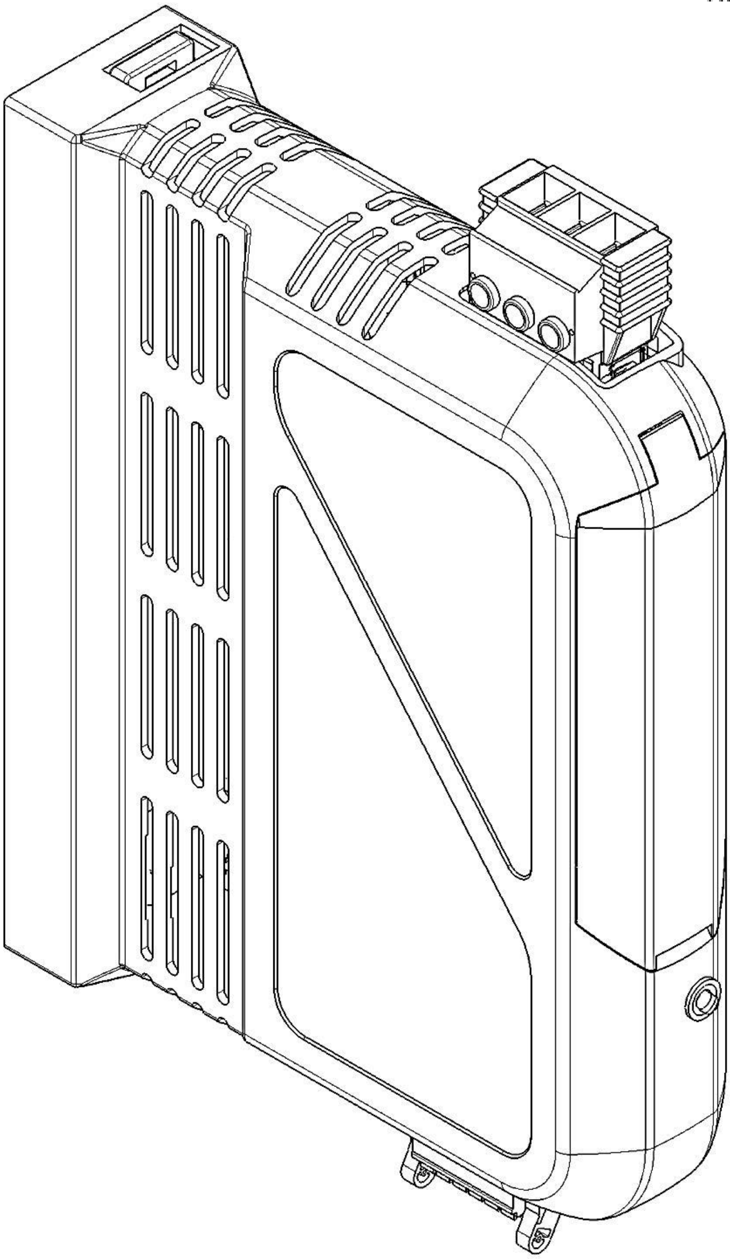


# OMUS®

# Electronic hybrid switch for resistive loads.

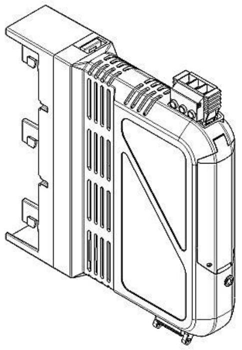
## User manual

**Revision 8, March 2017**

## Contents

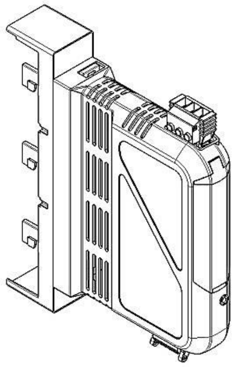
# 1 Design variants

### OMUS®30Compact



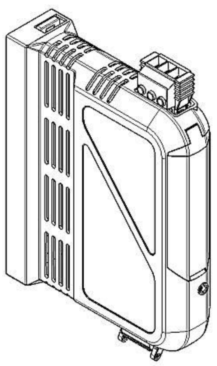
| Type | Pack Size | Weight kg/100 | Part No. |
|---|---|---|---|
| **OMUS®30Compact, IEC** | **1** | **45.2** | **36 152** |
| **OMUS®30Compact, UL and IEC** | **1** | **45.2** | **36 157** |

### OMUS®60Classic



| Type | Pack Size | Weight kg/100 | Part No. |
|---|---|---|---|
| **OMUS®60Classic, IEC** | **1** | **45.8** | **36 153** |
| **OMUS®60Classic, UL and IEC** | **1** | **45.8** | **36 158** |

### OMUS®CrossBoard

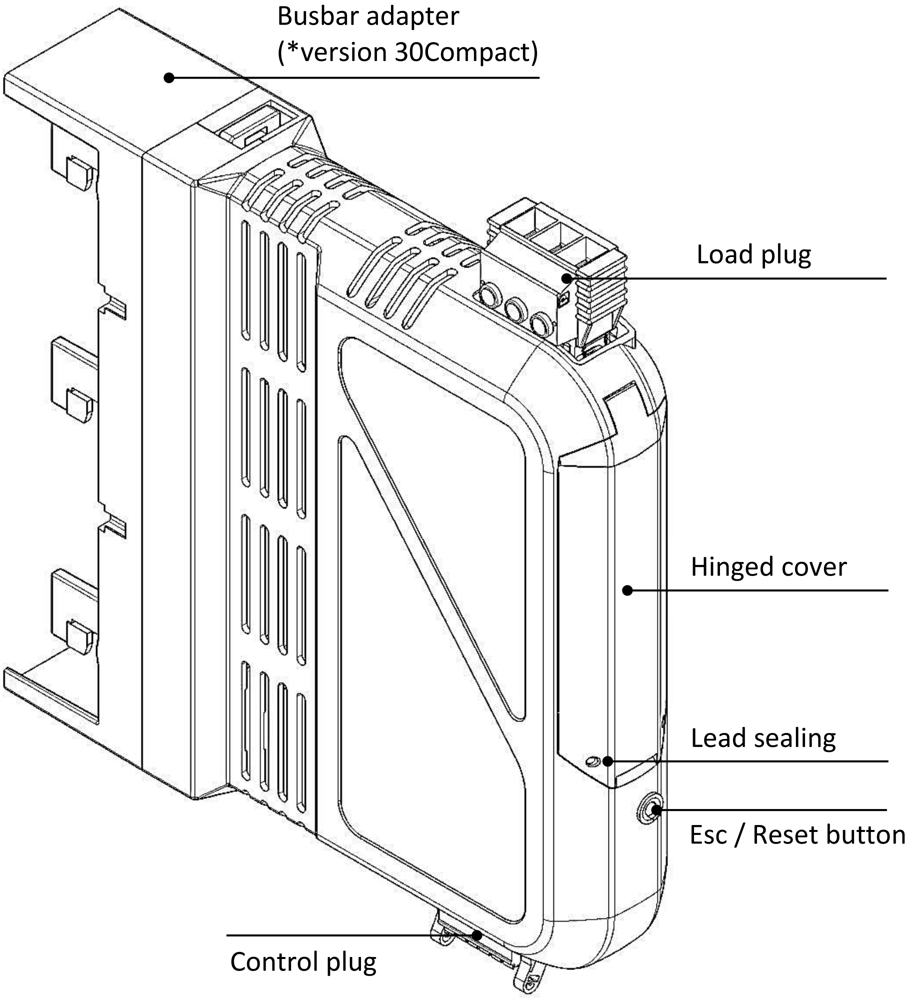


| Type | Pack Size | Weight kg/100 | Part No. |
|---|---|---|---|
| **OMUS®Crossboard, IEC** | **1** | **35.7** | **36 154** |
| **OMUS®Crossboard, UL and IEC** | **1** | **35.7** | **36 159** |

# 2 OMUS® Overview

## OMUS®

Electronic hybrid switch for resistive loads.




The OMUS® electronic hybrid switch is a compact switching device with a width of 36 mm. The hybrid switch is composed of a combination of relay contacts and power semi-conductors, integrated short-circuit protection as well as electronic current and temperature monitoring for operational switching of resistive loads (IEC up to 25 A / 400V AC; UL up to 20A / 480V AC). The universal *CrossLink*-interface at the connection side enables fast electrical and mechanical connection with various busbar systems.

## 2.1 Application

The OMUS® hybrid switch has been developed for areas of application in which contactors, overload relays, solid state relays and mechanical switches have previously been used.
This device was designed for the frequent switching of:

- single-pole resistive loads (phase-neutral) and
- three-pole resistive loads

This is a product for environment A (industry) regarding EMC. In environment B (household) this device may cause undesirable interference; in this case the user has to find appropriate counteraction to reduce electromagnetic interference. No powerful electrostatic charges may be transferred to the OMUS® from the load side. An external switching element is required for galvanic isolation. This could be a contactor or circuit breaker, for example. In a non-operational status, the OMUS® error relay will issue a signal. In order to interrupt an unintentional continuous current flow in case of an error, an external switchgear must ensure the interruption of the load circuit. The short-circuit protection is implemented via integrated fuses.

The combination of the functions

- Hybrid switch
- Feed
- Fuse
- Monitoring

enables a maximum space advantage in comparison to a group composition of three discrete devices with comparable properties.

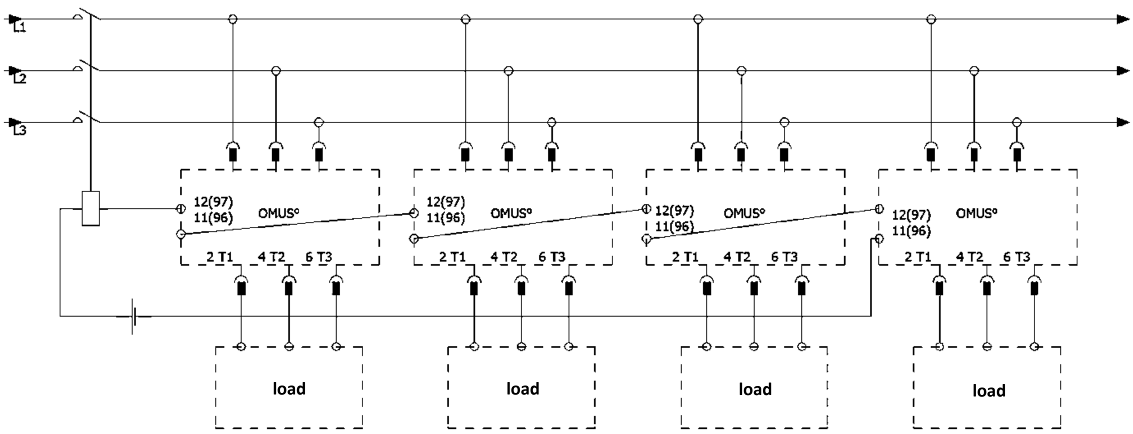
## 2.2 Incorporation of OMUS® into process control

OMUS® can be actuated with the help of a programmable logic controller (PLC). The precise specification for the input signals of OMUS® is described in detail, in chapter 9 *Technical data,* as well as in 2.5 *Switching processes in the hybrid switch*. The defined limit values such as a maximum switching frequency of 1Hz and minimum on and off duration of 100ms must be strictly adhered to in order to guarantee proper operation.
OMUS® possesses numerous self-diagnostic and safety monitoring mechanisms. Warnings and errors are routed to the analysis unit via the signal relays.
**The incorporation and active processing of the *warning* or *error* messages into the corresponding control of the system is necessary in order to achieve the maximum system dependability.**
If the limit values are exceeded, e.g. the minimum switch on time, OMUS® has a software-based self-diagnostic system, and will ignore unreliable control commands. The incorrect actuation will not be issued by a signal.

## 2.3 Galvanic isolation & short-circuit protection

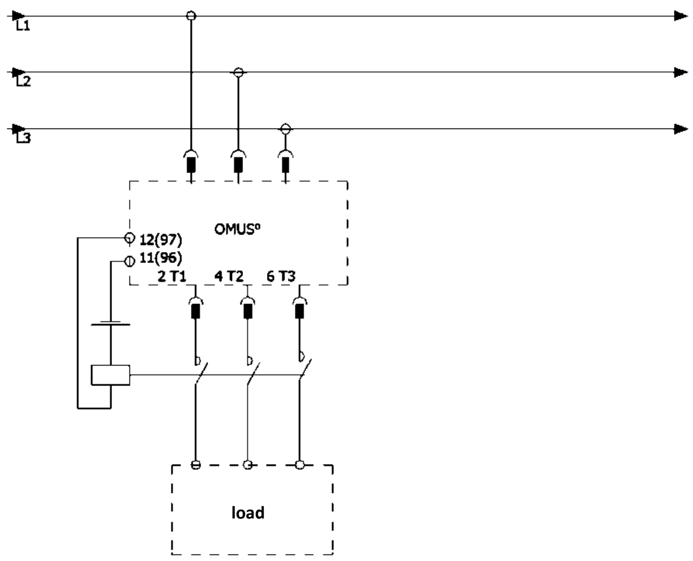
The device does **not have an internal galvanic isolation**. In the event of an error, OMUS® switches off as normal without being fully galvanically isolated. **An external switching element is required for galvanic isolation**. The galvanic isolation can be realized on the part of the feed.

**Galvanic isolation on the part of the feed:**



The galvanic isolation can also be realized between OMUS® and corresponding load.

**Galvanic isolation on the part of the load:**




Common devices for the implementation of a galvanic isolation are contactors or circuit breakers. In a non-operational status, the OMUS® error relay will issue a signal. In order to interrupt an unintentional continuous current flow in case of an error, an external switchgear must ensure the interruption of the load circuit.

The short-circuit protection is implemented via integrated fuses. An upstream short-circuit protection module is only required from an uninfluenced short-circuit current $I_{CP}$ above 30kA. For the UL design (with internal fuse Class CC 30A according to UL), an SCCR value of 30kA was verified. The electronic hybrid switch OMUS® complies with coordination type 1.

## 2.4 Line protection

The line protection of the connected line is realized by setting the correct current limit (16A, 20A or 25A). In order to ensure line protection with OMUS® depending on the configured current, at least the following wire cross-sections at the load plug have to be adhered to. The following values comply with the single installation of OMUS®. The specified wire cross-sections are additionally depending on the deratings for side-by-side installation (see chapter 9 Technical data) and if necessary installation type!

| Connected wire cross-section | Permitted adjustable current limits | Permitted load current (load plug with screw terminals Art.-Nr. 36918) | **Permitted load current (load plug with spring terminals Art.-Nr. 36916) |
|---|---|---|---|
| 2,5mm² | 16A, 20A | 20A | 16A |
| 4mm² | 16A, 20A, 25A | 25A | 20A |
| *6mm² | 16A, 20A, 25A | 25A | 20A |

*higher wire cross-section enables better heat dissipation
**spare component
If a wire cross-section below 2,5mm² is used, the line protection has to be realized either by using smaller fuses within OMUS® or adapting the pre-fuse.

## 2.5 Switching processes in the hybrid switch

OMUS® combines the advantages of power semi-conductor and relay technology. The interplay of both technologies is referred as hybrid switch. When OMUS switches on, the semi-conductor carries the current so that the relay can be switched on with low wear. The continuous current then flows through the relay, which generates significantly lower power loss in comparison to the semi-conductor. When OMUS switches off, the semi-conductor once again carries the current in the hybrid switch in order to open the relay contact with minimal current arcing. In comparison to a purely relay solution, this functionality allows for a significantly longer lifetime. Compared to a pure semi-conductor solution, the hybrid switch operates with much greater efficiency. The high degree of efficiency translates to lower power loss in the device.

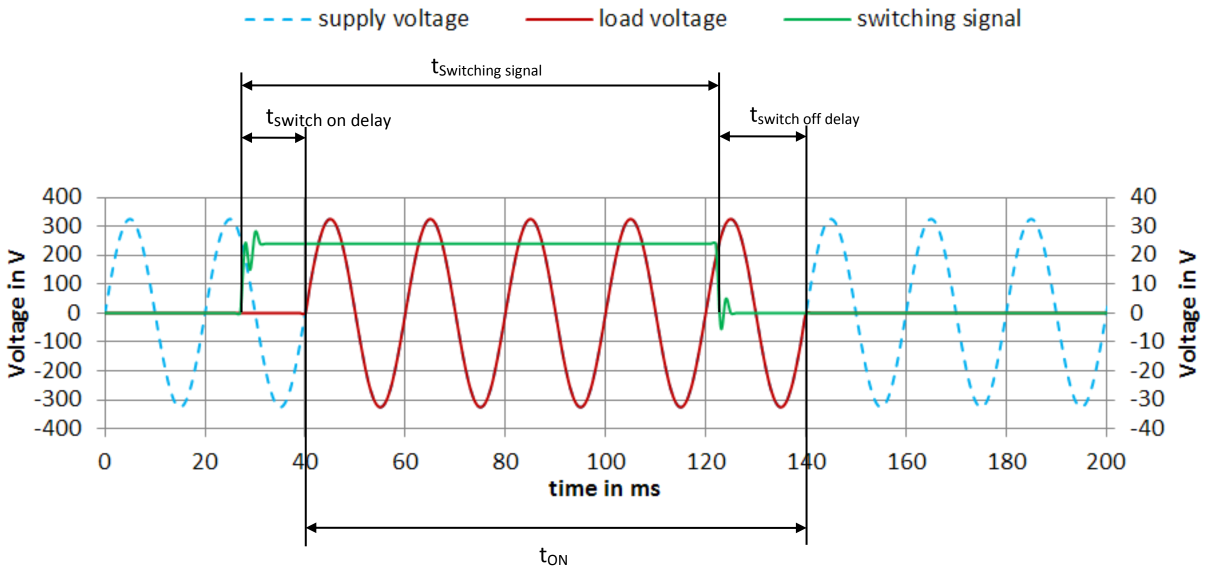
## 2.6 Adhering to limit values in switching processes

The electronics switch the load on and off at the zero crossing of the load voltage. The switch on and off commands are carried out after a delay (max. 80ms). The minimum duration of the switch on impulse has to be 100ms. The maximum switching frequency may not exceed 1Hz. The minimum load current is 2A. The proper functionality of the device cannot be guaranteed if the limit parameters are not adhered to. The electronics continuously monitor the correct performance of the control commands and the power consumption in all phases. Switching processes must be conducted in line with the following rules in order to achieve a high switch rate, long lifetime and low power loss:

- Maximum switching frequency $f$ 1 Hz
- Minimum switch on duration $t_{ON}$ 100ms
- Minimum switch off duration $t_{OFF}$ 100ms
- Minimum load current $I_{nc\ min}$ 2A
- Usage only with connected functional ground PE (Input 2 control plug)

**Note:** Please complete commissioning in conjunction with working through the checklist in subsection 5.6!

**Example: Switch on and off process with minimum switching duration of 100ms:**

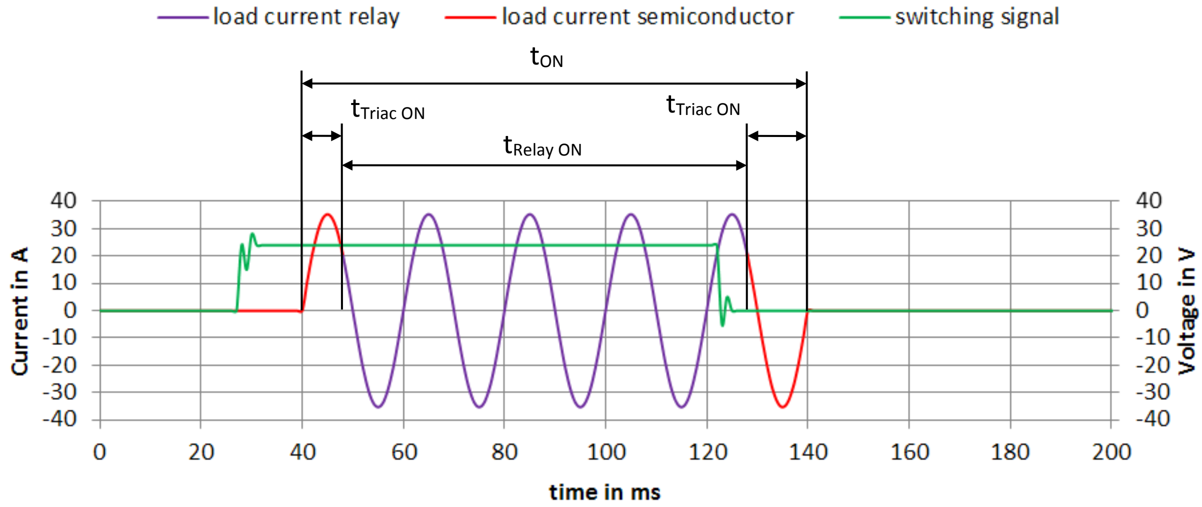



| Designation | Limit value | In example |
|---|---|---|
| $t_{switch\ on\ delay}$ | max. 80ms | approx. 13ms |
| $t_{switch\ off\ delay}$ | max. 80ms | approx. 17ms |
| $t_{switching\ signal}$(duration of the switch on impulse) | min. 100ms | approx. 100ms |
| $t_{ON}$: (Switch on duration of load) | min. 100ms | approx. 100ms |

**Power output 3-phase** at 25A load current**:**

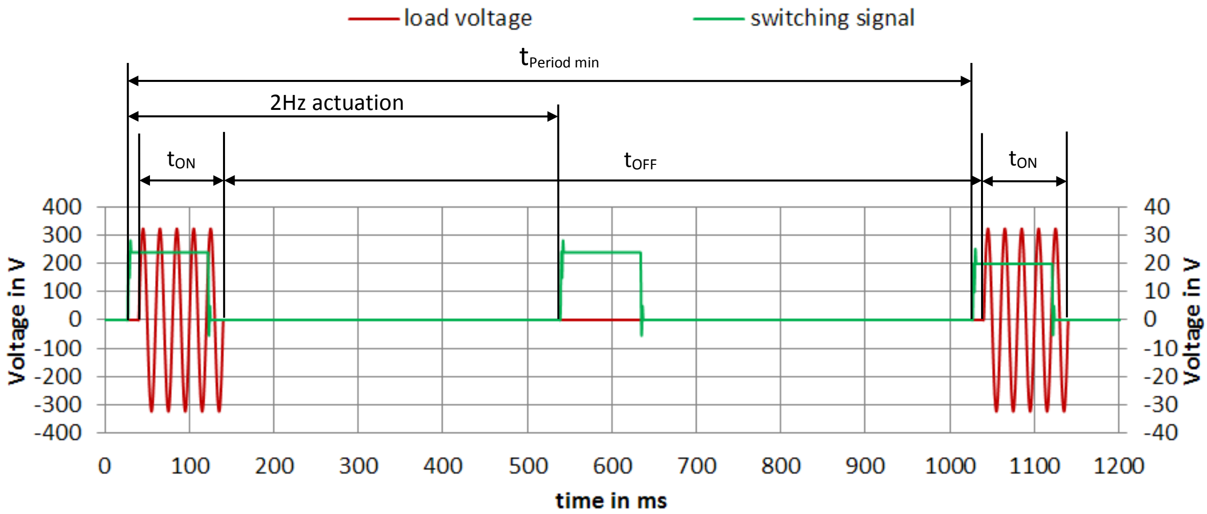
- 20W power loss in continuous operation (all relays permanently on, $t_{Relay\ ON}$ >> 1s)
- temporary 3-fold power loss during switch on or switch off ($t_{Triac\ ON}$)

**Exemplary switch on and off process with hybrid switches in detail (current flow)**




| Designation | Limit value | In example |
|---|---|---|
| $t_{Triac\ ON}$ (Switch on duration of Triac) | max. 20ms | approx. 8ms switch on<br>approx. 12ms switch off |
| $t_{Relay\ ON}$ (Switch on duration of relay) | min. 80ms | approx. 80ms |
| $t_{ON}$ (Switch on duration of load) | min. 100ms | approx. 100ms |

**Example: Switching cycle with max. switching frequency 1Hz and min. switch on duration 100ms**




**Incorrect actuation (in this case: 2Hz) is ignored!**

| Designation | Limit value | In example |
|---|---|---|
| $t_{Period\ min}$ (Minimal period duration between impulses) | min. 1000ms | approx. 1000ms |
| $t_{OFF}$ (Switch on duration of load) | min. 100ms | approx. 900ms |

## 2.7 Adjustability of the power output

The adjustability of the power output of OMUS® occurs depending on the actuation. In continuous operation, the consumer is continuously actuated. The output can be switched in a timed manner to reduce the power output. The duty cycle *D* is characterized by the relationship between duration of the actuation impulse and period duration of the timing:

$$D = \frac{t_{ON}}{t_{Period}}$$

The actuation limit parameters must be adhered to for the timing of the output. The prescribed minimum switching duration for the load of 100 ms results in a duty cycle of 10% for the maximum switching frequency of 1 Hz.

$$D = \frac{t_{ON}}{t_{Period\ min}} = \frac{100ms}{1000ms} = 10\%$$

The max. duty cycle in timed operation at a maximum switching frequency of 1 Hz is 90%:

$$D = \frac{t_{ON}}{t_{Period\ min}} = \frac{900ms}{1000ms} = 90\%$$

The max. control accuracy is determined by supply frequency and switching frequency. At 50Hz-supply frequency and 1Hz-switching frequency the max. control accuracy *Acc* is:

$$Acc = \frac{50Hz}{1Hz} = \frac{20ms}{1000ms} = 2\%$$

The limits of the duty cycle are depending on determined min. switch on and off times (100ms) and the variable switching frequency. At 1Hz-switching frequency the lower limit is 10%, the upper limit is 90%. In order to achieve a finer duty cycle, the switching frequency must be reduced. Example for 1% duty cycle:

Switching frequency to 0.1 Hz (≙10s period duration)

$$D = \frac{t_{ON}}{t_{Period}} = \frac{100ms}{10000ms} = 1\%$$

Example for 99% duty cycle: Switching frequency to 0.1 Hz (≙10s period duration)

$$D = \frac{t_{ON}}{t_{Period}} = \frac{9900ms}{10000ms} = 99\%$$

The duty cycle at a switching frequency of 0.1 Hz is adjustable between 1% and 99% in 0.2% steps.

| Duty cycle | Switching frequency | $t_{ON}$ | $t_{OFF}$ | Control accuracy |
|---|---|---|---|---|
| 1% | 0,1Hz | 100ms | 9900ms | 0,2% |
| 10% | 1Hz | 100ms | 900ms | 2% |
| 54% | 1Hz | 540ms | 460ms | 2% |
| 90% | 1Hz | 900ms | 100ms | 2% |
| 99% | 0,1Hz | 9900ms | 100ms | 0,2% |

## 2.8 Suitability of the application

The basis for the use of OMUS® in the planned application is operation within the following limit parameters.

| Electrical parameters OMUS® | Specification | |
|---|---|---|
| Type of load | resistive loads | |
| Max. load current $I_{nc\ max}$ | 25A (IEC) | 20A (UL) |
| Min. load current $I_{nc\ min}$ | 2A (IEC) | 2A (UL) |
| Max. operating voltage $U_e$ | 400V AC (IEC) | 480V AC (UL) |
| Max. switching frequency $f$ | 1Hz | |
| Min. switch on duration $t_{ON}$ | 100ms | |
| Min. switch off duration $t_{OFF}$ | 100ms | |
| Max. switch on delay | 80ms | |
| Max. switch off delay | 80ms | |

| Actuation parameters (e.g. PLC) | Specification |
|---|---|
| Max. actuation impulse switching frequency $f_{Impulse}$ | 1Hz |
| Min. duration of actuation impulse $t_{Switch\ on\ signal}$ | 100ms |
| Min. timeout duration $t_{Switch\ off\ signal}$ | 100ms |

| Parameter periphery | Specification |
|---|---|
| Evaluating the warning message | Detection and rectification of the warning's cause |
| Evaluating the error message | Using the error message contacts to switch off the load |
| Switch off the load during an error | galvanic isolation via external switchgear |

The limit values of *Electrical parameters OMUS®* must be adhered to by the *Actuation Parameters* in order to guarantee orderly operation. The parameters listed only constitute the basis for possible use. Additional parameters must be observed for a successful application (see chapter 9 *Technical Data* and 2.5 *Switching processes in the hybrid switch*).

# 3 Safety instructions / Installation instructions

Obey all national safety, accident prevention and industrial safety regulations when carrying out work on the device. Failure to obey safety instructions may result in a good deal of property damage, severe health damage or even danger to life and limb. The device may only be commissioned, installed, modified and retrofitted by a trained electrician. Disconnect the (busbar) system from the power supply before starting work on the device or the loads.

**If the semi-conductor elements break down or the relays are stuck, the electronics alone cannot turn off the load. In an irregular state, the error relay issues a signal. The layout of the semi-conductor elements means that there is no complete electrical isolation of the load from the main supply. In order to interrupt an unintentional continuous current flow in case of an error, an external switchgear must ensure the interruption of the load circuit.**

The safety regulations set out in DGUV V3 (BGV A3) are to be used for work. During operation, parts of the electrical switchgear can carry dangerous voltage! Safety covers must not be removed from electrical switchgear during operation. Keep the user manual in a safe place! The device must not be installed in potentially explosive atmospheres. Obey the safety regulations which apply to the installation and operation of related equipment. The device must not be exposed to mechanical or thermal stresses which exceed the limits described in the user manual. If necessary, the device may be installed in an appropriate housing with a suitable protection type (for example IP54) to IEC 60529 / EN 60529 to protect it from mechanical or electrical damage. If the device is used in dusty environment, it must be installed in a suitable housing (at least IP64) to EN 61241. Access to the circuits inside the device is not permitted during operation. The equipment cannot be repaired by the user and must be replaced by an equivalent device. Repair work may only be carried out by the device manufacturer. The device conducts function self-diagnostics continuously during operation. A warning or error may be signaled depending on the level of discrepancy between actual and nominal value. Only use power supplies with safe isolation using PELV voltage to EN 50178 / VDE 0160 (PELV). This prevents a short-circuit between the primary and secondary sides.

# 4 Product table

| Type | Pack Size | Weight kg/100 | Part No. |
|---|---|---|---|
| **OMUS®30Compact** | | | |
| Electronic hybrid switch IEC, 3-pole, complete with busbar adapter, control and load plug and fuse links 32A gG, 10 x 38 | 1 | 45.2 | 36 152 |
| Electronic hybrid switch UL and IEC, 3-pole, complete with busbar adapter, control and load plug and fuse links Class CC 30A time delay | 1 | 45.2 | 36 157 |
| **OMUS®60Classic** | | | |
| Electronic hybrid switch IEC, 3-pole, complete with busbar adapter, control and load plug and fuse links 32A gG, 10 x 38 | 1 | 45.8 | 36 153 |
| Electronic hybrid switch UL and IEC, 3-pole, complete with busbar adapter, control and load plug and fuse links Class CC 30A time delay | 1 | 45.8 | 36 158 |
| **OMUS®CrossBoard** | | | |
| Electronic hybrid switch IEC, 3-pole, complete with control and load plug and fuse links 32A gG, 10 x 38 | 1 | 35.7 | 36 154 |
| Electronic hybrid switch UL and IEC, 3-pole, control and load plug and fuse links Class CC 30A time delay | 1 | 35.7 | 36 159 |
| **Spare components** | | | |
| Busbar adapter 30Compact | 1 | 7.2 | 36 155 |
| Busbar adapter 60Classic | 1 | 7.8 | 36 156 |
| Load plug, 3-pole, spring terminals | 1 | 1.5 | 36 916 |
| Load plug, 3-pole, screw terminals | 1 | 1.5 | 36 918 |
| Control plug, 12-pole, spring terminals 0.2 – 1.5mm² | 1 | 0.8 | 36 917 |
| Fuse 32A gG, 10 x 38 | 10 | 0.6 | 31 189 |
| Fuse Class CC, 30A, UL listed | 10 | 0.8 | 31 252 |

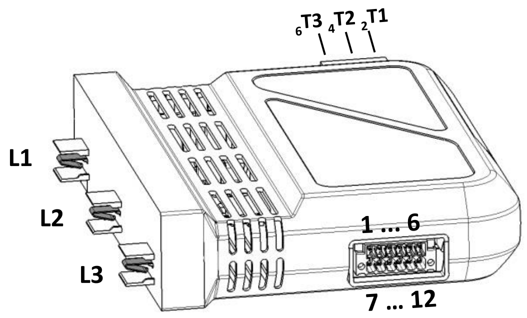
# 5 Commissioning

Refer to the safety instructions and area of use.

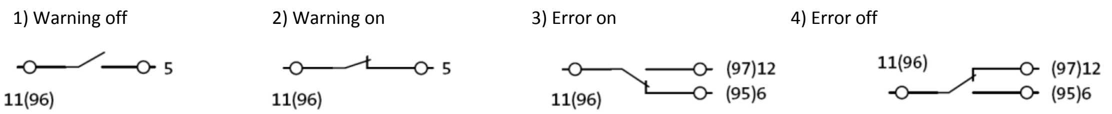
## 5.1 Connections

### Terminal assignment control cable

| Connection | Designation | Function |
|---|---|---|
| 1 | $U_i$ +24V DC | +24 V DC design control supply voltage |
| 2 | PE | Functional ground |
| 3 | E L2 | Control input for L2 |
| 4 | E (L1 + L2 + L3) | Control input for L1 + L2 + L3 |
| 5 | Warning | Warning message output |
| 6 | (95) error | Error message output („on“) |
| 7 | $U_i$ mass | Ground control supply voltage |
| 8 | E L1 | Control input for L1 |
| 9 | E L3 | Control input for L3 |
| 10 | Mass inputs | Ground control inputs L1 + L2 + L3 |
| 11 | (96) Warning + Error | Voltage input for message outputs |
| 12 | (97) error | Error message output („off“) |



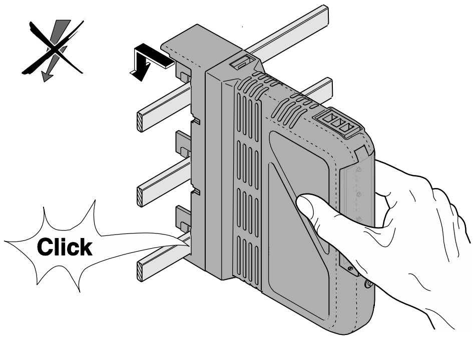

**Signal relay:**



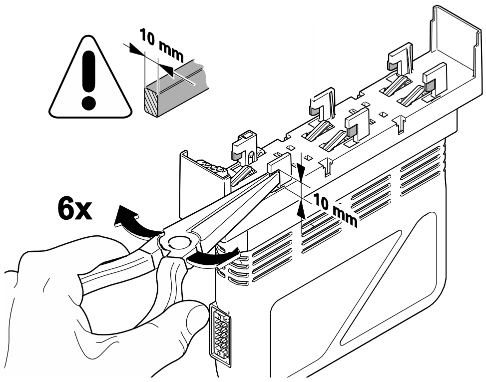
## 5.2 Installing and connecting the main circuits

**Mounting on the busbar system:**

Lock the complete module including the busbar adapter to the rails. The electrical connection to the three-phase conductors is made through the adapter.



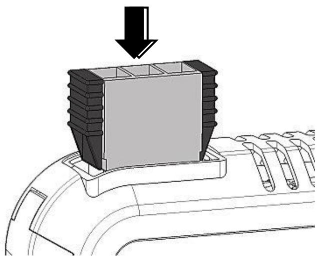

If necessary, adjust the busbar adapter's feet for 10mm busbars beforehand.
CAUTION: Never carry out work when the voltage is connected! Danger to life!




**Connection plug:**

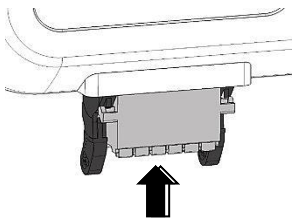
*Load plug:*

Connect the load side conductors to the load plug and lock it into the device.



*Control plug:*

Connect signal and control cables to the control plug and lock it into the device.



**Applying the operating voltage:**

- Apply 24V DC operating voltage to the OMUS®!
- Apply voltage to the busbar system!

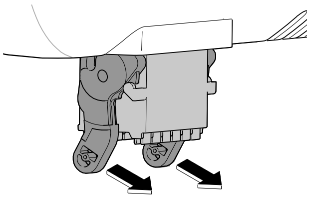
## 5.3 Meaning of the LED indicators

- Auto(matic) mode: LEDs permanently green (compare chapter 6.2 *Overview of display functions*)
- Warning: LEDs orange
- Error: LEDs red + OMUS® switched off

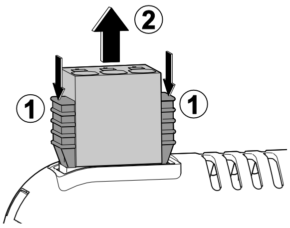
## 5.4 Disassembly and replacing devices

**Disconnect power to the busbar system, obey safety instructions!**

Remove the control plug:

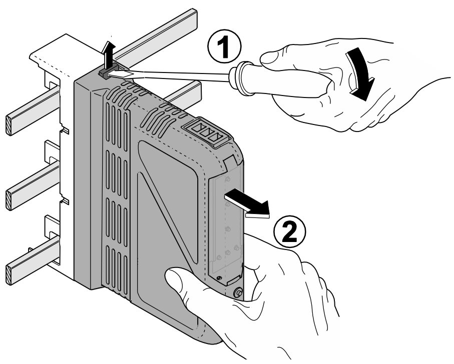


Remove the load plug



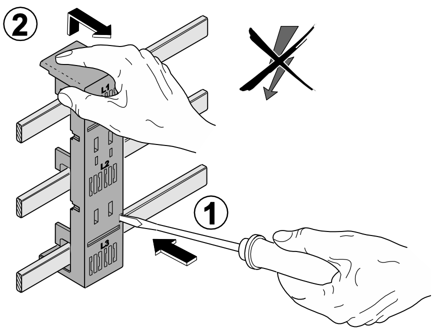

Remove the OMUS® from the adapter

1.




Remove the busbar adapter from the system:

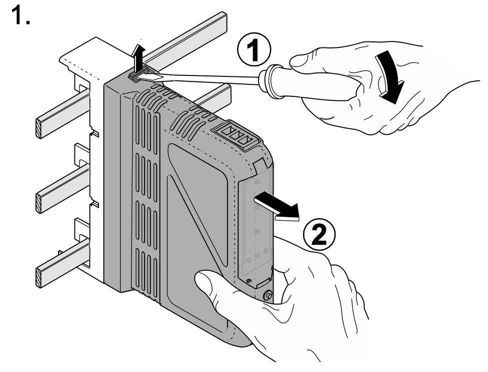
2.



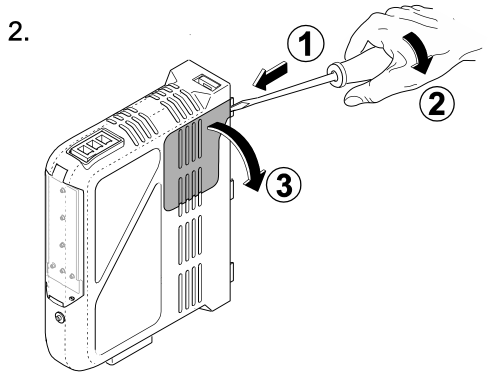
## 5.5 Replacing a fuse

Disconnect power to the busbar system, obey safety instructions!

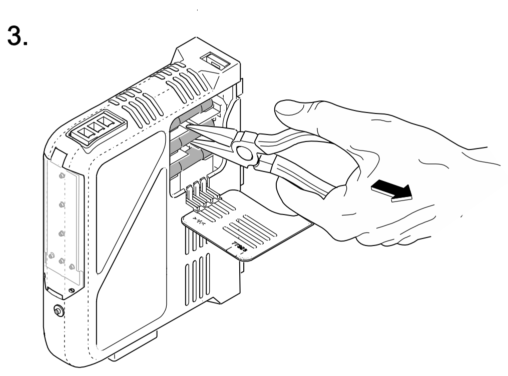
Remove the OMUS® from the adapter:



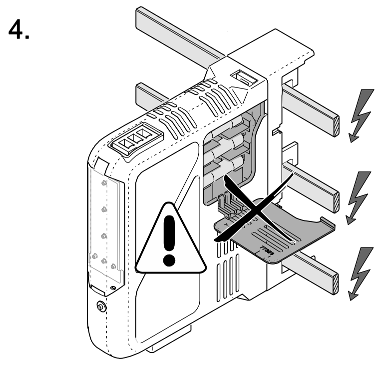

Open fuse cover:



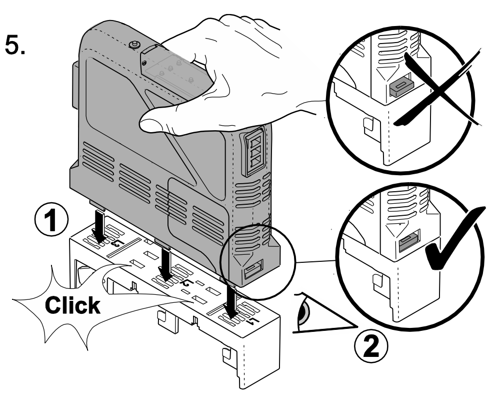

Exchange fuse:



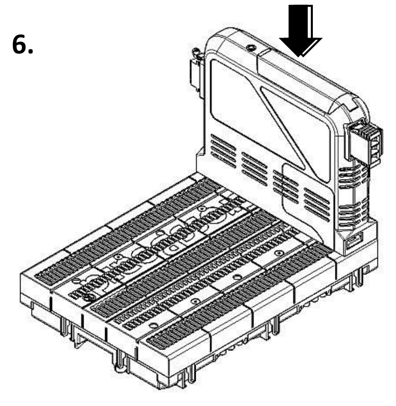

Do not exchange the fuse before dismantling!




Snap the OMUS® onto the adapter:




Snap the OMUS® onto the CrossBoard®:




Pay attention to the right position of the lock slide (compare assembly stage 5) and the reverse polarity protection!

## 5.6 Checklist

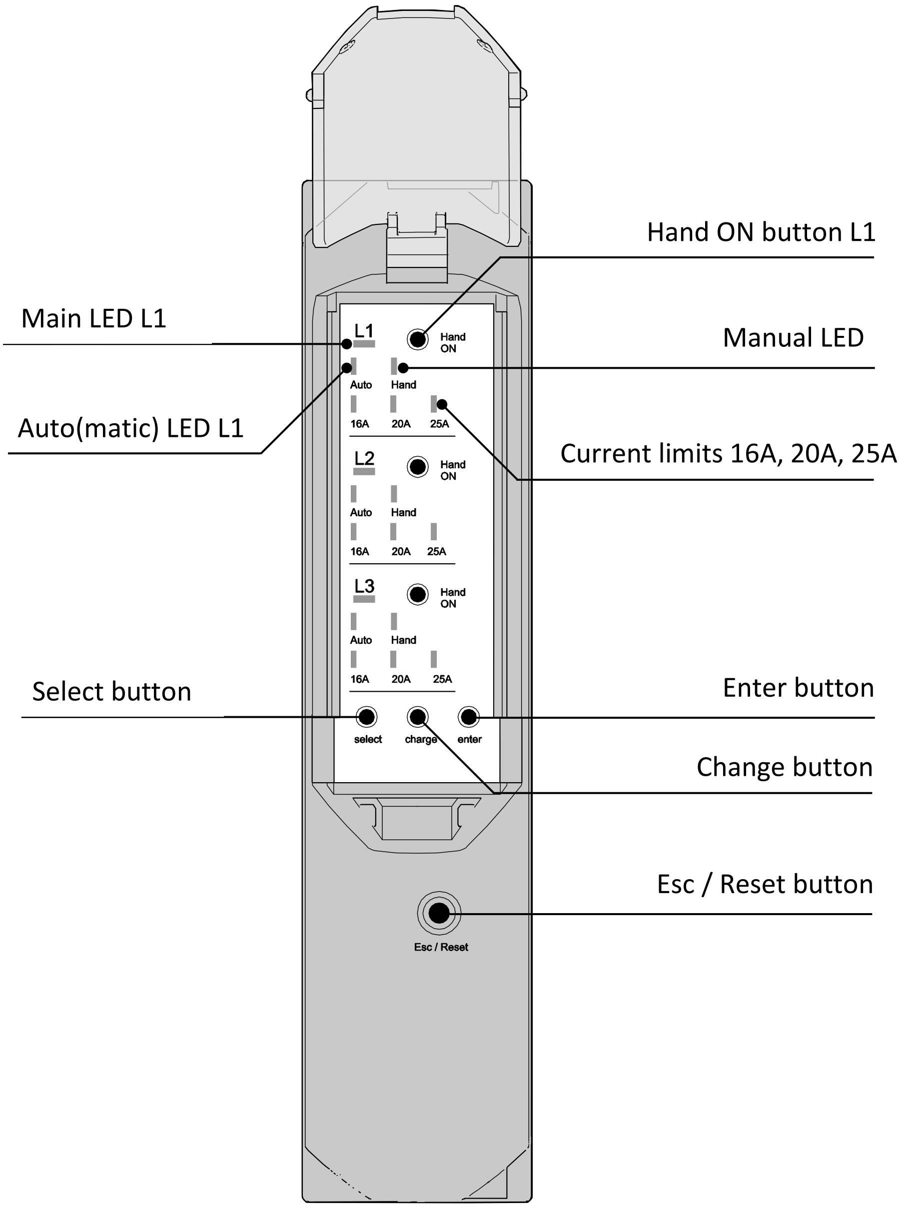
Work through the following checklist at the end of commissioning and check all corresponding points to guarantee the safe operation of the device.

| Parameter | Description | Status |
|---|---|---|
| Fuse | Fuses in place and functional | ☐ |
| Busbar adapter | Correct locking with the system | ☐ |
| Load plug | Correct locking and cabling of the load plug | ☐ |
| Control plug | Correct locking and cabling of the control plug | ☐ |
| Control voltage | Operating voltage applied, power supply adequately designed | ☐ |
| Functional ground | PE is connected to input 2 of the control plug | ☐ |
| Voltage load | Supply voltage is applied | ☐ |
| Switching variant | Suitable application (compare chapter 6.4) | ☐ |
| LED status | Main LED and parameter LEDs show permanent green light | ☐ |
| Warning | Warning signal relay wired and inactive | ☐ |
| Error | Error signal relay wired and inactive | ☐ |
| Actuation | Actuation within the prescribed parameters | ☐ |
| Operating mode | *Auto(matic)* for using the control inputs or *Hand (manual mode)* | ☐ |
| Current limit | Current limits set according to outlet cable | ☐ |
| Min. load current | The load current is at least 2A in rated operation | ☐ |

# 6 User interface

## 6.1 Front view

- Normal operation: LEDs permanently green (compare chapter 6.2 *Overview of display functions*)
- Warning: LEDs orange
- Error: LEDs red + OMUS® switched off



## 6.2 Overview of display functions

The detailed description of the different operation modes is shown in chapter 8.

### Auto(matic) mode (main LED: green)

| Status | Main LED | Auto LED | Manual LED | Current limits | Warning | Error | Load |
|---|---|---|---|---|---|---|---|
| Factory setting | Green | Green | Off | Green (16A) | Off 1) | Off 4) | Switched |
| Auto(matic) mode 16A | Green | Green | Off | Green (16A) | Off 1) | Off 4) | Switched |
| Auto(matic) mode 20A | Green | Green | Off | Green (20A) | Off 1) | Off 4) | Switched |
| Auto(matic) mode 25A | Green | Green | Off | Green (25A) | Off 1) | Off 4) | Switched |

### Warnings (main LED: orange)

| Status | Main LED | Auto LED | Manual LED | Current limits | Warning | Error | Load |
|---|---|---|---|---|---|---|---|
| Phase failure / fuse blown | affected orange | affected green | | affected flash green | On 2) | Off 4) | Switched |
| Load failure (current <2A) | affected flash orange | affected green | | affected off | On 2) | Off 4) | Switched |
| Current limit reached | affected flash orange | affected green | | affected flash green | On 2) | Off 4) | Switched |
| Temperature limit (approx. 65 °C) | flash orange | affected green | | affected green | On 2) | Off 4) | Switched |

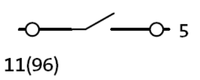
### Errors (main LED: red)

Acknowledge by pressing ESC/Reset button or disconnecting the 24 V supply

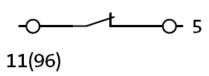
| Status | Main LED | Auto LED | Manual LED | Current limits | Warning | Error | Load |
|---|---|---|---|---|---|---|---|
| No 24V operating voltage | Off | Off | Off | Off | Off 1) | On 3) | Off |
| Overcurrent (approx. 15%) | affected flash red | affected green | | affected flash green | Off 1) | On 3) | affected Off |
| Overtemperature (approx. 80 °C) | flash red | Off | Off | Off | Off 1) | On 3) | Off |
| Current without actuation, device potentially defective, external switch off required | affected flash red | Green | Red | affected flash green | Off 1) | On 3) | affected permanent on |

### Signal relay:

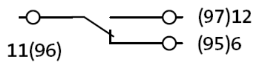
1) Warning off



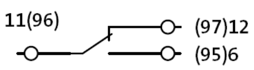

2) Warning on




3) Error on



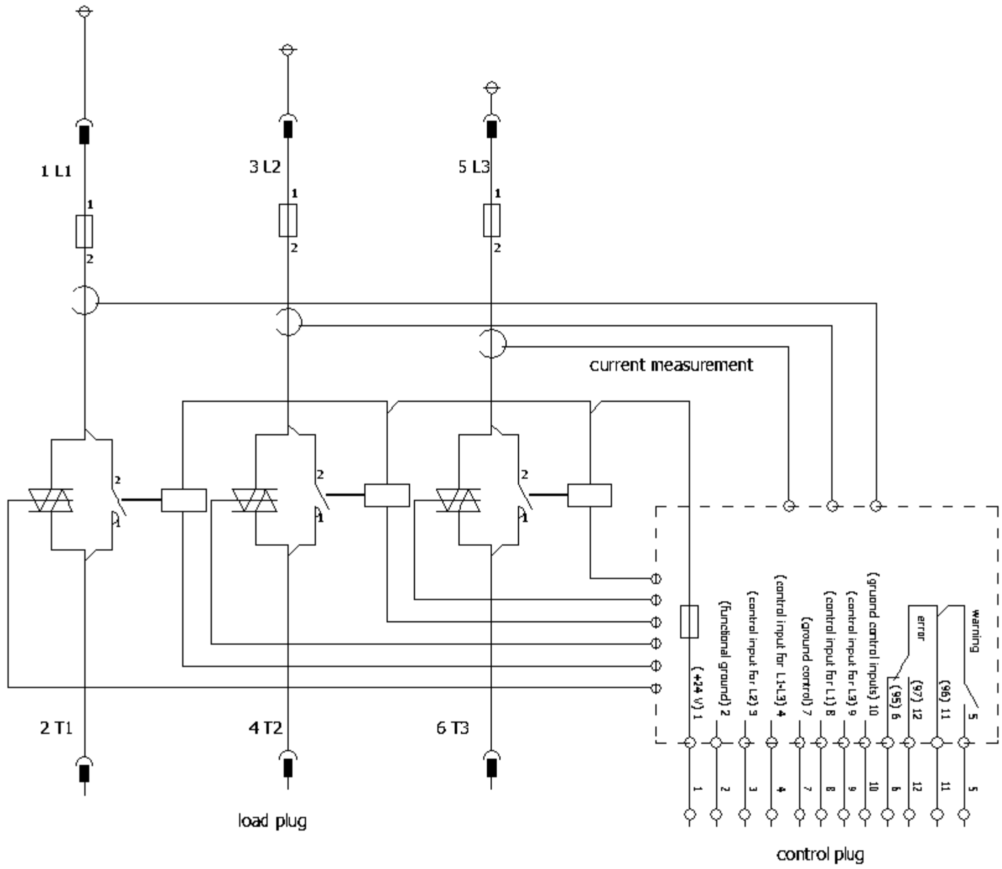

4) Error off



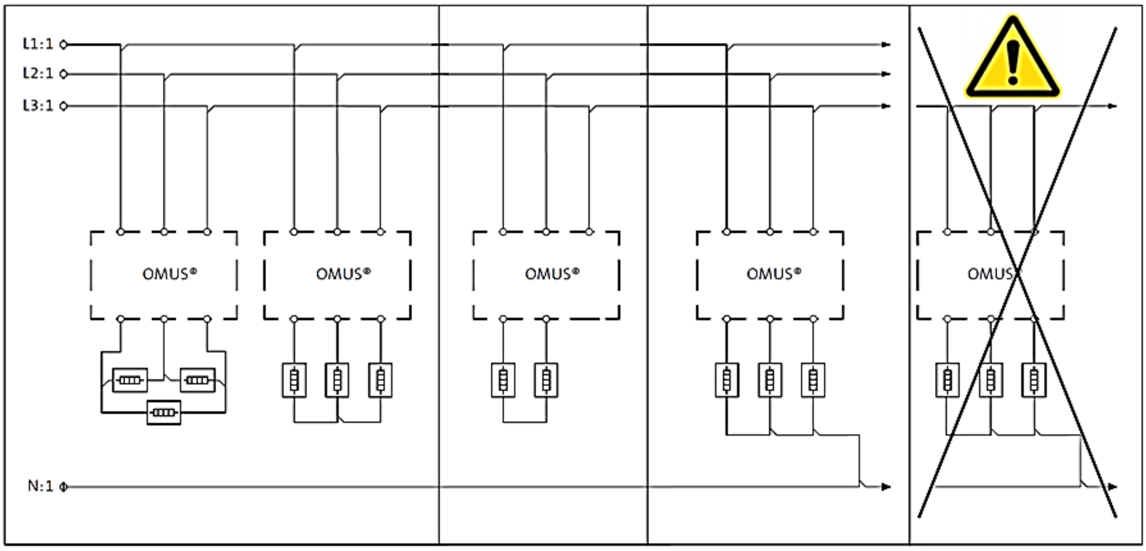

### Manual mode (for commissioning)

| Status | Main LED | Auto LED | Manual LED | Current limits | Warning | Error | Load |
|---|---|---|---|---|---|---|---|
| Manual mode 16A/20A/25A inactive | Green | Off | Green | Affected green | Off 1) | Off 4) | Off |
| Manual mode 16A/20A/25A active | Green | Off | Green | Affected green | Off 1) | Off 4) | Switched |

## 6.3 Eplan symbol



## 6.4 Switching variants




| | | | |
|---|---|---|---|
| For applications without a neutral conductor, the usage of the 3-phase input L1+L2+L3 (input 4 control plug) is mandatory! | For 2-pole usage without neutral conductor, the usage of the 3-phase input L1+L2+L3 (input 4 control plug) is mandatory! The third pole has to be in manual mode! | Usage of load against neutral conductor offers switching as required (individually or together). | Not suitable for operating in single-phase networks |

# 7 Configuration of OMUS®

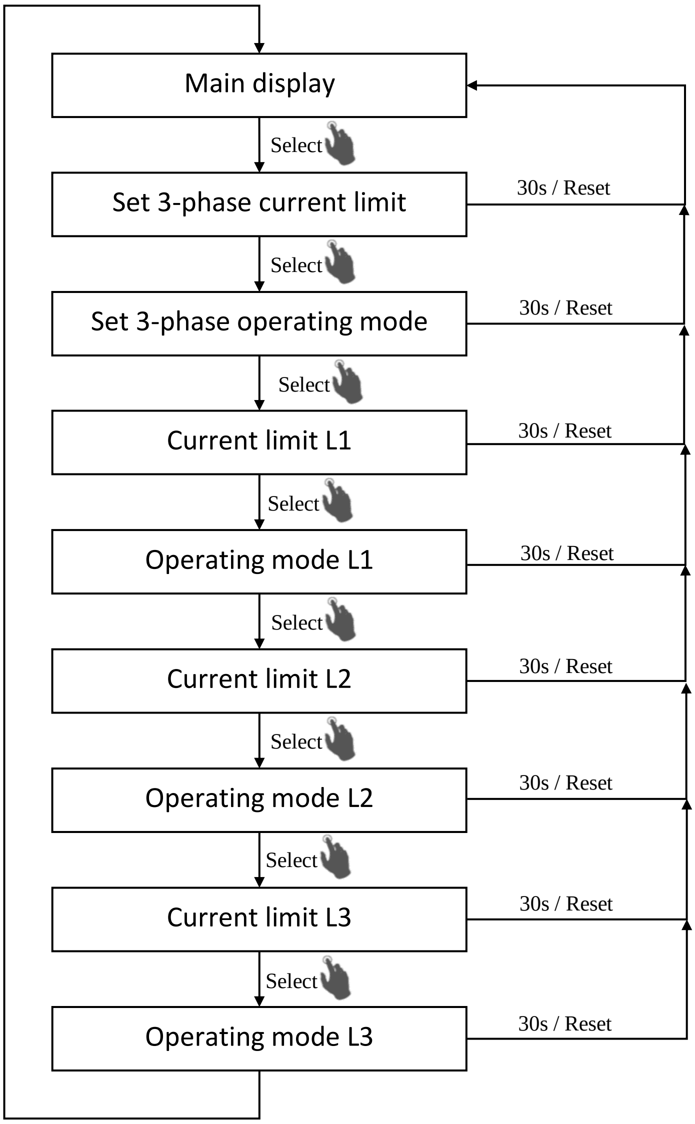
The settings menu allows the user to configure OMUS® in line with the application. The **setting of the current limits** at the levels 16A, 20A and 25A must be done by the user in accordance with the requirements and limits of the installation.
The first operating mode available is **auto(matic) mode**, which is controlled via 24V DC inputs (e.g. PLC). The second mode available is **manual mode** for commissioning, which is activated by the *Hand ON*-button. Each phase can be set to an individual configuration.

The **menu** is called up by **pressing** the **Select button** and pressing again switches to the next menu item. A continuous light displays the status set. The **Change button** in the selected menu item should be used to change the settings. Pressing it multiple times allows you to preselect all settings options for the present menu item. Selected settings flash green. Pressing the **Enter button applies the selected setting** and returns you to the menu. Settings not saved by pressing Enter will be lost.

You can leave the menu at any time by pressing the **Esc / Reset button**. The menu will also be closed after the last menu item or once approximately 30s pass with no action by the user. When leaving the menu all display LEDs will flash several times. The set parameters, confirmed with Enter, will be applied and the outputs will be switched back to active. All settings are saved on the device permanently. The settings are retained even if the 24 V operating voltage is switched off.

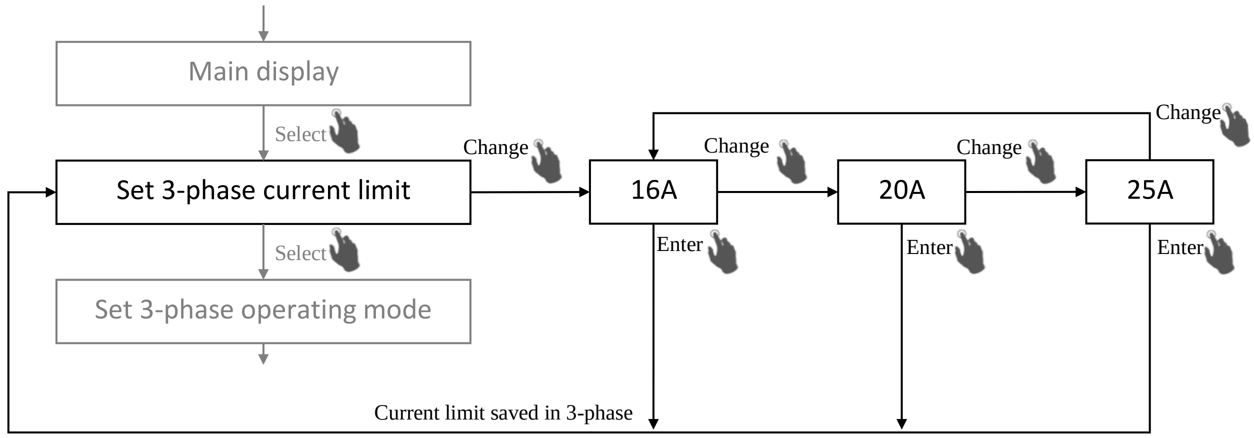
## 7.1 Menu structure

The menu structure is visualized in the following diagram. The following pages visually describe the settings for single phase or all three phases.

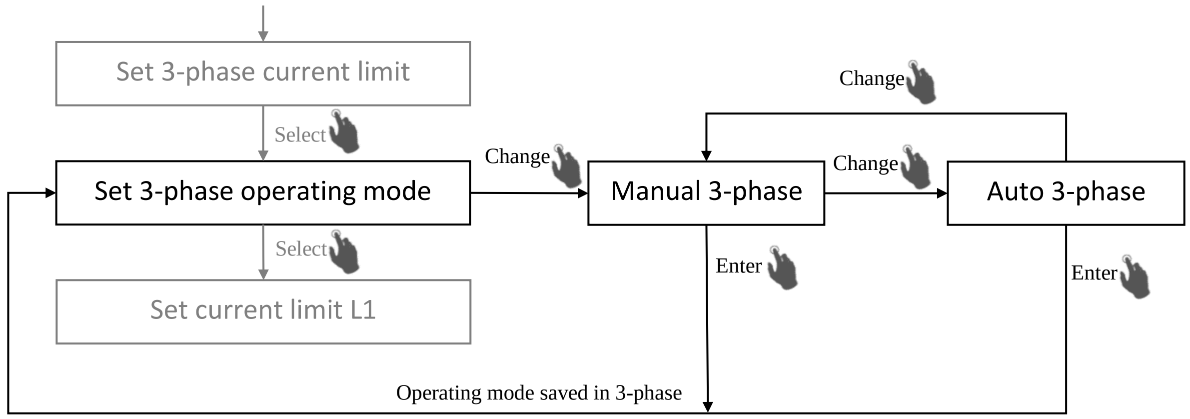


## 7.2 Three-phase settings

The three-phase setting of the current limits is pictured as follows:

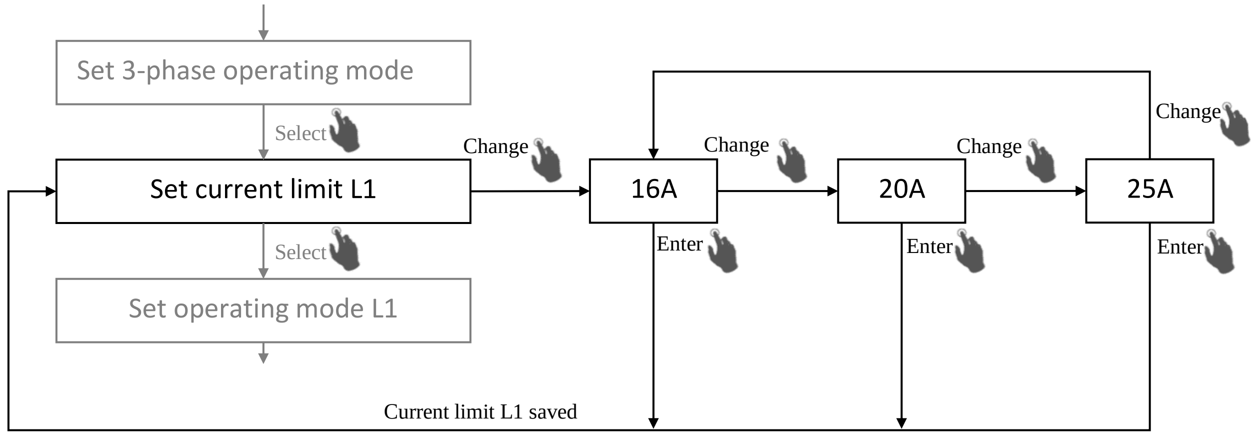



The three-phase setting of the operating mode is pictured as follows:

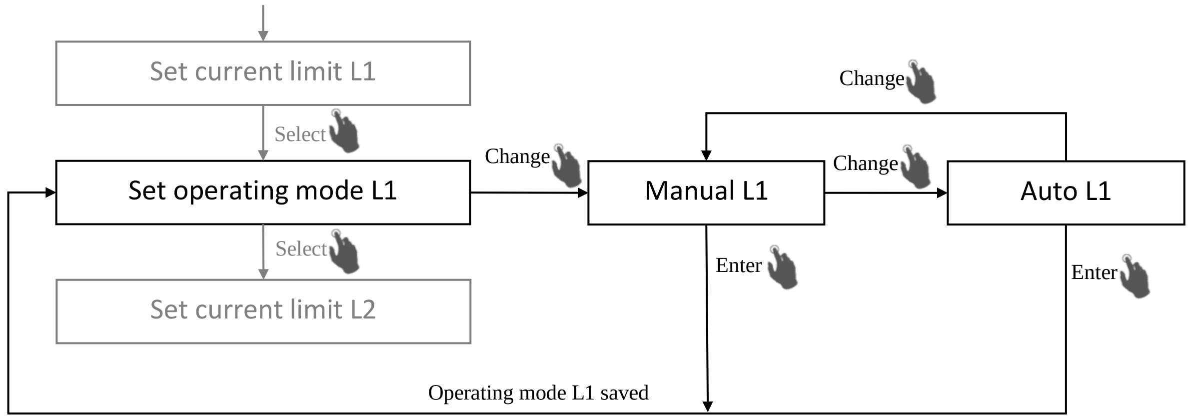


## 7.3 Single-phase settings

The single-phase setting of a current limit is pictured as follows:




The single-phase setting of an operating mode is pictured as follows:




The additional phase settings are carried out in the same way.

## 7.4 Restoring to factory settings

On delivery all phases are set to auto(matic) mode and the current limits to 16A. If you want OMUS® to be **reset to the delivery status**, press **Select and Enter button simultaneously**. This simultaneous pressing of the buttons will cause all LEDs to be illuminated and display the successful restoration of the delivery status by flashing multiple times. All settings will be overwritten and the **factory status will configure OMUS® to three-phase in auto(matic) mode with a current limit of 16A**.

## 7.5 Standby

The device can be **put in a Standby mode** which will **deactivate the outputs**. To do this, **press and hold the Esc/Reset button for approx. 8s**. **All the outputs will be shut down.** All manual LEDs will flash orange, all other LEDs are off. The warning relay will issue a signal. All settings are retained in Standby mode and no menu options are available. You can **leave** the **Standby mode** again by pressing the **Reset button for approx. 4s**. The device cannot be put in Standby mode, if there is an error.

# 8 Function description

The device has various operating states:

- auto(matic) mode
- manual mode
- settings menu
- warning and error states
- standby mode

Warnings are issued during running operation. Errors turn the load off. The factory settings can be restored by pressing the "select" + "enter" buttons simultaneously.

## 8.1 Auto(matic) mode

The device is in auto(matic) mode when it is used properly and there are no warnings or errors. All main LEDs are permanently illuminated green as are the selected settings. In auto(matic) mode, the outputs are actuated according to the input signals. **The present switching status is not displayed!** The various operating parameters are continuously monitored. You can switch to the settings menu from auto(matic) mode anytime.

**Auto(matic) mode (main LED: green)**

| Status | Main LED | Auto LED | Manual LED | Current limits | Warning | Error | Load |
|---|---|---|---|---|---|---|---|
| Factory setting | Green | Green | Off | green (16A) | Off 1) | Off 4) | Switched |
| Auto(matic) mode 16A | Green | Green | Off | green (16A) | Off 1) | Off 4) | Switched |
| Auto(matic) mode 20A | Green | Green | Off | green (20A) | Off 1) | Off 4) | Switched |
| Auto(matic) mode 25A | Green | Green | Off | green (25A) | Off 1) | Off 4) | Switched |

## 8.2 Settings menu

The normal working functions are deactivated in the settings menu. The load is turned off.

## 8.3 Manual mode

If manual mode is activated via the settings menu, the "Hand ON" buttons switch on the relevant phase. The "Hand ON" keys can be pressed simultaneously. In manual mode, warnings and errors are treated in the same way as in auto(matic) mode. You can switch to the settings menu from manual mode anytime.

## 8.4 Warning

The following statuses will lead to a warning:

- **Phase failure / Blown fuse**
- **Load failure**
- **Minor overcurrent** - current limit reached
- **Minor overtemperature** - temperature warning above 65 °C

> **PLC integration of warnings and avoidance of false alarms:**
>
> Warnings below 500ms should not be evaluated.
>
> Signals below should be rejected.

**Warnings (main LED: orange)**

| Status | Main LED | Auto LED | Manual LED | Current limits | Warning | Error | Load |
|---|---|---|---|---|---|---|---|
| Phase failure / blown fuse | affected orange | affected green | | affected flash green | On 2) | Off 4) | Switched |
| Load failure (current <2A) | affected flash orange | affected green | | affected off | On 2) | Off 4) | Switched |
| Minor overcurrent (<15%) | affected flash orange | affected green | | affected flash green | On 2) | Off 4) | Switched |
| Minor overtemperature (approx. 65°C) | Flash orange | affected green | | affected green | On 2) | Off 4) | Switched |

### Phase failure / blown fuse

During operation OMUS® monitors the voltage on the busbar. If the measured voltage drops below 42V AC, a phase failure is detected. The affected main LED will flash orange and the set current limit LED will flash green. The warning relay issues a signal. The warning itself will be cleared once the cause of the phase failure has been resolved.

### Load failure

If the measured load current drops below 2 A, this is detected as a load failure. The main LEDs for the affected phase will flash orange and the set current limit LED will turn off. The warning relay will issue a signal. The warning itself will be cleared once the cause of the undercurrent has been resolved. Ongoing operation will not be stopped.

**Minor overcurrent**

If the measured load current reaches the set current limit, this is detected as a warning. The main LED for the affected phase will flash orange and the set current limit LED will flash green. The warning relay will issue a signal. The warning itself will be cleared once the cause of the overcurrent has been resolved. Ongoing operation will not be stopped.

**Minor overtemperature**

If the temperature inside the hybrid switch exceeds 65°C, a warning is indicated. Main LEDs will flash orange. The warning relay will issue a signal. The warning itself will be cleared once OMUS® cools down. Ongoing operation will not be stopped.

## 8.5 Error

The Following parameters, monitored by OMUS® during operation, can lead to errors:

- **No 24V control voltage**
- **Major Overcurrent**- current limit exceeded by approx. 15%
- **Major Overtemperature** - temperature error above 80 °C
- **Irregular current flow**

**PLC integration of errors and avoidance of false alarms:**

Errors below 500ms should not be evaluated.

Signals below should be rejected.

**Errors (main LED: red)**

Acknowledge by pressing ESC/Reset button or disconnecting the 24 V supply

| Status | Main LED | Auto LED | Manual LED | Current limits | Warning | Error | Load |
|---|---|---|---|---|---|---|---|
| No 24V control supply voltage | Off | Off | Off | Off | Off 1) | On 3) | Off |
| Major Overcurrent (>15%) | affected flash red | Affected Green | | affected flash green | Off 1) | On 3) | affected Off |
| Major Overtemperature (approx. 80°C) | flash red | Off | Off | Off | Off 1) | On 3) | Off |
| Current without actuation, device potentially defective, external switch off required | affected flash red | Green | Red | affected flash green | Off 1) | On 3) | affected switched |

**No 24V control voltage**

If there is no 24V control supply voltage at OMUS® (input 1 or 7 at control plug), the error relay will issue a signal.

**Major Overcurrent**

If the measured load current exceeds the set current limit by more than 15%, the affected load is shut down. In the affected phase, the main LED turns red and the set current limit LED will flash green. The error relay continuously issues a signal. After the cause of the overcurrent has been resolved, the error message must be acknowledged (press Esc/Reset) to resume operation again.

**Major Overtemperature**

If the internal temperature of the hybrid switch exceeds 80°C, an error is indicated. All main LEDs will flash red. The error relay continuously issues signal. All outputs are shut down for self-protection. After cooldown, the error message must be acknowledged (press Esc/Reset button) to resume operation again.

**Irregular current flow**

If the electronics detect an irregular current flow to the load, it assumes a defect in the hybrid switch. In the affected phase, the main LED turns red and the set current limit LED will flash green. The error relay will continuously issue a signal. The load must be switched off by an external switchgear in order to interrupt the current flow. If the error continues after acknowledgement (press Esc/Reset), the hybrid switch must be replaced.

## 8.6 Acknowledgement of messages

If the cause of a warning has been resolved, the warning itself will be cleared. Error messages have to be acknowledged by pressing Esc/Reset. The cause of an error must be resolved first in this instance. The acknowledgement of an error by interrupting the 24 V operating voltage may only take place 500ms after switching off the load.

## 8.7 Interruption

If the 24V operating voltage is interrupted, the loads are shut down. All LEDs are off and the error relay will issue a signal. **The operational switching by disconnecting the 24 V operating voltage is not allowed! Non-observance will lead to higher wear of the hybrid switch.**

# 9 Technical data

| | |
|---|---|
| **Ambient conditions** | |
| Ambient temperature | -5°C to 35°C in control cabinet;<br>for temperatures up to 55°C or group layout see derating |
| Pollution degree | 2, in the housing |
| Overvoltage category | II, Load level |
| **Main circuits** | |
| Switching principle | 3 separate switches with bypass L1, L2, L3 |
| Number of main circuits | 3 independent circuits L1, L2 and L3 for resistive loads |
| Design operating voltage $U_e$ to IEC60947-1 | 400V AC, 50Hz |
| Maximum power loss (relays permanently on) | 20W |
| Setting continuous current limits | 16A, 20A, 25A, warning when limits are reached |
| Overload protection | shutdown if exceeded by more than 15% |
| Design operating current $I_e$<br>Utilisation category AC-51 to IEC 60947-4-3 | 25A 3× single-phase, 25A 1× three-phase |
| Minimum load current $I_{nc\ min}$ | 2A |
| Coordination type 1, system protection | 30kA, 400V |
| IP protection type | IP20 |
| Control circuit and main circuits isolation | $U_{imp}$ 2.5kV |
| Isolation function EN60947-1 2.1.19 | no position indicator for main contacts, device has no isolation function |
| Leakage current (input, output) separate | Less than 2mA (no electrical isolation) |
| Residual voltage during switching | 1,2V max. 10ms |
| Temperature protection in the device | 65°C warning, 80°C shutdown |
| Input protection circuits | Fuses<br>IEC: 3× 10×38, 32A gG, 400V<br>UL: 3× Class CC 30A, 600V<br>varistors 510V |
| **UL approval** | |
| File E483362 Vol.1 Sec. 1 | Type No. OM25-H cULus listed |
| Current / Voltage ratings | 20A 3x single-phase, 20A 1x 3-phase 480VAC |
| Minimum load current $I_{nc\ min}$ | 2A |
| Short Circuit Current Rating SCCR to UL 508a | 30kA, 480V with Class CC 30A |
| Maximum surrounding air temperature | 40°C |
| Maximum surface temperature | 55°C |
| Pollution degree | 2 |
| Maximum busbar temperature | 110°C |

### Timing

| | |
|---|---|
| Max. switching frequency | 1Hz |
| Min. duration of actuation ports | 100 ms |
| Min. switch on duration of load | 100 ms |
| Min. switch off duration of load | 100 ms |
| Max. switch on delay | 80ms |
| Max. switch off delay | 80ms |

### Control circuits

| | |
|---|---|
| Design control supply voltage $U_S$ to<br>IEC 60947-1<br>UL 508 | <br>24V DC<br>26.5V DC |
| Control supply voltage, noise level "Safe off" | < 5V DC |
| Design control supply current to IEC 60947-1 | ≤ 150mA |
| Control input L1, L2, L3, L1+L2+L3<br>Switching level "Low"<br>Switching level "Safe off"<br>Switching level "High"<br>Input current | <br>– 3 to 9.6 V DC<br>< 5V DC<br>19.2V – 30V DC<br>≤ 3mA |

### Check-back output

| | |
|---|---|
| Warning message | Floating contact, 1 normally open contact |
| Max. switching voltage | 24V AC/DC |
| Max. continuous load current $I_o$ | 0.5A |
| Error signal | Floating contact, 1 changeover contact |
| Max. switching voltage | 48V AC/DC |
| Max. continuous load current $I_o$ | 1A |

### Front controls

| | |
|---|---|
| Buttons Select, Change, Enter | Parameter setting |
| Manual button ON | Outputs switched on in manual mode |
| Main and Auto LED | Green = OK; Orange = Warning; Red = Error |
| Current limit LED | Continuous current limit value 16A, 20A, 25A |
| Esc / Reset button outside the hinged control panel | Acknowledgement of errors |
| Drilled hinged cover | enables sealing |

### Connection cross-sections

| Connection | Conductor type | IEC: | UL |
|---|---|---|---|
| 3-pin plug connector with spring terminals | Cu rm, f | 1.5 – 6mm² | AWG16 – AWG8 |
| 3-pin plug connector with screw terminals | Cu rm, f | 1.5 – 6mm²,<br>0.5–0.8Nm | AWG16 – AWG8<br>7lb-in |
| 12-pin control plug with spring terminals | Cu f | 0.2 – 1.5mm² | AWG24 – AWG16 |

| **Derating relative to 25A continuous current through busbar system according to IEC 61439-2** | | | |
|---|---|---|---|
| Installation ambient temperature up to | 35°C | 45°C | 55°C |
| Single installation/Gap ≥ 36mm | RDF = 1.0 | RDF = 0.9 | RDF = 0.8 |
| Layout with gap ≥ 9mm | RDF = 0.9 | RDF = 0.8 | RDF = 0.7 |
| Side-by-side layout, gap 0mm (4 devices) | RDF = 0.8 | RDF = 0.7 | RDF = 0.6 |
| Measurement with fuses 32A gG, load plug with screw terminals, busbar temperature 70°C | | | |
| **Derating relative to 25A continuous current through CrossBoard® according to IEC 61439-2** | | | |
| Installation ambient temperature up to | 35°C | 45°C | 55°C |
| Single installation/Gap ≥ 36mm | RDF = 1.0 | RDF = 0.9 | RDF = 0.8 |
| Side-by-side layout, gap 0mm | RDF = 0.6 | RDF = 0.54 | RDF = 0.48 |
| Measurement with CrossBoard® CB405, fuses 32A gG, load plug with screw terminals | | | |

GHV Trading

**GHV Trading, spol. s r.o.**
Edisonova 3, 612 00, Brno

**Česká Republika**
Tel.: +420 541 235 532-4
Tel.: +420 541 235 386
e-mail: ghv@ghvtrading.cz
http://www.ghvtrading.cz

**Slovenská Republika**
Tel.: +421 255 640 293
Tel.: +421 948 528 908
e-mail: ghv@ghvtrading.sk
http://www.ghvtrading.sk