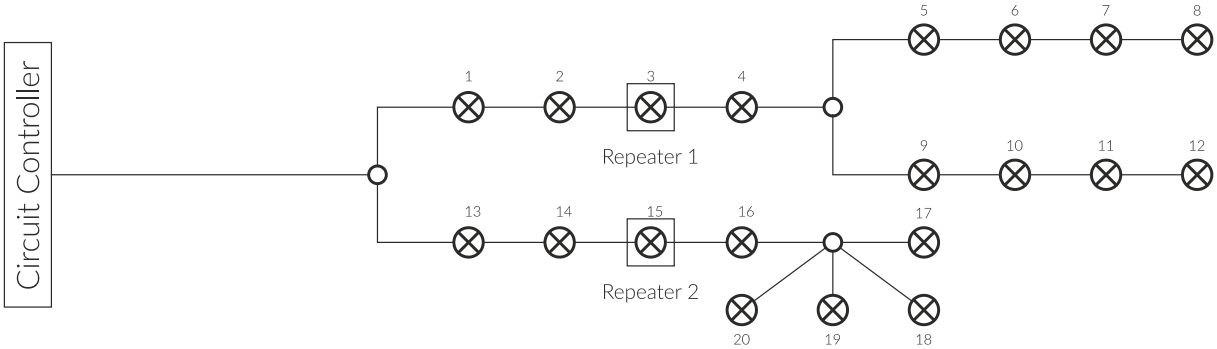
**NOTE!**
**For circuits with fixtures with no communication on one or two fixtures, the Repeater function should be activated. For this purpose, it is recommended to follow the following methods:**
**<u>Method 1 (last fixture)</u> - involves activating the Repeater function on the last fixture found (located farthest from the station/sub-switchboard, following the power cables).**
**<u>Method 2 (large node)</u> - involves activating the Repeater function on the last found fixture (located furthest from the station/sub-distribution, following the power cables) before nodes with a large number of branches.**
**If, despite using method 1 or 2, the luminaires placed around the perimeter are not found correctly, the arrangement of luminaires with the Repeater function should be selected experimentally, based on the guidelines described in the above two methods.**

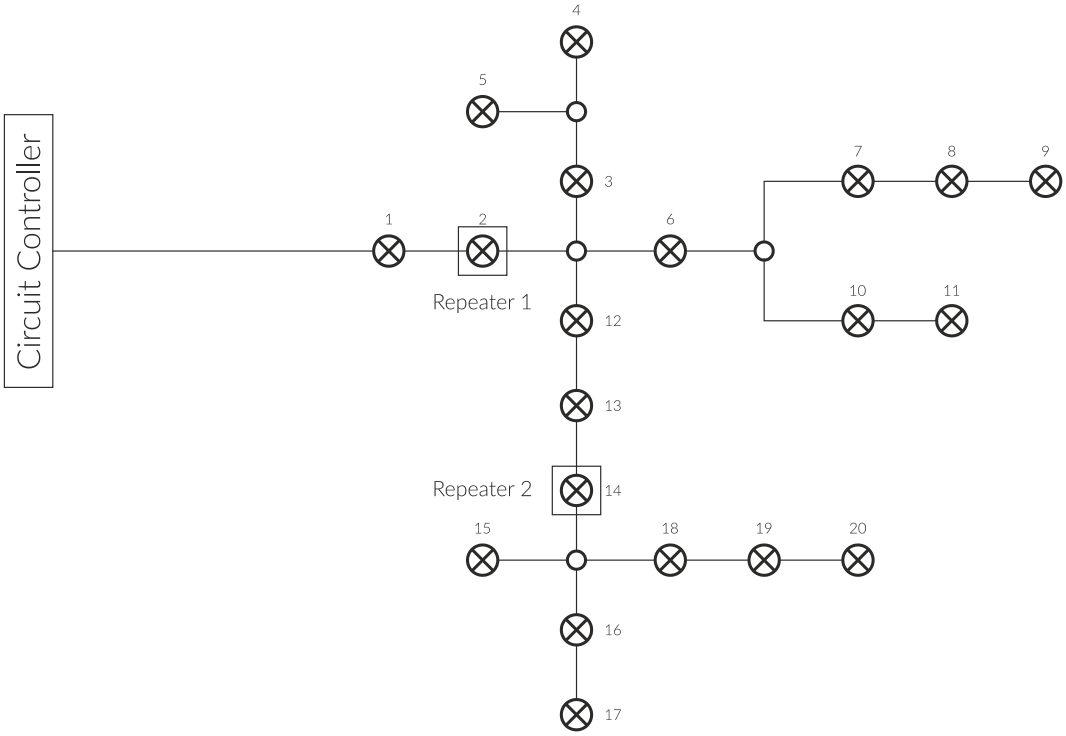
✓ Examples of topology of the power supply (communication) line of luminaires




Circuit Controller
Repeater 1


Circuit Controller
Repeater 1
Repeater 2


Circuit Controller
Repeater 1
Repeater 2


Circuit Controller
Repeater 1
Repeater 2

**ATTENTION!**
**Emergency luminaires do not have a fire operation function, and circuit continuity will not be maintained. Therefore, when designing the power supply line installation, the following principles must be observed.**
**Electrical and fiber optic cables, along with their fastenings, used in power supply and control systems for fire protection devices, should ensure the continuity of power supply or signal transmission for the duration required for the activation and operation of the device.**
**Electrical cables in fire alarm circuits, emergency lighting, and communication systems should have a PH rating appropriate to the time required for the operation of these devices.**
**Electrical cables should be designed and installed in such a way that, within the required time (up to 30 minutes, provided the cables are located within areas protected by fixed automatic water extinguishing systems), no interruption in the power supply or signal transmission occurs due to the influence of building elements or equipment.**

### 5.6. Connection of additional devices

Connect to the system with the power disconnected.

Connect the TM-I/O module, dedicated addressable modules TM-AM 02HM, TM-AM 02VM, TM-AM 03M, and the universal addressable module TM-AM 01M, TM-AM 01SM (MINI, MICRO) according to the attached instructions.

### 5.7. Connection of sub-distribution

The sub-distribution should be connected to the main station via a battery and communication cable - the appropriate terminals are shown in point 3.6.5 (TM-CB M SUB PR12) or point 3.6.6 (TM-CB M SUB PR20). The battery cable should be suitable for DC connections with a minimum operating voltage of 250 V, and the cross-section of the DC cables for sub-distribution power supply can range from 2.5 mm² to 16 mm² (see Table 2. Parameters for the TM-CB M models), with their maximum length chosen based on the load power.

The second cable is the RS485 bus communication cable (RS485 MAIN), whose maximum length should not exceed 1000 m (from the main station to the last sub-distribution), details are shown in section 5.4. Halogen-free telecommunications cables with the appropriate reaction to fire class (B2ca) and with maintaining electrical functions during fire (if required) with a cross-section of 1x2x0.8 mm should be used, e.g. HTKSHekw (maximum cable resistance 75 Ω/km, maximum effective steam capacity at 1 kHz 120nF /km).

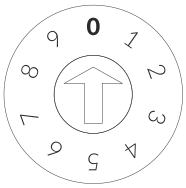
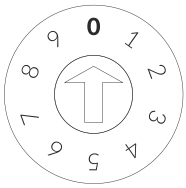
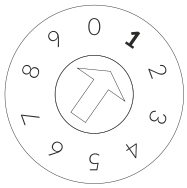
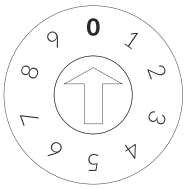
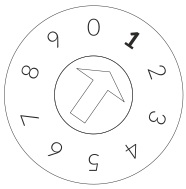
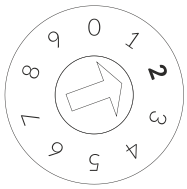
At the last sub-distribution, a terminating resistor of 120 Ohms should be set by placing a jumper on position T of connector X221.

### 5.8. Installation of fuses

Install the main battery fuses (B-), (B+) as specified in the "Fuse Table" (see section 3.7).

### 5.9. Setting the subpanel address

The sub-distribution address is set using two code setters located on the sub-distribution coordinator panel. The upper setter is used to set the tens digit, while the lower setter is used to set the units digit. The correct addresses for the sub-distribution panels range from 1 to 15.

| Code selectors | Address 00 | | Address 1 | | Address 12 | |
|---|---|---|---|---|---|---|
| Upper code selector setting | 0 |  | 0 |  | 1 |  |
| Lower code selector setting | 0 |  | 1 |  | 2 |  |

**ATTENTION!**
**If an address from outside the range for a given station model is selected, the subdistribution will not be visible.**

| TM-CB M model | Address range |
|---|---|
| M1 | 0 |
| M2, M3 | 1 |
| M4, M5 | 1 ÷ 4 |
| M6, M7 | 1 ÷ 7 |
| M8 | 1 ÷ 7 |
| M9, M10 | 1 ÷ 15 |

### 5.10. Connection of AC mains power

As shown in section 5.3 "Installation of batteries". Single-phase power supply 230 V AC. For powering TM-CB M cabinets, use halogen-free power cables with an appropriate fire reaction class (B2ca) and with fire-resistant electrical functionality (if required) of the HDGs type, with a minimum cross-section required by the external AC type B protection (see Table 2. Parameters for the TM-CB M models).

### 5.11. Ethernet connection (LAN)

Connecting the cabinet to the local network should be done according to the current requirements for structured network installations, for example, UTP category 5e cable.

### 5.12. Connection of internal phase monitors (IN1, IN2, IN3)

If phase monitoring is required in the local sub-distribution panel, connect the signals to the internal phase monitor of the control and monitoring unit using an HDGs cable with a minimum cross-section of 1.5 mm². The IN1 – IN3 inputs can be used as external triggers to control the operation of circuit controllers.

### 5.13. System startup

The device can be started if the following conditions are met:

- ✓ The power supply voltage must be connected,
- ✓ The effective value of the power supply voltage must be greater than 190 V AC.

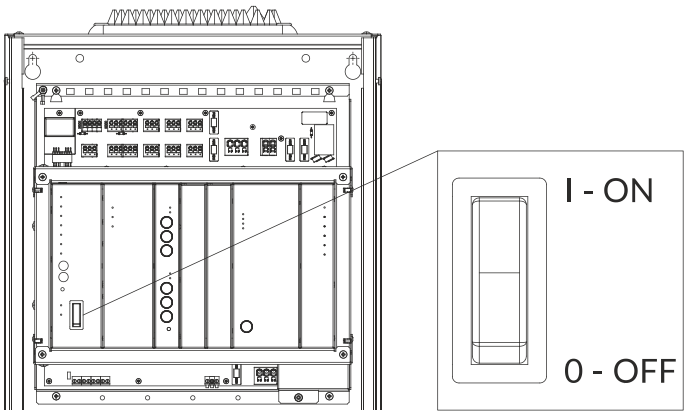
**NOTE!**
**Additional circuit cards should be installed only when the cabinet is completely switched off (AC voltage disconnected and DC battery fuses removed).**

Check if the screws are tightened and the compression connections are properly seated and tightened.

- ✓ Make sure by taking measurements that there is no short circuit or grounding.
- ✓ Install the appropriate fuses and connect the DC battery power supply.
- ✓ Activate primary power supply (connect voltage to the AC socket, see section 5.10).

Possible messages (DEEP DISCHARGE) result from a lack of batteries or battery fuses (B-), (B+), (-/+) or too low voltage (< 190 V DC) of the battery pack.

**NOTE!**
**The central battery system has a two-position switch on the front panel of the coordinator. During normal operation, it is necessary for the switch to be set to the "ON" position (Ready to operate). Moving the switch to the "OFF" position (Service mode/Lock) disconnects the power supply to the output circuits (operation in service mode – battery charging only).**
**In this mode, the central battery cannot perform its function.**



Activation of the battery and readiness for operation

- ✓ Set the Service Mode/Lock switch to the "ON" position (Ready for operation).
- ✓ After about 1÷3 minutes, the charging process (CHARGING) should begin.

Configuration and operation verification

- ✓ Log in to the system (VisualBase or VisualSite application, see section 8.12).
- ✓ Check if the system has started up correctly and shows no errors (no error messages, no ERROR SYSTEM LED lit on the main station coordinator).
- ✓ Verify if the system has detected installed VTM modules (optional).
- ✓ Perform the search/configuration of individual system components while maintaining the following order:
  - search for sub-distributions,
  - circuit configuration,
  - search for luminaires (applies only to CBM luminaires with addressable modules),
  - search for I/O modules (optional).
- ✓ Conduct an analysis of the number of installed luminaires compared to the number of detected luminaires in the system (for addressable luminaires), and for other luminaires, ensure that all are powered and functioning properly (all circuits can be configured for test operation in maintained mode, M mode).

  To remove double luminaires on the circuit, follow these steps:
  - change the addresses of duplicate luminaires to unique ones,
  - remove all fixtures from the circuit,
  - search and refresh them again,
  - then verify the correctness of the addresses of the installed luminaires.

**ATTENTION!**
**Just refreshing the luminaires after changing duplicate addresses is not enough, because the duplicate detection system only works during the search procedure.**

- ✓ Perform a calibration test if there are circuits with power tolerance set (Monitoring circuits). Setting the power tolerance to 0% disables the circuit monitoring function.
- ✓ Conduct functional tests on all luminaires in the system; during the test, the TEST and BATTERY OPERATION LEDs should illuminate.
- ✓ Check if the luminaires show no errors after the test.
- ✓ In case of luminaire errors, conduct a local inspection and check the luminaire for the indicated error.
- ✓ To confirm the proper operation of the system after installation, additionally perform the following tests:
  - Set the lock switch to the 'OFF' position and physically confirm that the luminaires do not operate in emergency mode after power failure (light source is not lit). After the test, set the switch back to 'ON',

- simulate a cabinet power failure and check if the BATTERY OPERATION LED is lit and if the luminaires on the premises operate properly,
- simulate a light source failure in a selected luminaire by unplugging/disconnecting it, perform a functional test, and check its status (whether the fault condition is reported correctly).

✓ Configure test group settings (according to the requirements described in point 9).

✓ Optionally configure night and fire groups as well as external triggers.

✓ If the system is connected to an Ethernet network, configure the network card settings of the coordinator.

✓ Enter the address data of the facility where the Central Battery System is installed.

✓ Generate a report at the control center.

✓ Prepare a protocol of the performed system startup procedures and attach the generated report (in paper form) confirming the system status.

Now the system is ready to operate.

**ATTENTION!**
**If the device detects a charging error or the battery voltage is less than 210 V during a power outage, the load (all output circuits) will be disconnected.**

**ATTENTION!**
**If the device detects a charging error or the battery voltage is less than 205 V during a power outage, the entire device will be disconnected (all LEDs will go out).**

**ATTENTION!**
**Loss of 230 V AC power at any sub-distribution board connected to the main station will switch the system to battery operation mode (the "BATTERY OPERATION" indicator activates on the main station coordinator and the sub-distribution board coordinator where the power loss occurred). Only the sub-distribution board that experienced the local AC power loss will operate from the batteries (DC voltage), while the rest of the system, which still has AC power, including the main station, will continue to operate on AC voltage. For safety reasons, the main station also disables the charging system. It is possible to configure the system so that a loss of AC power at the main station will cause a global switch of the entire system (main station and all installed sub-distribution boards) to battery operation mode (the parameter "Global reaction to power loss" must be set).**

**ATTENTION!**
**Execute system configuration (setting operating time and battery capacity).**

### 5.14. Shutting down the system (RESET)

- ✓ Set the "Service Mode" switch to position "0" - OFF, and then wait until all circuits are turned off (circuit cards indicate no voltage output).
- ✓ Disconnect the 230 V AC power supply.
- ✓ Disconnect the battery by removing the battery fuses (B+), (B-).
- ✓ Wait for at least 10 seconds before restarting the system.

To restart the system, follow the instructions in section 0 "System Startup".

## 6. Accessories

### 6.1. DC splitter set (TM-MN.CB01MS) for TM-CB M4, M5, M6, M7

One "DC splitter" set (TM-MN.CB01MS) allows connecting up to three sub-distribution panels to the main cabinet. Ultimately, one TM-MN.CB01MS set can be installed in TM-CB M4 and M5 cabinets, while two sets can be installed in MTM-CB M6 and M7 cabinets.

Installation must be carried out with the main power supply turned off.

Remove the main cabinet cover (disconnect the grounding wire).

Mount the DC splitter (with the INPUT DC- / INPUT DC+ socket facing down) (see section 3.6.7) using two screws (included in the accessory) to the two protruding studs (internally threaded) located in the upper right corner of the cabinet.

Connect the installed DC splitter (DC INPUT - / + socket) to the splitter (DC OUTPUTS - / + socket) located under the DIN rail.

Connect additional sub-distribution panels using the sockets (DC OUTPUTS - / + socket).

Reinstall the main cabinet cover (reconnect the grounding wire).

Details, see:

Attachment 5. Installation manual for the TM-MN.CB01MS accessory - extension for sub-distribution for TM-CB M4 / M5 / M6 / M7

### 6.2. VTM module set (TM-MN.CB02Mx) for TM-CB M1, M2, M3, M4, M5, M6, M7

The VTM module set (TM-MN.CB02Mx) is used for monitoring (voltage and temperature measurement) of batteries. Install inside the main cabinet (directly on the batteries). For details, see section 8.7 and:

Attachment 6. Installation manual for the TM-MN.CB02Mx accessory - VTM module set

| Ordering data | | | |
|---|---|---|---|
| Accessory code | Main cabinet | Accessory code | Main cabinet |
| TM-MN.CB02M1 | TM-CB M1 | TM-MN.CB02M5 | TM-CB M5 |
| TM-MN.CB02M2 | TM-CB M2 | TM-MN.CB02M6 | TM-CB M6 |
| TM-MN.CB02M3 | TM-CB M3 | TM-MN.CB02M7 | TM-CB M7 |
| TM-MN.CB02M4 | TM-CB M4 | - | - |

### 6.3. TM-I/O module set for TM-CB M1, M2, M3, M4, M5, M6, M7, M8, M9, M10 stations and TM-CB SUB ZPR12, 20 sub-distribution boards

The TM-I/O module (available in versions IN/OUT; IN 230; IN SW; IN 24; OUT with power supply) is used for controlling emergency lighting groups. For details, see section 8.8 and:

Attachment 7. Installation manual for the TM-MN.CB03x accessory - TM-I/O module set for sub-distribution boards

| Ordering data | | | |
|---|---|---|---|
| Accessory code | TM-I/O module | Accessory code | TM-I/O module |
| TM-MN.CB031 | IN/OUT | TM-MN.CB034 | IN 24 |
| TM-MN.CB032 | IN 230 | TM-MN.CB035 | OUT |
| TM-MN.CB033 | IN SW | - | - |

The TM-I/O module is mounted externally on a DIN rail, with the power supply mounted inside the sub-distribution board.

Attachment 8. Installation manual for the TM-MN.xx.ZSDxxx accessory - TM-I/O module set for stations

| Ordering data | | | |
|---|---|---|---|
| Accessory code | TM-I/O module | Accessory code | TM-I/O module |
| TM-MN.UN.ZSD001 | IN SW | TM-MN.UN.ZSD004 | IN/OUT |
| TM-MN.UN.ZSD002 | IN 24 | TM-MN.D2.ZSD002 | IN 230 |
| TM-MN.UN.ZSD003 | OUT | - | - |

The TM-I/O module is mounted externally on a DIN rail, the power supply mounted externally on a DIN rail.

Attachment 9. Universal descriptive instruction for the TM-I/O module

### 6.4. The Fuse set (TM-MN.CB04M0) for TM-CB M8, M9, M10

The fuse set (TM-MN.CB04M0) is used for system expanding with additional sub-distribution panels. One set allows connecting one sub-distribution panel to the main cabinet.

Installation must be carried out with the main power supply turned off.

Remove the three covers of the main cabinet (front, top, and rear, and disconnect the grounding wires).

Insert the fuse into the fuse holder, then mount the assembly (front side of the main cabinet) on the DIN rail marked (DC OUTPUT BATTERY –). Repeat the same steps for (DC OUTPUT BATTERY +), see section 3.6.4.

From the rear side of the main cabinet, connect the cable (included in the accessory) to the connection terminal (DIN rail, DC OUTPUT BATTERY –) using the ring terminal, spring washer, and screw (included in the accessory), and connect the other end of the cable to the fuse holder (bottom fuse socket). Repeat the same steps for (DIN rail, DC OUTPUT BATTERY +).

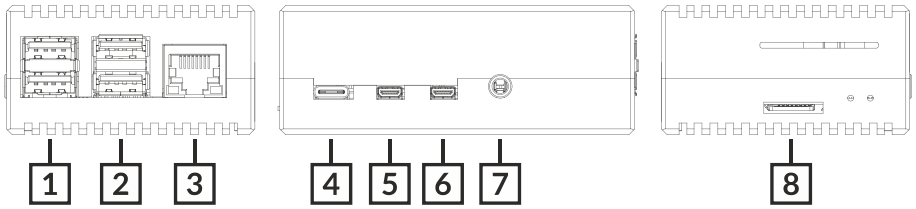
Connect additional sub-distribution panels using the top fuse sockets.

Reinstall the main cabinet cover (reconnect the grounding wire). Turn on the main station power supply. Details, see:

Attachment 10. Installation manual for the TM-MN.CB04M0 accessory - sub-distribution extension for TM-CB M8 / M9 / M10

### 6.5. Hardware module set for communication with the VisualSite website (TM-MN.VSxxx) for TM-CB M1, M2, M3, M4, M5, M6, M7, M8, M9, M10

The set consisting of a hardware module and a power supply for communication with the VisualSite website (see section 8.12) and brackets for mounting the set in a cabinet. Installation must be carried out with the main power supply turned off. Mount the power supply on a DIN rail. Connect the power supply to the "X20" socket (see section 3.6) on the motherboard.

| | |
|---|---|
| Hardware module |   |
| 1 | Two USB 3.0 (USB A) ports |
| 2 | Two USB 2.0 (USB A) ports for connection to the coordinator's USB C port (see section 8.3); cable available as an accessory |
| 3 | Ethernet socket |
| 4 | USB C power port (5 V/3 A) for connecting an external power supply; cable available as an accessory |
| 5 | Micro HDMI socket |
| 6 | |
| 7 | Slot stereo audio |
| 8 | Micro SD card slot |

For details on mounting the accessory to the main cabinet, see:

Attachment 11. Installation manual for the TM-MN.VSxxx accessory - hardware module for communication with the VisualSite website

| Ordering data | |
|---|---|
| Accessory code | Main cabinet |
| TM-MN.VS001 | TM-CB M1, M2, M3 |
| TM-MN.VS002 | TM-CB M4, M5, M6, M7, M8, M9, M10 |

## 7. Storage conditions before installation

- ✓ The packaging and the device should be stored in a place protected from rain.
- ✓ Do not put anything on the packaging.
- ✓ Dry environment, not exposed to moisture and chemical agents, away from strong magnetic fields.
- ✓ Recommended storage temperature: +10 °C ÷ +25 °C.
- ✓ Store in unit packages. Do not stack.
- ✓ Store in the manufacturer's original packaging until installation.
- ✓ Storage conditions for batteries are described in section 8.2

# 8. Functions of Individual System Blocks

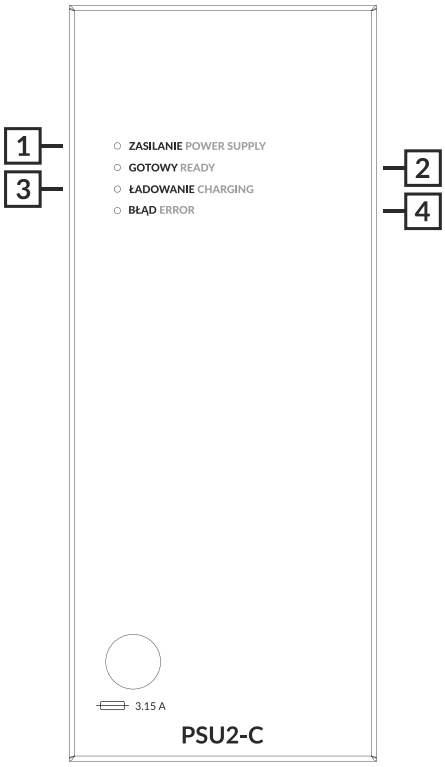
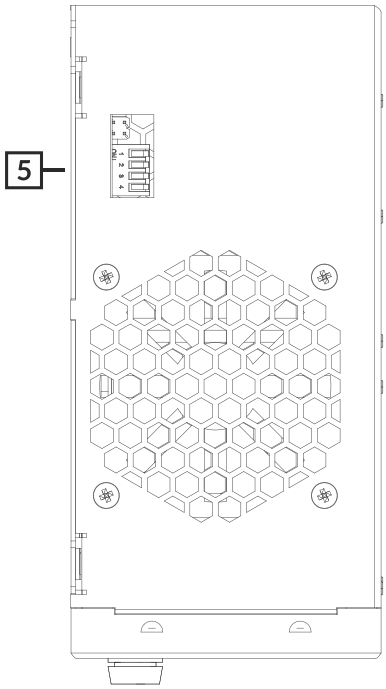
## 8.1. Charger (PSU2-C)

General Information

An electronic module used for charging batteries. It ensures the charging of batteries of a certain capacity within an appropriate time frame. Charging is carried out pulsatingly with temperature compensation, which extends the battery life. The maximum charging current, depending on the version, is 2.5 A or 3 A (chargers with boost mode). The charger constantly monitors the charging current, battery voltage, and temperature. It is a Plug & Play device. The device charges batteries by selecting charging voltages depending on the cell temperature. In case of excessive heating of the charger, the charging current is automatically limited. The module also contains a fuse to protect against shorts up to 3.15 A.
Correct charger operation is indicated by the POWER SUPPLY and READY LEDs. Charger malfunction is indicated by the ERROR LED. The CHARGING LED signals charging of the batteries.

Characteristics

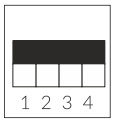
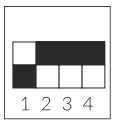
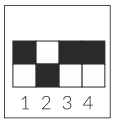
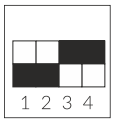
- ✓ Integrated voltage monitoring.
- ✓ CV / CC charging characteristic - processor-controlled (without the need for calibration).
- ✓ The charger charges the battery to 80% of the nominal capacity within 12 hours.
- ✓ Battery charging is carried out by a microprocessor system. The charging algorithm ensures optimal battery life by considering current intensity, voltage, temperature, and current state of charge.
- ✓ Adjusting the charger to charge batteries of different capacities is possible after the appropriate system configuration.
- ✓ Control of the charging characteristic is also possible in case of lack of communication with the coordinator. This ensures that even in the event of coordinator failure, battery charging is carried out correctly.

| | | | |
|---|---|---|---|
|  |  | 1 | Charger powered |
| | | 2 | Ready for operation |
| | | 3 | Charging |
| | | 4 | Charger error<br>- fan stopped<br>- too low/high power supply voltage<br>- too low/high battery voltage<br>- blown fuse<br>- output short circuit<br>- overheat |
| | | 5* | Dip-Switch to set the charger address |
| *applies to TM-CB M 8-10 models when more than one charger is used, see notes below | | | |

**ATTENTION!**
**The chargers have physical addresses set on the Dip-Switch from 0 to 7.**
**<u>By default, the charger should have address 0 set.</u>**

**ATTENTION!**
**For TM-CB M 8-10 models when using more than one charger,**
**they should be set to subsequent addresses 1, 2, 3**
**(e.g. for TM-CB M 10 where there are four chargers, they should have physical addresses 0, 1, 2 and 3).**

**ATTENTION!**
**Dip-Switch setting: pin (1, 2, 3) – ON / OFF; pin 4 always OFF.**
**OFF - switching off (pin up); ON - switching on (pin down).**

| **Dip-Switch** | Address | Pin 1 | Pin 2 | Pin 3 | Pin 4 |
|---|---|---|---|---|---|
|  | 0 | OFF | OFF | OFF | OFF |
|  | 1 | ON | OFF | OFF | |
|  | 2 | OFF | ON | OFF | |
|  | 3 | ON | ON | OFF | |

### 8.2. Battery

Battery bank

The battery consists of 18 maintenance-free lead-acid batteries with a voltage of 12 V and a capacity dependent on the selected TM-CB M 1-10 model. When selecting the capacity, a 25 % reserve is taken into account. The main power supply (CPS) batteries should have a declared average service life of at least 10 years at an ambient temperature of 20 °C. Battery data sheets are available in the attachments.

Table 18. List of 12V VRLA Batteries Used in TM-CB M Models

| Model TM-CB M | Battery capacity [Ah] | Battery Order Code | Datasheet |
|---|---|---|---|
| 1/5-006-00 | 5 | TM-AAL005.UN.B1 | Attachment 12. Battery 5 Ah 12 V |
| 2/7-006-01 | 7.2 | TM-AAL7A2.UN.B1 | Attachment 13. Battery 7.2 Ah 12 V |
| 3/7-112-01 | | | |
| 4/12-112-04 | 12 | TM-AAL012.UN.B1 | Attachment 14. Battery 12 Ah 12 V |
| 5/18-112-04 | 18 | TM-A5P018.UN.B1 | Attachment 15. Battery 18 Ah 12 V |
| 5/20-112-04 | 20 | TM-A5P020.UN.B1 | Attachment 16. Battery 20 Ah 12 V |
| 6/26-112-07 | 26 | TM-A5P026.UN.B1 | Attachment 17. Battery 26 Ah 12 V |
| 6/28B-112-07 | 28 | TM-A5P028.UN.B1 | Attachment 18. Battery 28 Ah 12 V |
| 7/33-112-07 | 34 | TM-A5L034.UN.B1 | Attachment 19. Battery 34 Ah 12 V |
| 8/40-220-07 | 40 | TM-A6P040.UN.B1 | Attachment 20. Battery 40 Ah 12 V |
| 8/45-220-07 | 45 | TM-A6P045.UN.B1 | Attachment 21. Battery 45 Ah 12 V |
| 8/55-220-07 | 55 | TM-A6L055.UN.B1 | Attachment 22. Battery 55 Ah 12 V |
| 9/55-220-15 | | | |
| 8/65-220-07 | 65 | TM-A6P065.UN.B1 | Attachment 23. Battery 65 Ah 12 V |
| 9/65-220-15 | | | |
| 8/75h-220-07 | 75 | TM-A6L075.UN.B1 | Attachment 24. Battery 75 Ah 12 V |
| 9/75-220-15 | | | |
| 8/80-220-07 | 80 | TM-A6P080.UN.B1 | Attachment 25. Battery 80 Ah 12 V |
| 9/80-220-15 | | | |
| 8/90-220-07 | 90 | TM-A6L090.UN.B1 | Attachment 26. Battery 90 Ah 12 V |
| 9/90-220-15 | | | |
| 8/100h-220-07 | 100 | TM-A6L100.UN.B1 | Attachment 27. Battery 100 Ah 12 V |
| 9/100h-220-15 | | | |
| 8/120h-220-07 | 120 | TM-A6L120.UN.B1 | Attachment 28. Battery 120 Ah 12 V |
| 9/120h-220-15 | | | |
| 8/134-220-07 | 130 | TM-A8L134.UN.B1 | Attachment 29. Battery 134 Ah 12 V |
| 9/134-220-15 | | | |
| 10/120-240-15 | 120 | TM-A8L120.UN.B1 | Attachment 30. Battery 120 Ah 12 V |
| 10/150-240-15 | 150 | TM-A6L150.UN.B1 | Attachment 31. Battery 150 Ah 12 V |

### Operating principles

The battery is replaceable. Replacement can only be performed by the manufacturer, manufacturer's service, or competent personnel.

- ✓ Before replacing the batteries, check for any visible mechanical damage.
- ✓ Ensure that the replacement batteries are of the same type as the batteries originally installed in the system. **Replacing batteries with an incorrect type may result in an explosion.**
- ✓ Before connecting or disconnecting the batteries, ensure that they are not being charged or discharged.
- ✓ Excessive temperature at which the battery operates adversely affects its parameters and lifespan.
- ✓ Soldering battery terminals is not recommended.
- ✓ Connect batteries using wires of equal length and appropriate cross-section.
- ✓ Before starting, check the polarity and correct connection of the terminals.
- ✓ Do not mix old and new batteries. This may damage them or adversely affect the operation of the remaining batteries.
- ✓ The entire set of batteries should be replaced if negative test results are obtained.

Storage

- ✓ Batteries should be stored in a dry, cool place, away from direct sunlight.
- ✓ The optimal storage humidity for batteries is 55 % +/- 30 %.
- ✓ The storage time of batteries depends on the temperature at which they are stored.

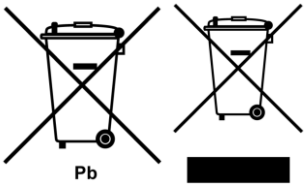
  The table below shows the time after which the battery should be recharged based on the storage temperature.

| Storage Time (in months) after which charging should be done | Storage temperature [°C] |
|---|---|
| 6 | < 20 |
| 4 | 20 ÷ 30 |
| 2 | 30 ÷ 40 |

After the time indicated in the table, the battery should be charged with a voltage of 2.27 V per cell for 96 hours or until the charging current remains unchanged for 3 hours. Whether the battery needs to be charged is indicated by measuring the open circuit voltage of the battery. It is recommended to recharge the battery if the voltage drops below 2.07 V per cell. Failure to adhere to these conditions may result in reduced durability and capacity of the battery.

Do not dispose of used electrical and electronic equipment in the trash. Disassembly and disposal of stationary batteries should only be done by competent personnel. Appropriate national and international regulations should be followed.

Used batteries are waste products that must be disposed of at a collection point for recyclable materials in accordance with applicable regulations.



### 8.3. Coordinator (CU-C)

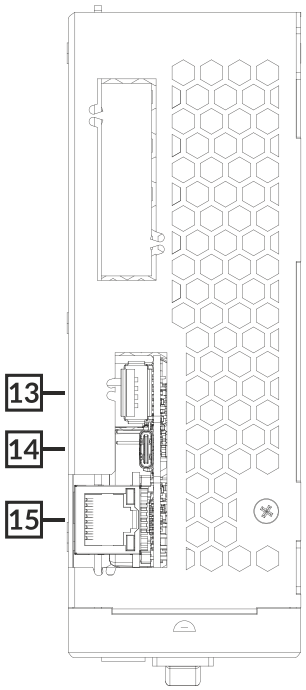
General information

The unit controls the entire sub-distribution. It is the main component of the system, carrying out all control and monitoring functions.

The basic functions performed by the coordinator include:

Displaying system status information **(LEDs visible after system installation through a glass viewer located in the cabinet door)**.

Information about the system status using LEDs and socket descriptions:




| | |
|---|---|
| 1 | Coordinator powered |
| 2 | Mains power supply |
| 3 | Test |
| 4 | Battery mode |
| 5 | System error |
| 6 | Deep discharge of batteries (manual reset required) |
| 7 | Critical loop |
| 8* | Sub-distribution address |
| 9 | Functional button available only for service users |
| 10 | LED D1 no communication with the power supply |
| 11 | LED D1 no communication with the charging module or charger |
| 12 | Ready for operation I - ON Service mode/Lock 0-FF |
| 13** | USB A socket for pendrive connection (log copying) |
| 14** | USB C socket for computer / VisualSite module (see section 6.5) |
| 15** | Ethernet socket for MODBUS communication |

*not present in the station

**not supported in the sub-distribution (for future applications)

During normal operation, only LEDs indicating proper power supply and battery charging should be illuminated. After power-up and with correctly connected batteries, charging starts within 2 minutes. During the test, the TEST and BATTERY MODE LEDs light up. If a system error is detected, the SYSTEM ERROR LED illuminates.

### 8.4. Circuit Controller (MCL-C, MCL-A, MCL-H, MCL-B)

General information

The circuit control device manages the operation of output circuits. Depending on the operating mode, it activates the appropriate type of voltage (AC or DC), controls monitored addressable luminaires of the CBM type, performs DC current measurements, and activates the modified luminaire mode. One circuit controller handles one or two output circuits. Depending on the TM-CB M system type, a maximum of 3, 6, 10, or 20 circuit controller cards can be connected. Installation of single or dual-circuit controllers is possible in any order and in any slots. Circuit controllers are automatically detected by the system.

The electrical circuits of the module serve as end circuits for TM-CB M emergency lighting systems. The coordinator identifies the cards using the integrated Plug & Play system.

Depending on the model, the cards are equipped with:

- For MCL-C, MCL-A, two electrical circuits ("Circuit A" and "Circuit B"), each with a maximum load of 3 A;
- For MCL-H, MCL-B, one electrical circuit ("Circuit A") with a maximum load of 6 A.

Additionally, each circuit has ground fault detection, which signals any insulation faults in the end circuit with a yellow LED (error).

Programming of the operating mode (M - maintained mode or NM - non-maintained mode) in the end circuit is done separately for each circuit.

The cards have internal fault detection and report errors related to fuses, relays, and overload.

MCL-A and MCL-B models do not have communication modules via the power line with addressable CBM luminaires. They can also control CB+ luminaires and power regular CB-type luminaires, making them universal.

However, MCL-A and MCL-B models do not have a communication module via the power line with CBM-type addressable luminaires. Nevertheless, they can control CB+ luminaires and power regular CB-type luminaires.

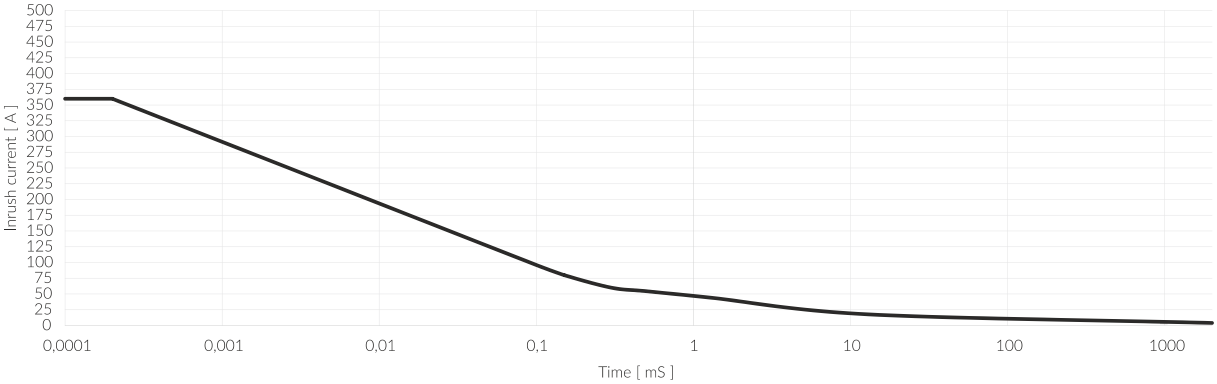
Characteristics

- ✓ Output 2x3 A - maximum load up to 500 VA (per circuit) with integrated overload protection.
- ✓ Output 1x6 A - maximum load up to 1000 VA (per circuit) with integrated overload protection.
- ✓ Possible operation of luminaires in mixed mode.
- ✓ Dual protection on each line L, B+, and B- with a delayed sand fuse protecting the end circuits.
- ✓ Handling of one or two output circuits - protection for each circuit separately.
- ✓ In case of damage to the power supply L fuse, operation with battery backup is possible.
- ✓ Configuration of the operating mode for each circuit (M - maintained mode, NM - non-maintained mode, OFF - circuit disabled).
- ✓ Integrated circuit monitoring based on calibration.
- ✓ Built-in insulation status control.
- ✓ Night group support.
- ✓ Communication with CBM luminaires via the power line (MCL-C and MCL-H models only).
- ✓ Defined circuit operation time (no limit, 1h, 2h, 3h, 8h) and delays after failure (0 ÷ 30 minutes).

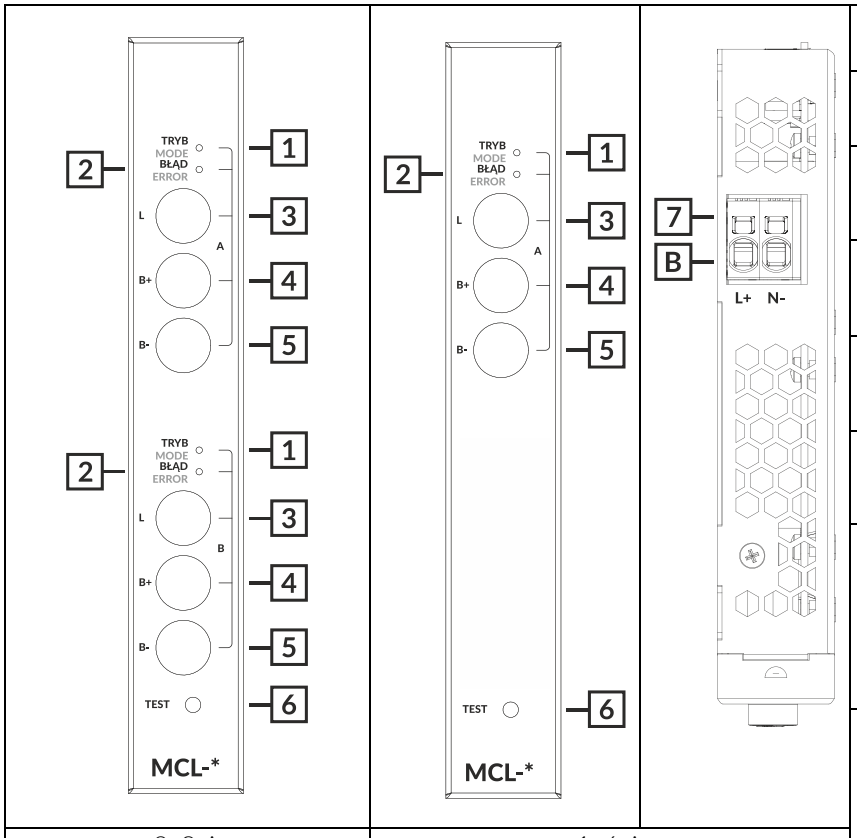
- ✓ Ability to install single and dual-circuit controllers in any configuration. Refer to controller installation details:

  Attachment 32. Circuit controller MCL-C(H) installation manual

Characteristics of maximum AC or DC starting current




Signaling using LED indicators and socket description:




| | |
|---|---|
| 2x3 A | 1x6 A |
| *C – with communication | *H – with communication |
| *A – without communication | *B – without communication |

| | |
|---|---|
| 1 | Green LED |
| 2 | Yellow LED |
| 3 | Phase AC voltage fuse - „L” symbol |
| 4 | Battery „+” fuse - „B+” symbol |
| 5 | Battery „-" fuse – „B-“ symbol |
| 6 | Test button - available only for service users |
| 7 | Output of the circuit controller, marked “L+”; “N-“, only for MCL-H or MCL-B, see section 5.5 |
| B | PHOENIX CONTACT 1991105 See Table 6. Connector parameters |

**NOTE!**
**The circuit board with communication (MCL-C, MCL-H) enables the operation of addressable CB luminaires (modulated PLC transmission) (CBM).**

**NOTE!**
**The circuit board without communication enables the operation of CB luminaires.**

A and B circuit:

| MODE - Green LED | FAILURE – Yellow LED |
|---|---|
| ➢ Continuous light – DC voltage output<br>➢ Short pulses (illumination time 0.5s; period 5s) - no voltage output.<br>➢ Slow pulses (illumination time 1s; period 2s) - AC voltage output. Normal luminaire operation mode.<br>➢ Fast pulses (illumination time 0.1s; period 0.2s) - modified mode. AC voltage output. | ➢ Continuous light – voltage output, despite circuit disconnection<br>➢ Does not shine - everything OK.<br>➢ Fast pulses (illumination time 0.1s; period 0.2s) - earthing fault, fuse, or relays.<br>➢ Slow pulses (illumination time 1s; period 2s) - circuit test error.<br>➢ Short pulses (illumination time 0.5s; period 5s) - luminaire error on the circuit. |

**ATTENTION!**
**If no LEDs are shining, the card is damaged or has no power supply. If all LEDs are shining, the card did not correctly recognize its address. In such a case, the card should be replaced.**
**If replacement does not help, service assistance should be requested.**

Changing circuit operation mode

Switching circuit modes is possible through the user interface (Visual Base), details can be found in section 8.12.

**ATTENTION!**
**In case of changing the circuit load (e.g., adding new luminaires, changing the luminaire type(s), etc.), the circuit should be recalibrated.**

During the emergency lighting system inspection (usually conducted once a year), the circuits should be recalibrated after checking the condition of the light sources. Such actions compensate for the aging effect on the current drawn by them, thus preventing the possibility of incorrectly diagnosing a circuit failure.

### 8.5. Power Supply Module (PWU-C)

General information

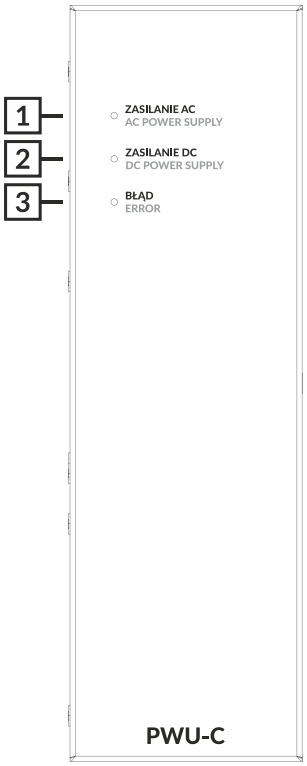
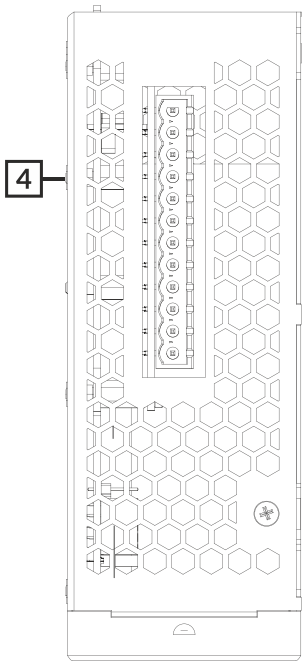
Table 19. Tabular list of available power supply models (PWU-C)

| Model | Power supply power [W] | Relay board (system status) | Total Stop | Fan power supply | Application | Standard installation |
|---|---|---|---|---|---|---|
| CB_ZAS_1 | 35 | - | - | - | TM-CB M SUB PR12 | - |
| | 65 | | | | TM-CB M SUB PR12 | + |
| CB_ZAS_2 | 35 | + | - | - | TM-CB M1-2 | - |
| | 65 | | | | TM-CB M3-7 | - |
| CB_ZAS_3 | 35 | - | + | - | TM-CB M SUB PR12 | - |
| | 65 | | | | TM-CB M SUB PR12 | - |
| CB_ZAS_4 | 35 | + | + | - | TM-CB M1-2 | + |
| | 65 | | | | TM-CB M3-7 | + |
| CB_ZAS_5 | 120 | - | - | + | TM-CB M SUB PR20 | + |
| CB_ZAS_6 | 120 | + | - | + | TM-CB M8-10 | - |
| CB_ZAS_7 | 120 | - | + | + | TM-CB M SUB PR20 | - |
| CB_ZAS_8 | 120 | + | + | + | TM-CB M8-10 | + |

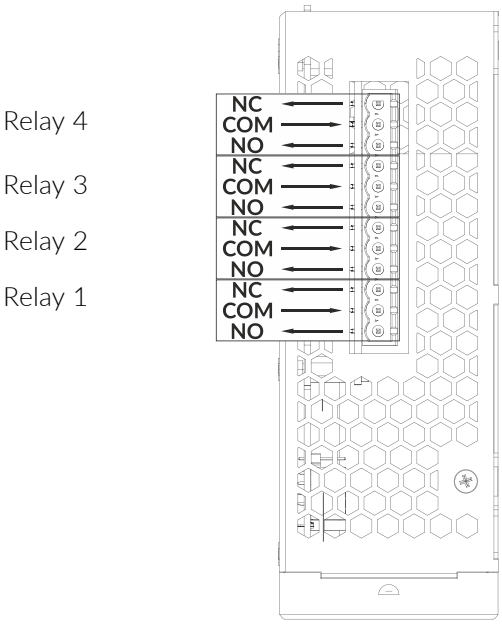
The power supply module performs the following basic functions:

- ✓ Providing appropriate supply voltages (24VDC and 5VDC) from the available source:
  - AC - mains power supply;
  - DC - batteries in case of AC failure.
- ✓ Current output depending on the version: 35 W - 1.45 A, 65 W - 2.7 A, 120 W - 5 A (actually 3.5 A).
- ✓ Monitoring AC and DC supply voltages as well as output voltages.
- ✓ Detection of AC power supply failure and its measurement.
- ✓ Supplying power to external I/O modules.
- ✓ Protection circuit preventing batteries from deep discharge (hardware threshold approximately 167V).
- ✓ Communication with the coordinator.
- ✓ Hardware watchdog, temperature measurement of the card.
- ✓ Control of an external fan (if installed).
- ✓ Monitoring the status of phase monitors inputs (IN1, IN2, IN3 – detection threshold approx. 165 V AC) and optionally the Total Stop circuit.
- ✓ Control of a relay card with potential-free outputs informing about the current system status (connector located at the top of the power supply module).

Signaling using LED indicators and socket description:

<table>
<tr><td rowspan="3"> 
</td><td rowspan="3"> 
</td><td>1</td><td>AC power supply (green LED) - when voltage above 190V AC</td></tr>
<tr><td>2</td><td>DC power supply (green LED) - when voltage above 190V DC</td></tr>
<tr><td>3</td><td>Module Error (yellow LED):<br>✓ when the output voltage of the main 24V power supplies is below the 21V DC<br>✓ when the malfunction of the system fan FAN1 was decoded (configured and does not rotate)<br><br>The coordinator has detailed information about which error occurred.</td></tr>
<tr><td>4</td><td colspan="3">Connector (only present in all TM-CB M1-10 main stations, power module models: CB_ZAS_2, CB_ZAS_4, CB_ZAS_6, and CB_ZAS_8) with potential-free outputs, load capacity 5A, 250 V AC / 30 V DC:<br>✓ Relay 1 – Indicates presence of primary power supply AC;<br>✓ Relay 2 – Indicates battery operation status;<br>✓ Relay 3 – Indicates general station error;<br>✓ Relay 4 – Indicates deep battery discharge.</td></tr>
</table>

Description of the connector pins with potential-free outputs:




COM – common
NC – default closed
NO – default opened

### 8.6. Charging Control Module (CHC-C)

General Information

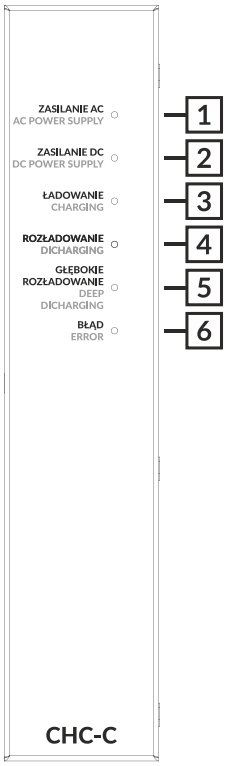
The charging control module is a unit that controls the charger(s).

**ATTENTION!**
**The global system current is shown with a "+" sign (when charging) and with the sign "-" (when there is discharge).**

Basic functions performed by the module:

- ✓ control and communication with the charger(s) (up to 5 units);
- ✓ temperature measurement of batteries and/or battery chamber;
- ✓ battery voltage measurement;
- ✓ battery current measurement;
- ✓ hardware watchdog, board temperature measurement;
- ✓ communication with the coordinator.
- ✓ communication with VTM modules via TM-BUS;
- ✓ turns on and supplies power to chargers.

LED Signaling




| | |
|---|---|
| 1 | AC Power Supply (green LED) |
| 2 | DC Power Supply (green LED)<br>The LED illuminates when the batteries are connected, and their voltage is at least 20 V DC. |
| 3 | Charging - indicates the battery charging status (green LED)<br>The charger power is on. |
| 4 | Discharging - indicates the battery discharging status (yellow LED)<br>The LED lights up when the current drawn from the batteries exceeds 0.2 A. |
| 5 | Deep Discharging (yellow LED)<br>The diode illuminates when the battery voltage drops below 189 V DC. |
| 6 | Module Error (yellow LED)<br>The LED emits continuous light to signal the occurrence of one or more errors:<br>• lack of communication with the coordinator for more than 5 minutes,<br>• lack of communication with any VTM module detected after system startup,<br>• error in the current sensor's auto-calibration,<br>• battery voltage too low (below 80 V DC),<br>• internal device temperature above 45°C,<br>• excessive charging voltage or charger operating temperature exceeded. |

### 8.7. Single Battery 12V Control Module (VTM)

General Information

Basic functions performed by the module:

- ✓ ability to assign and change addresses via RFiD,
- ✓ battery voltage measurement,
- ✓ battery temperature measurement,
- ✓ communication with the charger control module via a dedicated TM-BUS bus, input types "entered/exited" without transmission line polarization,
- ✓ LED (red) signaling communication with the charger control module,
- ✓ powered from the controlled battery (polarization irrelevant),
- ✓ enters sleep mode when not communicating with the charger controller.

VTM modules are used by default in TM-CB M8 / 9 / 10 cabinets where high-capacity batteries are used, details, see:

Attachment 33. Installation manual for VTM modules for TM-CB M8 / 9 / 10

VTM modules can be optionally used as TM-MN.CB02Mx accessories in TM-CB M1 / 2 / 3 / 4 / 5 / 6 / 7 cabinets (additionally, see section 6.2).

**NOTE!**
**The VTM modules must be addressed (addresses from 1 to 18) and then mounted according to the battery number (labels with numbers 1 to 18). For example, the VTM module with address "7" should be mounted on the battery labeled with the number "7". Addresses must be unique. Connect the communication bus from module to module. After installation, ensure that the bus is continuous and free of shorts.**

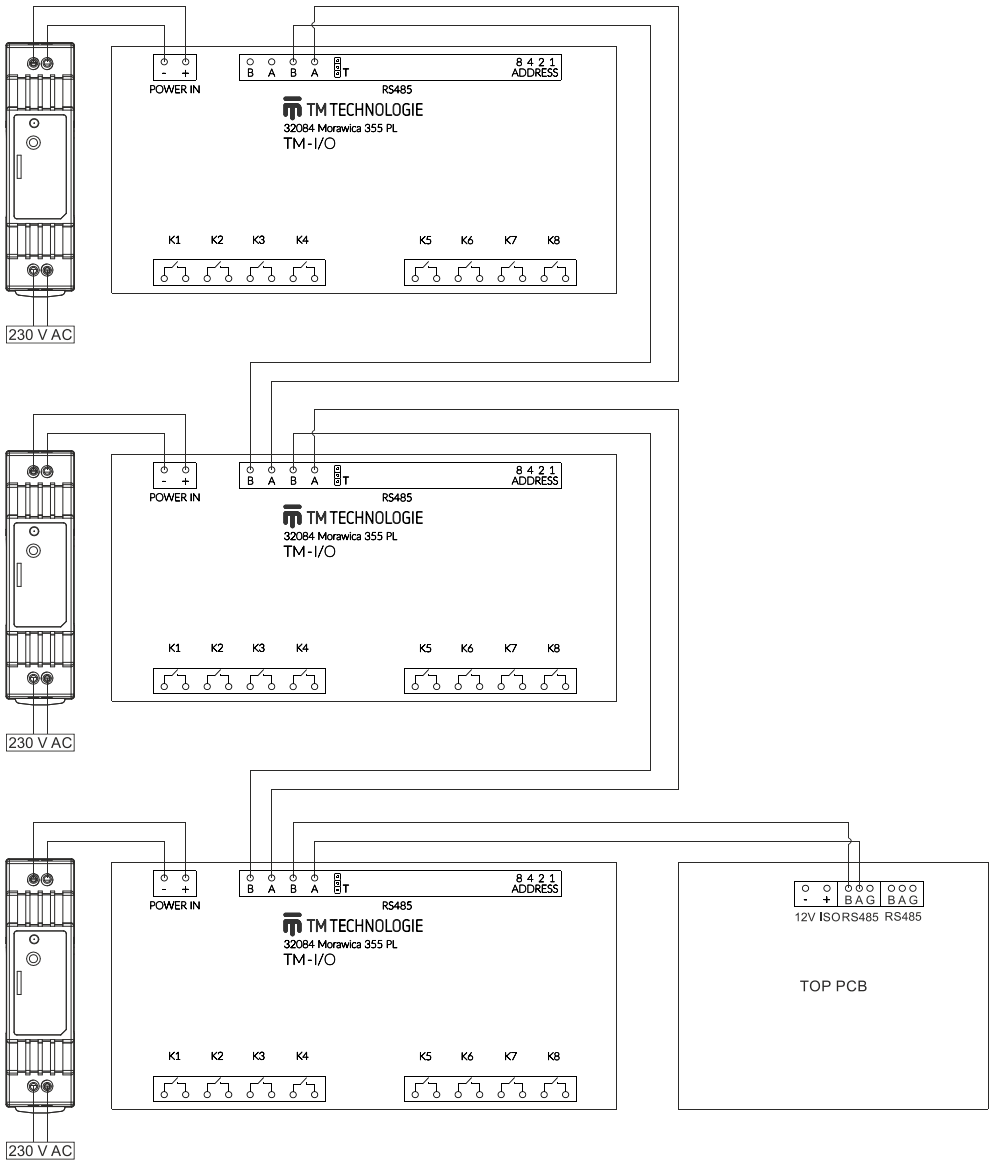
**NOTE!**
**It is recommended to address the VTM modules (using the TM-PROG programmer) before mounting them in the cabinet. This is because if the modules are installed close to each other, changing the address of a single VTM module may be difficult or impossible (the addresses of neighboring modules may also change).**

### 8.8. TM-I/O

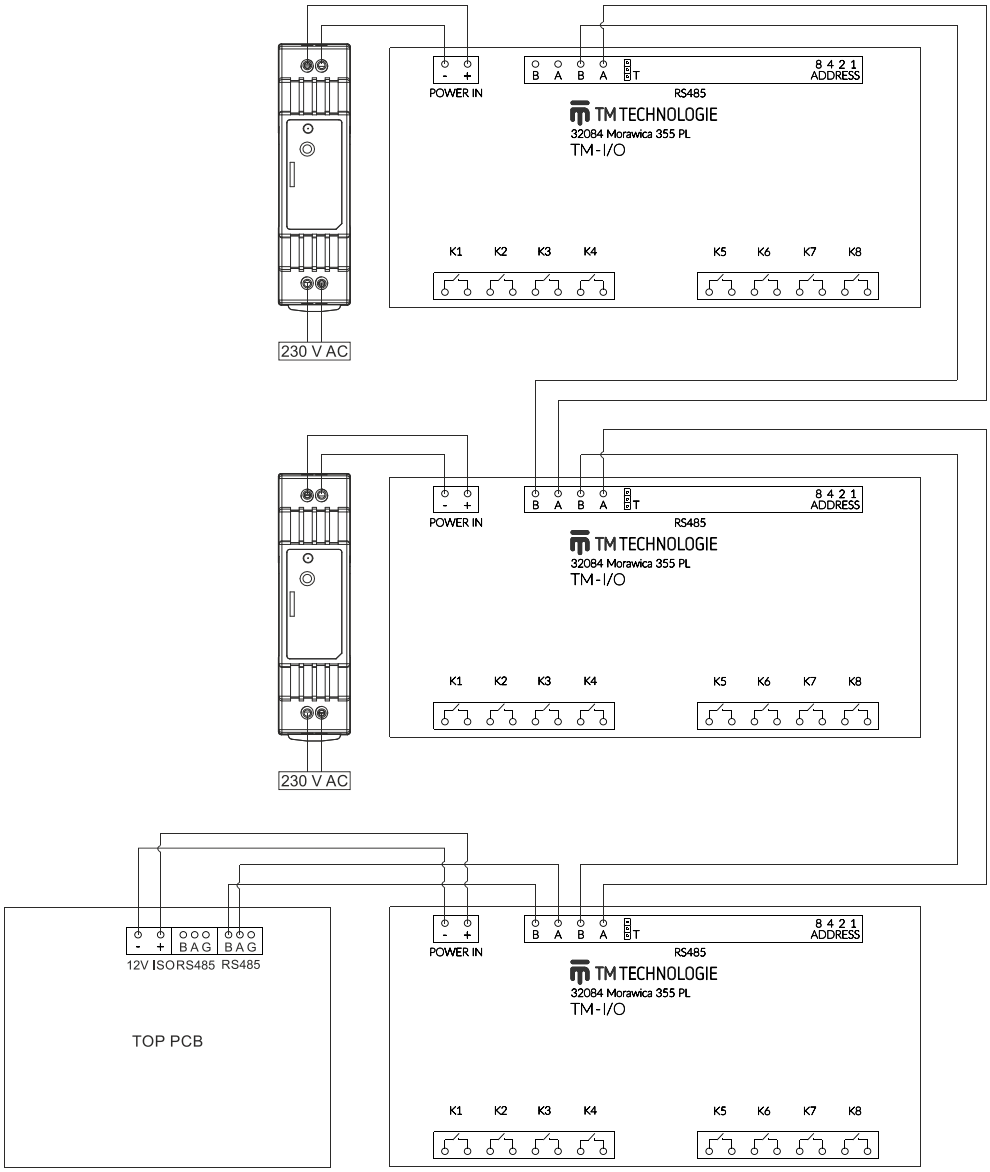
The central battery system supports up to **16** TM-I/O modules. Modules with the main station communicate via an RS485 bus. The connection between the TM-I/O module and the main station must be made using a shielded two-wire **communication cable**, where the shield must be connected to PE (protective earth) on the main station side and to the **power supply cable**, with a minimum cross-section of 0.75 mm$^2$ to limit voltage drops. The modules are powered by 12V (current consumption depending on the version: 100 or 170 mA).

Halogen-free telecommunications cables with the appropriate reaction to fire class (B2ca) and with maintaining electrical functions during fire (if required) with a cross-section of 1x2x0.8 mm should be used, e.g. HTKSHekw (max. cable resistance 75 Ω/km, maximum effective steam capacity at 1 kHz 120nF/km).

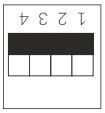
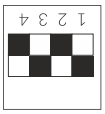
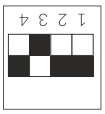
Below is an example of connecting the TM-I/O module to the main station (TM-CB M1, M2, M3, M4, M5, M6, M7, M8, M9, M10).



Below is an example of connecting the TM-I/O module to the sub-distribution board (TM-CB M SUB PR12, TM-CB M SUB PR20).



The address of the modules is set using a Dip-Switch located in the TM-I/O module. The first switch has a weight of 1, the second switch 2, the third switch 4, and the fourth switch 8. The formula for the address is as follows: 1 + 1W1 + 2W2 + 4W3 + 8W4

| Dipswitch | Address (example) |
|---|---|
|  **8 4 2 1** | 1 + 8*0 + 4*0 + 2*0 + 1*0 = **1** |
|  **8 4 2 1** | 1 + 8*0 + 4*1 + 2*0 + 1*1 = **6** |
|  **8 4 2 1** | 1 + 8*1 + 4*0 + 2*1 + 1*1 = **12** |

The addresses of connected TM-I/O modules must not duplicate. In case of communication failure, check the RS485 (swap A wit B) cable polarization. Searching and configuring modules is done according to the interface user manual (website).

Characteristics of TM-I/O modules (accessory TM-MN.CB03x and TM-MN.xx.ZSDxxx, see also point 6.3).

### 8.9. Addressable modules dedicated to TM-AM 02HM, TM-AM 02VM, TM-AM 03M

Characteristics of addressable modules, see:

Attachment 34. Configuration manual for addressable modules for TM-CB System

### 8.10. Universal addressable modules TM-AM 01M, TM-AM 01SM

Characteristics of the addressable module, see:

Attachment 35. Addressable module TM-AM 01 manual

### 8.11. Universal addressable modules TM-AM 01M MICRO, TM-AM 01M MINI

Characteristics of the addressable module, see:

Attachment 36. Addressable module TM-AM 01 MICRO / TM-AM 01 MINI manual

### 8.12. Interface (application or website)

The central battery system monitors the operation of installed stations, sub-distributions and luminaires in large public utility facilities. It determines their status by conducting functional and operation time tests, which are configured by the user. Thanks to its user-friendly interface, the system is intuitive to use.

After installation and proper configuration, the system is maintenance-free as it conducts required tests and gathers necessary data. Therefore, it does not have a built-in user interface but is limited to displaying essential statuses on LED indicators, exposing them through relays, or via MODBUS protocol registers.

However, to enable configuration, system startup, and remote monitoring of system operation, two solutions are available to the user:

- ✓ VisualBase Application - advanced local configuration and control via USB-C port using a PC/laptop.
- ✓ VisualSite Web Service - remote configuration and visualization through Ethernet network (required additional external hardware module VisualSite connected to the system via USB-C port, see section 6.5).

Characteristics

- ✓ Allows system configuration.
- ✓ Execution and storage of system operation reports.
- ✓ Full system event history (tests, reports, logs).
- ✓ Password protection for different levels of authorization.
- ✓ Automatic and cyclical triggering of station tests according to a defined schedule.
- ✓ Visualization of luminaire status on the premises (with the ability to place them on floor plans) – only on VisualSite.

Detailed description, see:

Attachment 37. TM-CB M – VisualBase application manual

Attachment 38. TM-CB M – VisualSite interface manual

## 9. Tests

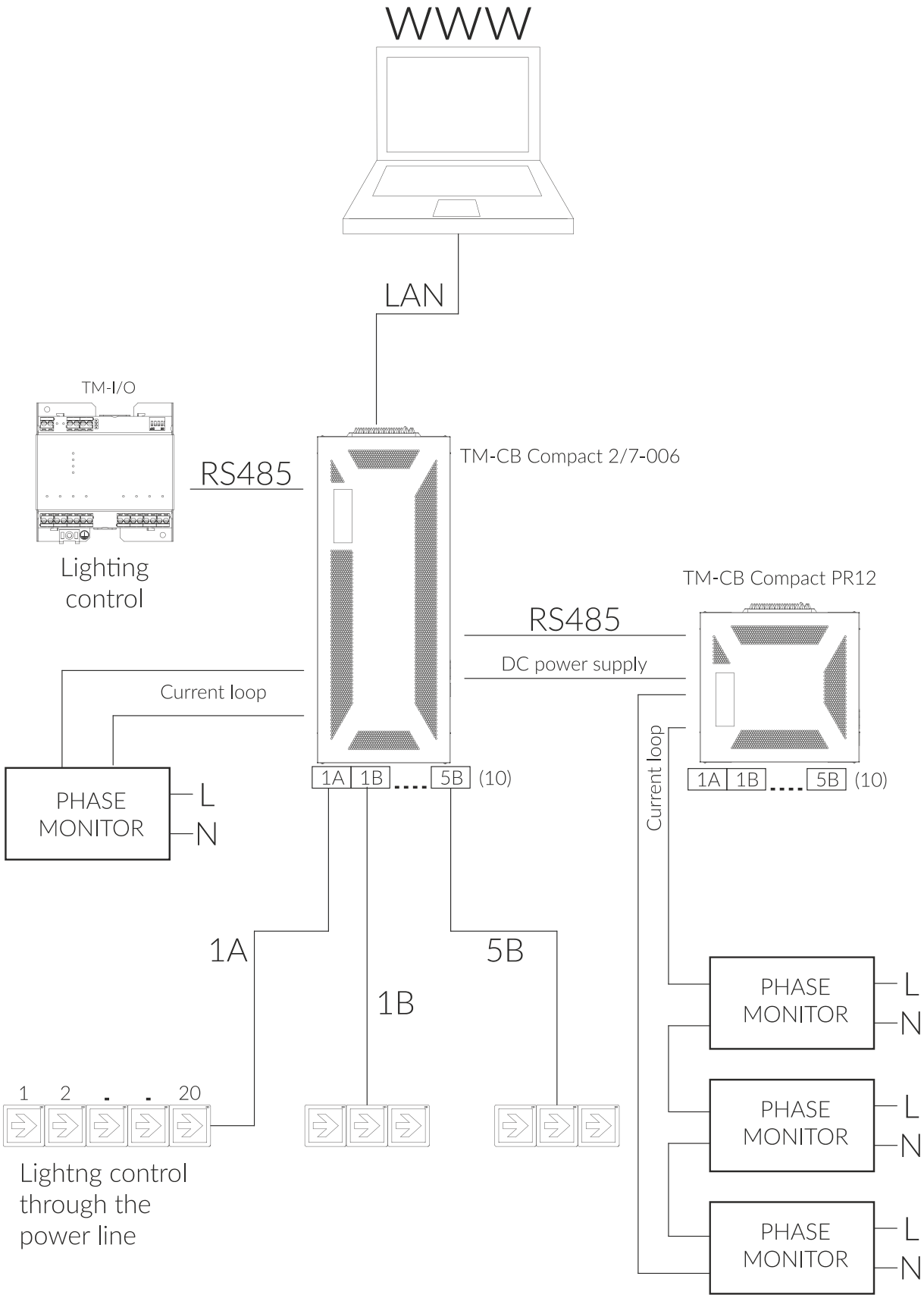
**NOTE!**
**Activities such as testing may only be carried out by competent personnel trained in power system safety.**

Periodic tests should be conducted in accordance with local/national regulations. Weekly tests can be performed by the user (a competent person) or by an automatic testing system. If there are no local/national regulations, the following intervals between tests are recommended:

- Automatic Transfer Switching Devices (ATSDs):
  - functional test with load change – weekly;
  - testing through network failure simulation – every six months.
- Protective devices:
  - visual inspection of setting values – once a year.
- Batteries
  - functional test for a sufficient time under full site load – weekly;
  - performance test for rated autonomy under full object load – once a year;
    for the purposes of this study, the battery should be charged according to the manufacturer's specifications, and after 24 hours of maintenance charging, it should undergo discharge testing. During discharge, the central emergency power system should be fully loaded at the workplace, and the rated autonomy time should be achieved, ensuring that the battery voltage is not less than the specified minimum voltage at the end of discharge.
- Equipment for monitoring ground faults – once a week;
- Protection against electric shock:
  - on input through measurement – once every 3 years
    NOTE! Measurement may comply with standard EN 62368-1,
  - For output circuits protected by a Residual Current Device (RCD), the effectiveness of the built-in test device in the equipment is checked using its test button – every six months.

Function and voltage value of each battery cell or battery block should be tested and documented.

**10. Example of installation of the TM-CB M central battery system**



## 11. Maintenance and service

Proper operation of the system requires periodic tests and inspections. Tests are carried out automatically in accordance with separate regulations.

**NOTE!**
**To maintain the warranty for the correct operation of the system (which ensures the safety of evacuating persons using the facility), and to comply with legal regulations, it is necessary to conduct a system inspection no later than 12 months from the date of purchase of the first components of the system.**

During the inspection, the following activities should be performed:

- ✓ Perform the tests described in point 9 (required during the annual inspection).
- ✓ System operation check.
- ✓ Charging current and voltage check.
- ✓ Charging voltage adjustment.
- ✓ Battery voltage and individual battery measurement.
- ✓ Electrolyte level and density measurement (if required).
- ✓ Battery sealing check.
- ✓ Continuity test of connections.
- ✓ Check for electrolyte leaks.
- ✓ Ventilation check (ensure fans are working and air intakes are not blocked).
- ✓ Battery temperature measurement (also confirm proper sensor operation).
- ✓ System recalibration.
- ✓ And any other requirements for the correct operation of the system.

### 11.1. Spare Parts

Only original spare parts manufactured by TM Technologie should be used.

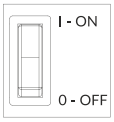
WARNING! Using improper spare parts may cause damage or serious malfunction of the entire system. If the use of inappropriate service parts is detected, the manufacturer reserves the right to void the warranty and any other claims arising from the operation of the system.

If you have any questions or concerns regarding the operation of the system, please contact the service department:

TM TECHNOLOGIE Sp. z o.o.
32-084 Morawica
Morawica 355, near Cracow
tel.: +48 12 444 60 60, fax: +48 12 350 57 34
www.tmtechnologie.pl

## 12. Troubleshooting and Assistance

The following list will help in troubleshooting. If it is not possible to resolve the issue, please contact the manufacturer's service department.

| Issue | Displayed | Possible Cause | Solution |
|---|---|---|---|
| Device does not power on | | Primary power not available | Check if external power supply is present and voltage is correct, inspect the fuse |
| | | Power supply failure | Contact authorized TM TECHMOLOGIE service |
| Device is not functioning - emergency mode (battery power) | Coordinator panel - Deep discharge | Too low battery voltage | Ensure the battery is charged |
| | | Blown DC fuses | Check DC fuses and circuit breakers |
| |   | Service mode | Set the switch to position I - ON |
| Lack of circuit function in primary power | | Primary power failure | Verify power supply |
| | | Service mode | Turn off service mode |
| | OFF | Circuit disabled | Switch the circuit to operate in maintained mode |
| | OFF | Unconfigured circuit | |
| | NM | Circuit for non-maintained operations | |
| | X | The circuit operates in modified mode | Incorrect configuration. External trigger |
| | Yellow LED flashing. | Fuse error | Replace the fuse. If it doesn't help, replace the card |
| | | Ground fault | |
| | | Card defect | |
| Lack of circuit function in battery power | | Service mode | Turn off service mode |
| | OFF | Circuit disabled | Switch the circuit to operate in maintained/non-maintained mode |
| | OFF | Unconfigured circuit | |
| | Red LED flashing. | Fuse error | Replace fuses. If it doesn't help, replace the card |
| | | Ground fault | |
| | | Card defect | |
| Battery not charging (charger indication) | Green LED POWER SUPPLY<br>Green LED READY<br>LED if off CHARGING<br>Yellow LED ERROR | Blown fuse | Replace fuses |
| | Green LED POWER SUPPLY<br>LED if off READY<br>LED if off CHARGING<br>Yellow LED ERROR | Device not calibrated | Contact authorized TM TECHMOLOGIE service |
| | LED if off POWER SUPPLY<br>LED if off READY<br>LED if off CHARGING<br>Yellow LED ERROR | Charger communication error | |
| | | Battery error, fuse error | Check and replace faulty fuses |
| | | Battery error | Replace faulty batteries |
| | | Battery error, no connection | Connect batteries correctly |
| Circuit operates despite interrupted critical loop or trigger from TM-I/O module | | Module incorrectly connected or configured | Check connection or configuration |
| Device shutdown during primary power failure | | No connected batteries or blown fuse | Check batteries, replace faulty components |

## 13. Modbus register table

**NOTICE!**
**The register status is refreshed every 4 seconds.**

| Register address | Description | Data type | Value |
|---|---|---|---|
| 0 | The status of the entire system | unsigned | 1 - error, 0 - ok |
| 1 | Module Control Charging Status | unsigned | 1 - error, 0 - ok |
| 2 | Charger Status | unsigned | 1 - error, 0 - ok |
| 3 | VTM Module Status | unsigned | 1 - error, 0 - ok |
| 4 | Status of all Sub-distribution | unsigned | 1 - error, 0 - ok |
| 5 | IO Module Status | unsigned | 1 - error, 0 - ok |
| 6 | Circuit Status | unsigned | 1 - error, 0 - ok |
| 7 | Luminaire Status | unsigned | 1 - error, 0 - ok |
| 8 | System Status | structure | cb_status_t |
| 9 | System Errors | structure | cb_flags_t |
| 10 | Test Results | structure | test_result_t |
| 11 | Module Control Charging Status | structure | cm_status_t |
| 12 | Battery Voltage | unsigned | 0,0 [V] |
| 13 | Battery Symmetry Voltage | unsigned | 0,0 [V] |
| 14 | Battery Current | signed | 0,0 [A] |
| 15 | Battery Temperature | signed | 0,0 [st C] |
| 16 | Module Control Charging Errors | structure | flags_t |
| 17 | Charger 1 Status | structure | ch_status_t |
| ... | | structure | |
| 24 | Charger 8 Status | structure | ch_status_t |
| 25 | Charger 1 Errors | structure | ch_errors_t |
| ... | | structure | |
| 32 | Charger 8 Errors | structure | ch_errors_t |
| 33 | Charger 1 Voltage | unsigned | 0,00 [V] |
| ... | | unsigned | |
| 40 | Charger 8 Voltage | unsigned | 0,00 [V] |
| 41 | Charger 1 Current | unsigned | 0,00 [A] |
| ... | | unsigned | |
| 48 | Charger 8 Current | unsigned | 0,00 [A] |
| 49 | Charger 1 Temperature | signed | 0,0 [st C] |
| ... | | signed | |
| 56 | Charger 8 Temperature | signed | 0,0 [st C] |
| 57 | VTM Module 1 Status | structure | vtm_status_t |
| ... | | structure | |
| 74 | VTM Module 18 Status | structure | vtm_status_t |
| 75 | VTM Module 1 Voltage | unsigned | 0,0 [V] |
| ... | | unsigned | |

| | | | |
|---|---|---|---|
| 92 | VTM Module 18 Voltage | unsigned | 0,0 [V] |
| 93 | VTM Module 1 Temperature | signed | 0 [st C] |
| ... | | signed | |
| 110 | VTM Module 18 Temperature | signed | 0 [st C] |
| 111 | Sub-distribution 00 status | structure | st_status_t |
| 112 | Sub-distribution 01 status | structure | st_status_t |
| ... | | | |
| 126 | Sub-distribution 15 status | structure | st_status_t |
| 127 | Sub-distribution 00 Phase Voltage | unsigned | 0,0 [V] |
| 128 | Sub-distribution 01 Phase Voltage | unsigned | 0,0 [V] |
| ... | | | |
| 142 | Sub-distribution 15 Phase Voltage | unsigned | 0,0 [V] |
| 143 | Station 00 Battery Voltage | unsigned | 0,0 [V] |
| 144 | Station 01 Battery Voltage | unsigned | 0,0 [V] |
| ... | | | |
| 158 | Station 15 Battery Voltage | unsigned | 0,0 [V] |
| 159 | Circuit 00/01A status | structure | st_circuit_t |
| 160 | Circuit 00/01B status | structure | st_circuit_t |
| 161 | Circuit 00/02A status | structure | st_circuit_t |
| 162 | Circuit 00/02B status | structure | st_circuit_t |
| 163 | Circuit 00/03A status | structure | st_circuit_t |
| 164 | Circuit 00/03B status | structure | st_circuit_t |
| 165 | Circuit 00/04A status | structure | st_circuit_t |
| 166 | Circuit 00/04B status | structure | st_circuit_t |
| 167 | Circuit 00/05A status | structure | st_circuit_t |
| 168 | Circuit 00/05B status | structure | st_circuit_t |
| 169 | Circuit 00/06A status | structure | st_circuit_t |
| 170 | Circuit 00/06B status | structure | st_circuit_t |
| 171 | Circuit 00/07A status | structure | st_circuit_t |
| 172 | Circuit 00/07B status | structure | st_circuit_t |
| 173 | Circuit 00/08A status | structure | st_circuit_t |
| 174 | Circuit 00/08B status | structure | st_circuit_t |
| 175 | Circuit 00/09A status | structure | st_circuit_t |
| 176 | Circuit 00/09B status | structure | st_circuit_t |
| 177 | Circuit 00/10A status | structure | st_circuit_t |
| 178 | Circuit 00/10B status | structure | st_circuit_t |
| 179 | Circuit 01/01A status | structure | st_circuit_t |
| 180 | Circuit 01/01B status | structure | st_circuit_t |
| ... | | | |
| 197 | Circuit 01/10A status | structure | st_circuit_t |
| 198 | Circuit 01/10B status | structure | st_circuit_t |
| 199 | Circuit 02/01A status | structure | st_circuit_t |
| 200 | Circuit 02/01B status | structure | st_circuit_t |
| ... | | | |
| 217 | Circuit 02/10A status | structure | st_circuit_t |

| | | | |
|---|---|---|---|
| 218 | Circuit 02/10B status | structure | st_circuit_t |
| 219 | Circuit 03/01A status | structure | st_circuit_t |
| 220 | Circuit 03/01B status | structure | st_circuit_t |
| ... | | | |
| 237 | Circuit 03/10A status | structure | st_circuit_t |
| 238 | Circuit 03/10B status | structure | st_circuit_t |
| 239 | Circuit 04/01A status | structure | st_circuit_t |
| 240 | Circuit 04/01B status | structure | st_circuit_t |
| ... | | | |
| 257 | Circuit 04/10A status | structure | st_circuit_t |
| 258 | Circuit 04/10B status | structure | st_circuit_t |
| 259 | Circuit 05/01A status | structure | st_circuit_t |
| 260 | Circuit 05/01B status | structure | st_circuit_t |
| ... | | | |
| 277 | Circuit 05/10A status | structure | st_circuit_t |
| 278 | Circuit 05/10B status | structure | st_circuit_t |
| 279 | Circuit 06/01A status | structure | st_circuit_t |
| 280 | Circuit 06/01B status | structure | st_circuit_t |
| ... | | | |
| 297 | Circuit 06/10A status | structure | st_circuit_t |
| 298 | Circuit 06/10B status | structure | st_circuit_t |
| 299 | Circuit 07/01A status | structure | st_circuit_t |
| 300 | Circuit 07/01B status | structure | st_circuit_t |
| ... | | | |
| 317 | Circuit 07/10A status | structure | st_circuit_t |
| 318 | Circuit 07/10B status | structure | st_circuit_t |
| 319 | Circuit 08/01A status | structure | st_circuit_t |
| 320 | Circuit 08/01B status | structure | st_circuit_t |
| ... | | | |
| 337 | Circuit 08/10A status | structure | st_circuit_t |
| 338 | Circuit 08/10B status | structure | st_circuit_t |
| 339 | Circuit 09/01A status | structure | st_circuit_t |
| 340 | Circuit 09/01B status | structure | st_circuit_t |
| ... | | | |
| 357 | Circuit 09/10A status | structure | st_circuit_t |
| 358 | Circuit 09/10B status | structure | st_circuit_t |
| 359 | Circuit 10/01A status | structure | st_circuit_t |
| 360 | Circuit 10/01B status | structure | st_circuit_t |
| ... | | | |
| 377 | Circuit 10/10A status | structure | st_circuit_t |
| 378 | Circuit 10/10B status | structure | st_circuit_t |
| 379 | Circuit 11/01A status | structure | st_circuit_t |
| 380 | Circuit 11/01B status | structure | st_circuit_t |
| ... | | | |
| 397 | Circuit 11/10A status | structure | st_circuit_t |

| | | | |
|---|---|---|---|
| 398 | Circuit 11/10B status | structure | st_circuit_t |
| 399 | Circuit 12/01A status | structure | st_circuit_t |
| 400 | Circuit 12/01B status | structure | st_circuit_t |
| … | | | |
| 417 | Circuit 12/10A status | structure | st_circuit_t |
| 418 | Circuit 12/10B status | structure | st_circuit_t |
| 419 | Circuit 13/01A status | structure | st_circuit_t |
| 420 | Circuit 13/01B status | structure | st_circuit_t |
| … | | | |
| 437 | Circuit 13/10A status | structure | st_circuit_t |
| 438 | Circuit 13/10B status | structure | st_circuit_t |
| 439 | Circuit 14/01A status | structure | st_circuit_t |
| 440 | Circuit 14/01B status | structure | st_circuit_t |
| … | | | |
| 457 | Circuit 14/10A status | structure | st_circuit_t |
| 458 | Circuit 14/10B status | structure | st_circuit_t |
| 459 | Circuit 15/01A status | structure | st_circuit_t |
| 460 | Circuit 15/01B status | structure | st_circuit_t |
| … | | | |
| 477 | Circuit 15/10A status | structure | st_circuit_t |
| 478 | Circuit 15/10B status | structure | st_circuit_t |

### 13.1. System status

| SYSR | LBW | CRIT | TOTAL | SERV | MSPF | BCH | DTEST |
|---|---|---|---|---|---|---|---|
| bit 15 | | | | | | | bit 8 |

| PE | CHPF | SSD | SEAR | NORM | TEST | PFL | PWR |
|---|---|---|---|---|---|---|---|
| bit 7 | | | | | | | bit 0 |

bit 15 SYSR: System State Reading
1 = In progress
0 = Normal operating mode

bit 14 LBW: Low Battery Warning
1 = Warning active
0 = No warning

bit 13 CRIT: Critical Circuit Status
1 = Loop interrupted
0 = Ok

bit 12 TOTAL: Total Stop
1 = ON
0 = OFF

bit 11 SERV: Service mode
1 = ON
0 = OFF

bit 10 MSPF: Main Station Power Failure

1 = Power failure
0 = Power available

bit 9 BCH: Battery Charging
1 = Charging ON
0 = Charging OFF

bit 8 DTEST: Deferred Automatic Test
1 = Test deferred
0 = No deferred test

bit 7 PE: Insulation Control Error
1 = Error
0 = No Error

bit 6 CHPF: Charger Power Failure
1 = Power failure
0 = Power available

bit 5 SSD: System Scheduled for Shutdown
1 = Scheduled
0 = Normal operation

bit 4 SEAR: Luminaire Search
1 = In progress
0 = Normal operation

bit 3 NORM: Normal operating mode
1 = Station operating properly
0 = Abnormal system state

bit 2 TEST: System Under Test
1 = Test active
0 = No test

bit 1 PFL: Post-Failure Delay
1 = System in post-failure delay
0 = No delay

bit 0 PWR: Power Outage
1 = Power outage
0 = Power available

### 13.2. System error status

| - | - | - | - | - | - | - | - |
|---|---|---|---|---|---|---|---|
| bit 15 | | | | | | | bit 8 |

| FUSE | CODT | TEMP | CHG | ERROR | SYM | BAT | DEEP |
|---|---|---|---|---|---|---|---|
| bit 7 | | | | | | | bit 0 |

bit 15-8 Not implemented: Read as '0'

bit 7 FUSE: Fuse Error
1 = Error
0 = No Error

bit 6 CODT: Current Overload Detected
1 = Error

0 = No Error

bit 5 TEMP: Operating Temperature Exceeded
1 = Error
0 = No Error

bit 4 CHG: Charger Error
1 = Error
0 = No Error

bit 3 ERROR: Charging Error
1 = Error
0 = No Error

bit 2 SYM: Symmetry Voltage Error
1 = Error
0 = No Error

bit 1 BAT: Battery Error
1 = Error
0 = No Error

bit 0 DEEP: Deep Discharge
1 = Error
0 = No Error

### 13.3. Test results status

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - |
| bit 15 | | | | | | | bit 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | VTM | FUN | CAP |
| bit 7 | | | | | | | bit 0 |

bit 15-3 Not implemented: Read as '0'

bit 2 VTM: VTM Module Test Error
1 = Error
0 = No Error

bit 1 FUN: Functional Test Error
1 = Error
0 = No Error

bit 0 CAP: Capacity Test Error
1 = Error
0 = No Error

### 13.4. Charging control module status

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - |
| bit 15 | | | | | | | bit 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | VTM | PE | PWR | KOM |
| bit 7 | | | | | | | bit 0 |

bit 15-4 Not implemented: Read as '0'

bit 3 VTM: VTM Added to the System
1 = Added
0 = None

bit 2 PE: Insulation Control Error
1 = Error
0 = No Error

bit 1 PWR: Charging Module Power Failure
1 = Error
0 = No Error

bit 0 COM: Communication with Charger
1 = No communication error with the device
0 = Communication error with the device

### 13.5. Error Status of the Charging Control Module

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | CAL |
| bit 15 | | | | | | | bit 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ERROR | BAT_H | TEMP | BAT_L | NORM | VTM | PE | ZAS |
| bit 7 | | | | | | | bit 0 |

bit 15-9 No implemented: Read as '0'

bit 8 CAL: Calibration Error
1 = Error
0 = No Error

bit 7 ERROR: Charger error
1 = Error
0 = No Error

bit 6 BAT_H: High charging voltage
1 = Error
0 = No Error

bit 5 TEMP: High temperature
1 = Error
0 = No Error

bit 4 BAT_L: Low battery voltage level
1 = Error
0 = No Error

bit 3 NORM: Normal operating mode
1 = Station operating properly
0 = Abnormal state

bit 2 VTM: VTM Added to the System
1 = Added
0 = None

bit 1 PE: Insulation Control Error
1 = Error
0 = No Error

bit 0 ZAS: No chargers power supply

1 = Error
0 = No Error

### 13.6. Charger State

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - |
| bit 15 | | | | | | | bit 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | ERROR | CHG | RDY | PWD | COM | ADD |
| bit 7 | | | | | | | bit 0 |

bit 15-6 No implemented: Read as '0'
bit 5 ERROR: Charger error
1 = Error
0 = No Error
bit 4 CHG: Charging
1 = Charging ON
0 = Charging OFF
bit 3 RDY: Charger read for work
1 = Ready
0 = Not ready
bit 2 PWD: Charger powered
1 = Powered
0 = No powered
bit 1 COM: Communication with charger
1 = No communication error with the device
0 = Communication error with the device
bit 0 ADD: Charger added to the system
1 = Device added
0 = No device

### 13.7. Charger error status

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - |
| bit 15 | | | | | | | bit 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BOOST | FAN | LMT | TEMP | FUSE | BSC | DC | AC |
| bit 7 | | | | | | | bit 0 |

bit 15-8 No implemented: Read as '0'
bit 7 BOOST: Increased charging current
1 = ON
0 = OFF
bit 6 FAN: Charger fan
1 = ON
0 = OFF
bit 5 LMT: Charging current limitation

1 = ON
0 = Normal operation

bit 4 TEMP: High temperature
1 = Error
0 = No Error

bit 3 FUSE: Fuse damage
1 = Error
0 = No Error

bit 2 BSC: Battery short circuit
1 = Error
0 = No Error

bit 1 DC: Incorrect battery voltage
1 = Error
0 = No Error

bit 0 AC: Incorrect charger power supply
1 = Error
0 = No Error

### 13.8. VTM module status

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - |
| bit 15 | | | | | | | bit 8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | - | - | - | - | BLAD | COM | ADD |
| bit 7 | | | | | | | bit 0 |

bit 15-3 No implemented: Read as '0'

bit 2 ERROR: VTM module error
1 = Error
0 = No Error

bit 1 COM: Communication with VTM module
1 = No communication error with the device
0 = Communication error with the device

bit 0 ADD: VTM module added to the system
1 = Device added
0 = No device

### 13.9. Sub-distribution Status

| FUSE | TOTAL | CURR | L3 | L2 | L1 | CRIT | SERV |
|---|---|---|---|---|---|---|---|
| bit 15 | | | | | | | bit 8 |

| PFD | SEAR | ERROR | BAT | TEST | PWR | COM | ADD |
|---|---|---|---|---|---|---|---|
| bit 7 | | | | | | | bit 0 |

bit 15 FUSE: Fuse damage
1 = Error
0 = No Error

bit 14 TOTAL: Total Stop
1 = ON
0 = OFF

bit 13 CURR: Current overload detected
1 = Error
0 = No Error

bit 12 L3: Phase 3 internal phase monitor input
1 = Voltage detected
0 = No voltage

bit 11 L2: Phase 2 internal phase monitor input
1 = Voltage detected
0 = No voltage

bit 10 L1: Phase 1 internal phase monitor input
1 = Voltage detected
0 = No voltage

bit 9 CRIT: Critical circuit status
1 = Loop interrupted
0 = Ok

bit 8 SERV: Service mode
1 = ON
0 = OFF

bit 7 PFD: Post-fault delay
1 = Sub-distribution in post-fault delay
0 = No delay

bit 6 SEAR: Luminaire search
1 = In progress
0 = Normal operation

bit 5 ERROR: Sub-distribution error
1 = Error
0 = No Error

bit 4 BAT: Battery operation
1 = Sub-distribution operating on battery
0 = Sub-distribution not operating on battery

bit 3 TEST: Sub-distribution test
1 = Sub-distribution undergoing test
0 = No test

bit 2 PWR: Primary power supply
1 = Primary power supply
0 = No primary power supply

bit 1 COM: Communication with sub-distribution
1 = No communication error with the device
0 = Communication error with the device

bit 0 ADD: Sub-distribution added to the system
1 = Device added
0 = No device

### 13.10. Circuit status

| IO1 | IO0 | FE | LUM4 | LUM3 | LUM2 | LUM1 | LUM0 |
|---|---|---|---|---|---|---|---|
| bit 15 | | | | | | | bit 8 |

| CUR | TEST1 | TEST0 | STAN | MODE1 | MODE0 | COM | INS |
|---|---|---|---|---|---|---|---|
| bit 7 | | | | | | | bit 0 |

bit 15-14 IO<1:0>: Circuit configuration for external triggering
3 = Configured - circuit in a modified mode
2 = Configured - circuit off
1 = Configured - circuit in default mode
0 = Unconfigured

bit 13 FE: Faulty luminaires
1 = Faulty luminaires
0 = Luminaires ok

bit 12-8 LUM<4:0>: Number of luminaires
X = Number of luminaires
0 = No luminaires

bit 7 CUR: Result of current measurement in the last test
1 = Error
0 = No Error

bit 6-5 TEST<1:0>: Test status
3 = Reserved
2 = Test error
1 = In test
0 = Test ok

bit 4 ST: Circuit card state
1 = Error
0 = No Error

bit 3-2 MODE<1:0>: Default operating mode of circuit
3 = Unconfigured
2 = Maintained operation
1 = Non-maintained operation
0 = Disabled

bit 1 COM: Communication status

| | |
|---|---|
| | 1 = Communication ok |
| | 0 = No communication |
| bit 0 | INS: Circuit card installed |
| | 1 = Card installed |
| | 0 – no card |