Your Global Automation Partner

TURCK

# PSU67-3P-1H2-1H0-24250-IOL

# Smart switching power supply in IP65/IP67

Instructions for Use

# Table of Contents

# 1 About these instructions

These instructions for use describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the product. If the product is passed on, pass on these instructions as well.

## 1.1 Target groups

These instructions are aimed at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

## 1.2 Explanation of symbols used

The following symbols are used in these instructions:

| | |
|---|---|
|  | **DANGER**<br>DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided. |
|  | **WARNING**<br>WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided. |
|  | **CAUTION**<br>CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided. |
|  | **NOTICE**<br>NOTICE indicates a situation which may lead to property damage if not avoided. |
|  | **NOTE**<br>NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work. |
| ▶ | **CALL TO ACTION**<br>This symbol denotes actions that the user must carry out. |
| ⇨ | **RESULTS OF ACTION**<br>This symbol denotes relevant results of actions. |

## 1.3 Additional documents

Besides this document, the following material can be found on the Internet at www.turck.com:

- Data sheet
- Declarations of Conformity (current version)
- Quick Start Guide
- Approvals

## 1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to techdoc@turck.com.

# 2 Notes on the product

## 2.1 Product identification

These instructions apply to the following IP65/IP67 power supply series PSU67:

- PSU67-3P-1H2-1H0-24250-IOL (ID 100028240)

## 2.2 Scope of delivery

The scope of delivery includes:

- IP65/IP67 power supply
- Quick Start Guide

## 2.3 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under www.turck.com contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on p. [▷ 35].

# 3 For your safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

## 3.1 Intended use

The power supply unit PSU67-3P-1H2-1H0-24250-IOL is a stand-alone power supply for three-phase mains systems for indoor use with IO-Link interface. The device is designed with IP65/IP67 protection and is suitable for use directly on the machine. The protection class can only be guaranteed if all mating connectors are firmly connected.

The devices may only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

## 3.2 Foreseeable misuse

- Do not operate the power supply unit with DC input voltage.

## 3.3 General safety notes

- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device meets the EMC requirements for industrial areas. When used in residential areas, take measures to avoid radio interference.
- The device is class of protection I equipment according to IEC 61140.
- The device is designed for pollution degree 3 areas in controlled environments.
- Only use the device with additional protective devices in the area of personal and machine protection.
- Operate the device exclusively within the technical specifications.
- Do not connect the negative potential of any output externally to PE.
- Do not use without a proper PE (Protective Earth) connection.

# 4 Product description

The 3-phase switching power supply PSU67-3P-1H2-1H0-24250-IOL is designed in IP65/IP67. A Han Q4/2 male connector (XD1) is available for connecting the input voltage. The output voltage side is connected via a Han Q4/0 female connector (XD2).

The IO-Link interface is designed as an A-coded M12 connector (X0). Configuration and diagnostics are performed either via directly on the device via the operator interface (LEDs and buttons) or via IO-Link.

### Mating connectors

- Input voltage (XD1): Han Q4/2 female connector, 4 contacts + 2 control contacts
- Output voltage (XD2): Han Q4/0 male connector
- IO-Link (X0): M12 female connector, A-coded, 5-pin

## 4.1 Device overview

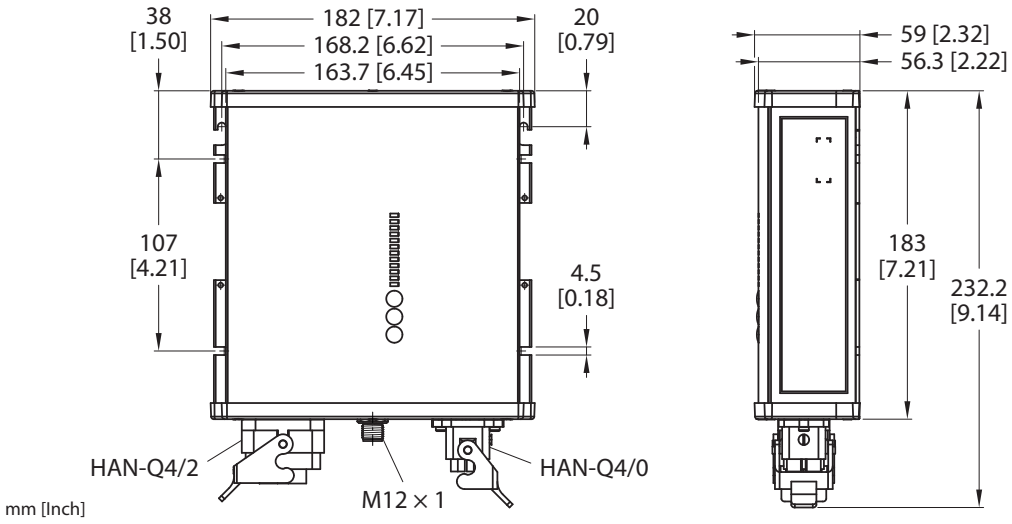



Fig. 1: Dimensions

### 4.1.1 Block diagram

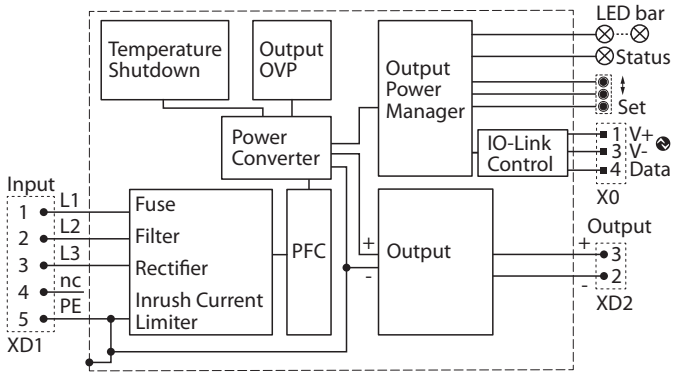



Fig. 2: Block diagram

### 4.1.2 Operating elements

The devices are has with the following operating elements:

- Buttons for requesting the device settings and for configuring the device [Voltage Set] and [↑] [↓].

### 4.1.3 Display elements

The device has a LED bar (monitoring mode [▶ 21]) to display:

- Total output power (in %)
- Output voltage
- Operating states (status LED)

## 4.2 Properties and features

- Degree of protection IP65/IP67
- 3-phase AC input, 1 × Han Q4/2
- 24 VDC output voltage, settable up to 28 VDC
- Output current 25 A
- Output, 24 VDC, 1 × Han Q4/0
- IO-Link interface
- Wide temperature range
- LED status display
- High efficiency, > 95 %
- Operator interface (LEDs and buttons)

## 4.3 Functional principle

The device converts an AC input voltage of 320…550 VAC into a 24 VDC output voltage.

## 4.4 Functions and operating modes

### 4.4.1 User interface

#### Output level control

The buttons [Voltage Set] and [↑] [↓] are used to configure the output voltage in the configuration mode [▶ 16]. After commissioning the power supply, the device is in monitoring mode (normal operation) for monitoring the output power.

### 4.4.2 AC voltage input

The voltage input is designed for a 3-phase AC voltage of 3 × 380…480 VAC (nominal range).

#### Inrush current limitation

The power supply is equipped with an active inrush current limiting circuit, which limits the input inrush current to a very low value after switching on. The inrush current is usually lower than the permanent input current.

| | 3AC 400 V | 3 AC, 480 V | |
|---|---|---|---|
| Inrush current | Max. 2.1 $A_{peak}$ | Max. 2 $A_{peak}$ | Temperature independent |
| | Typ. 1.9 $A_{peak}$ | Typ. 1.8 $A_{peak}$ | |
| The charging current in the EMI suppression capacitors is neglected in the first microseconds after switch-on. | | | |

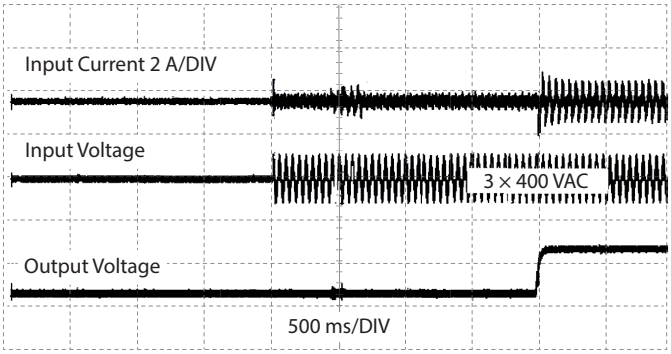



Fig. 3: Typical switch-on behavior at nominal load and 25 °C ambient temperature

#### Input protection

The unit is designed, tested and approved for branch circuits up to 32 A (IEC) and 20 A (UL) without additional protective device.

If an external fuse is used, type B or C circuit breakers of at least 6 A have to be used to prevent unwanted tripping of the circuit breaker.

## Phase failure protection (2-phase operation)

No external protective devices are required for protection against phase failure. Continuous 2-phase operation is not recommended for this power class since the supplying 3-phase network could become unbalanced.

However, if one phase fails, the unit may continue to operate if the load is below the power limit (s. fig.: Performance in 2-phase operation). Exceeding of these limits for an extended period may result in a thermal shut-down of the unit.

During power-on, some start-up attempts can occur until a permanent output power is available. EMC performance, hold-up time, losses, and output ripple differ from a three 3-phase operation. Such use is not included in the approval according to UL 61010 and IEC 62368.

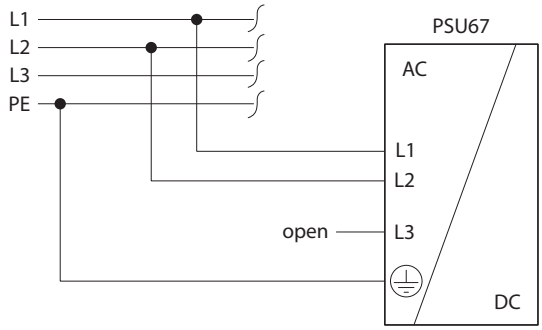



Fig. 4: 2-phase operation

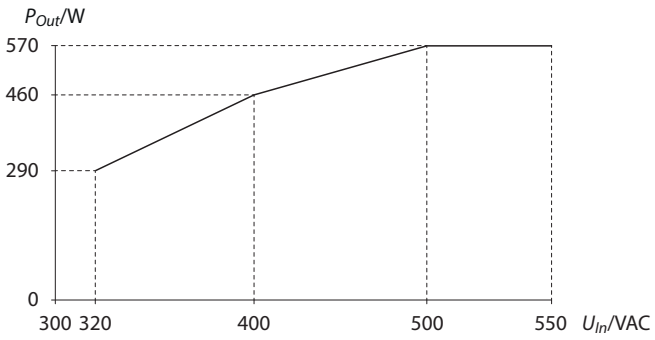



Fig. 5: Performance in 2-phase operation

### 4.4.3 DC voltage output

The device provides a stabilized and galvanically isolated 24 VDC output voltage (PELV/ES1) at the output. The negative potential of the outputs is permanently connected to PE in the device. The outputs are electronically protected against open-circuit, overload and short-circuit and can supply any type of loads, including unlimited inductive and capacitive loads.

Connecting capacitors with a capacitance >100 mF to an output may cause the device to switch to hiccup mode after switching on the device or connecting the load.

#### Hold-up time

The hold-up time is the time during which a power supply's output voltage remains within specification following the loss of input power. The hold-up time is output load dependent. At no load, the hold-up time can be up to several seconds. The status LED is on during this time.

| | 3 AC, 400 V/480 V | Output load |
|---|---|---|
| Hold-up time | Typ. 56 ms<br>Min. 47 ms | 250 W |
| | Typ. 24 ms<br>Min. 20 ms | 500 W |

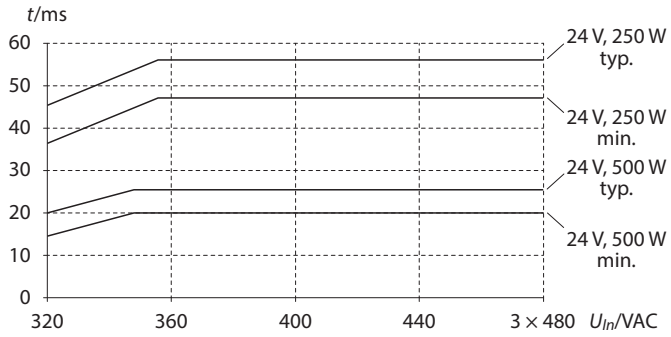



Fig. 6: Hold-up time vs. input voltage

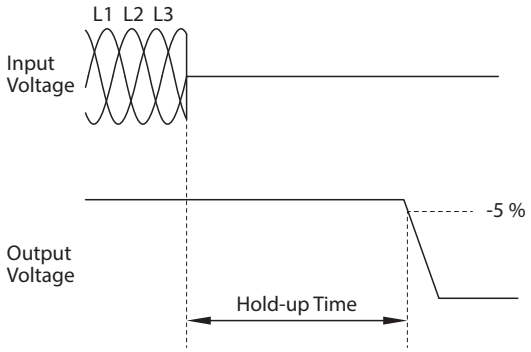



Fig. 7: Shutdown behavior

### 4.4.4 IO-Link interface

The devices (PSU67-…-IOL) have an IO-Link interface V1.1 for connection to IO-Link masters. The device can be parameterized via IO-Link using the associated IODD. In addition, device-internal measurement data and diagnostics are made available via IO-Link. The IODDs are available for download free of charge at **www.turck.com**.

The devices can also be operated without active IO-Link communication. Settings made via IO-Link during commissioning for example, are stored in the EEPROM of the device and are available even if the IO-Link communication fails.

# 5 Installing

The housing of the device ensure IP65 and IP67 protection when all mating connectors are firmly connected.

**CAUTION**
Sharp edges on the back of the device
**Risk of injury**

- ▶ Mount the devices on a sufficiently large, even surface so that all sharp edges are covered.

- ▶ Mount the device vertically with the connection level facing downwards on a flat surface using two M4 screws each at the upper and lower mounting holes.
- ▶ Other mounting orientations: Reduce the output current ( [▷ 32]).
- ▶ Do not obstruct airflow. Do not cover ventilation fins.
- ▶ Observe the minimum installation clearances: 50 mm on top and bottom, 10 mm on the front and 10 mm left and right side.

### Device cooling

The device uses convection cooling. An external fan is not necessary.

## 5.1 Special installation instructions – mounting altitude

The device is generally designed for altitudes up to 5000 m (16400 ft). The devices may only be used as described in these instructions. Above 2000 m (6560 ft), the output current and overvoltage category must be reduced.

When using the device in TN, TT and IT networks the following applies:

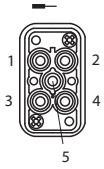
- TN, TT mains systems with earthed neutral and IT star mains systems with insulation monitoring: Use in zones of overvoltage category III up to an altitude of 2000 m (6560 ft), use in zones of overvoltage category II up to an altitude of 5000 m (16400 ft)
- TN, TT, IT delta mains systems or IT star mains systems without insulation monitoring: Use in zones of overvoltage category II up to 2000 m (6560 ft)

# 6 Connecting

## 6.1 Connecting the AC input voltage

The device has a 5-pin Han Q4/2 male connector to connect the AC input voltage.

- Connect the AC input voltage to the device according to the pin assignment below.



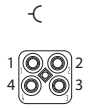

1 = L1
2 = L2
3 = L3
4 = n.c.
5 = PE

Fig. 8: Pin assignment — Han Q4/2 male connector, AC input voltage (XD1)

## 6.2 Connecting the DC output voltage side

To connect the DC output voltage side, the device has a 4-pin Han Q4/0 female connector.

- Connect the output voltage side according to the pin assignment shown below.




1 = n.c.
2 = GND
3 = 24 VDC
4 = n.c.

Fig. 9: Pin assignment — Han Q4/0 female connector, DC output voltage side (XD2)

### Notes on connecting loads

- Only connect return voltages < 35 V from a load to the outputs.
- Do not connect outputs or devices in parallel.

## 6.3 Connecting the device to IO-Link

For the connection to IO-Link, the device has a 5-pin, A-coded M12 connector. The maximum tightening torque is 0.6 Nm.


1 = 24 VDC
2 = n.c.
3 = GND
4 = C/Q (IO-Link)
5 = n.c.

Fig. 10: Pin assignment - IO-Link interface (X0)

# 7 Commissioning

After connecting the wires and by switching on the AC input voltage, the device automatically goes into operation.

# 8 Setting

## 8.1 Setting the device via LED bar and pushbuttons

The device has an LED bar and three buttons for monitoring output power and channel output current (monitoring mode [▶ 21]) as well as for configuring the output voltage. In configuration mode, the output voltage can be set.

### 8.1.1 Configuration mode

#### Output voltage setting

The output voltage is set for both outputs.

- ▶ Press [Voltage Set] for 3 s.
- ⇨ The device changes to the start mode "Set output voltage", all LEDs flash briefly. The actual setting is indicated by a green LED on the LED bar.
- ▶ Press [↑] and [↓] buttons to set the value for the output voltage.
- ⇨ The set value is displayed via the LED bar. All orange LEDs are off. The setting becomes effective immediately.

Without further pressing the buttons, the LED bar will return from any other mode to normal mode after 15 s.

### 8.1.2 Activating and deactivating the button lock

#### Activate button lock

- ▶ Hold [↑] and [↓] buttons simultaneously for 3 s.
- ⇨ All LEDs flash for 5 s to indicate that the key lock status has changed. The display returns to normal operation.

#### Check button lock

- ▶ Press and hold the [Voltage Set] key for 3 s.
- ⇨ If the button lock is activated, all LEDs flicker for 5 s.

#### Remove button lock

- ▶ Hold [↑] and [↓] buttons simultaneously for 3 s.
- ⇨ All LEDs flash for 5 s to indicate that the key lock status has changed. The display returns to normal operation.

## 8.2 Setting the device via IO-Link

### 8.2.1 Direct Parameter Page 1

| ISDU Index Hex. (dec.) | Sub index | Object name | Access Read (R) Write (W) | Length in byte | Meaning |
|---|---|---|---|---|---|
| 0x00 (0) | Direct Parameter Page 1 | | R | 16 | |
| | 0x02 | Master cycle time | R | 1 | |
| | 0x03 | Min. cycle time | R | 1 | |
| | 0x04 | M sequence capability | R | 1 | |
| | 0x05 | IO-Link version ID | R | 1 | 17 |
| | 0x06 | Process data input length | R | 1 | |
| | 0x07 | Process data output length | R | 1 | |
| | 0x08 | Vendor ID | R | 2 | ID for Turck: 0x013D |
| | 0x09 | | | | |
| | 0x0A | Device ID | R | 3 | E. g.: PSU67-3P-1S-2L-24250-IOL-F: 2228224 (0x220000) |
| | 0x0B | | | | |
| | 0x0C | | | | |
| | 0x10 | Standard command | R/W | 1 | 129: application reset<br>130: restore factory settings |

### 8.2.2 Identification

| ISDU Index Hex. (dec.) | Object name | Access Read (R) Write (W) | Length in byte | Meaning |
|---|---|---|---|---|
| 0x10 (16) | Vendor name | R | 16 | Turck |
| 0x11 (17) | Vendor text | R | 32 | www.turck.com |
| 0x12 (18) | Product name | R | 32 | PSU67-… |
| 0x13 (19) | Product ID | R | 16 | ID of the device |
| 0x14 (20) | Product text | R | 32 | IP67 Power Supply |
| 0x15 (21) | Serial number | R | 16 | Sequential serial number |
| 0x16 (22) | Hardware revision | R | 8 | Hardware revision of the device, e. g. V1.0 |
| 0x17 (23) | Firmware revision | R/W | 16 | Firmware revision of the device, e. g. V1.0.7.0 |
| 0x18 (24) | Application Specific Tag | R/W | 32 | Default "***"<br>Field for customer or application specific data |

| ISDU Index Hex. (dec.) | Object name | Access Read (R) Write (W) | Length in byte | Meaning |
|---|---|---|---|---|
| 0x19 (36) | Function Tag | R/W | 32 | Default "***"<br>Field for the application specific device function |
| 0x1A (26) | Location Tag | R/W | 32 | Default "***"<br>Field for the application-specific installation location of the device |

### 8.2.3 Index 0x02: System commands (according to IO-Link specification)

| Command | |
|---|---|
| 129 | Application reset |
| 130 | Restore factory settings |

### 8.2.4 Index 0x0C: Device Access Locks

Default values are shown in **bold**.

| Sub index Hex. (dec.) | Object name | Bit offset | Data type | Meaning |
|---|---|---|---|---|
| 1 | Parameter (write) access lock | 0 | BOOL | Not implemented |
| 2 | Data storage lock | 1 | | **0: not activated (default)** |
| | | | | 1: activated |
| 3 | Local parameterization lock | 2 | | Not implemented |
| 4 | Local user interface lock | 3 | | Not implemented |

### 8.2.5 Parameters

#### Parameter overview

| Index Hex. (dec.) | Sub index | Parameter name | Data type | Length in bit | Unit | Access Read (R) Write (W) |
|---|---|---|---|---|---|---|
| 0x65 (101) | 0 | Standby | BOOL | 8 | | RW |
| 0x67 (103) | 0 | Configuration setting | UINT8 | 8 | | RW |
| 0x68 (104) | 0 | PSU total output current Pre-alarm level | UINT16 | 16 | $2^{-8}$ A/bit | RW |
| 0x69 (105) | 0 | Output Voltage Setpoint | UINT16 | 16 | $2^{-8}$ V/Bit | RW |

### Standby — index 0x65 (101)

This parameter can be used to actively set the device to the "standby" state.

| Format | Length |
|---|---|
| BOOL | 1 bit |

Default values are shown in **bold**.

| Value | Meaning | |
|---|---|---|
| **0** | **False** | PSU normal operation |
| 1 | True | PSU standby<br>Power supply in standby mode, all outputs are switched off |

### Configuration setting — index 0x67 (103)

This parameter defines the interface via which the device can be configured. In addition, the device can also be locked against configuration.

| Format | Length |
|---|---|
| UINT8 | 8 bit |

Default values are shown in **bold**.

| Value | Meaning | |
|---|---|---|
| 0 | Human-machine interface only | Configuration of the device only possible directly on the device via the user interface |
| 1 | IO-Link only | Configuration of the device only possible via IO-Link (IODD) |
| **2** | **Both** | Configuration of the device possible both directly on the device and via IO-Link (IODD) |
| 3 | None (button lock) | Configuration locked |

### Total converter current pre-alarm level — index 0x68 (104)

This parameter defines pre-alarm level for the total current.

| Format | Length |
|---|---|
| UINT16 | 16 bit |

Default values are shown in **bold**.

| | |
|---|---|
| Unit: | $2^{-8}$ A/bit |
| Value range: | 256…25600 = 1…100 A |
| Default value: | **5120 = 20 A** |

### Output voltage setpoint — index 0x69 (105)

This parameter defines the setpoint for the output voltage.

| Format | Length |
|---|---|
| UINT16 | 16 bit |

Default values are shown in **bold**.

| | |
|---|---|
| Unit: | $2^{-8}$ V/bit |
| Value range: | 6144…7168 = 24…28 V |
| Default value: | **6272 = 24.5 V** |

# 9 Operating

## 9.1 Monitoring mode

### Mode: Monitoring output power (normal operation)

In the “Monitoring output power" mode, the LEDs display the current output power as a percentage of 500 W (50 % = 250 W, 100 % = 500 W). For values above 100 %, the orange 125 % LED flashes. Immediately after switching on, the LEDs display the total output power.

## 9.2 LED displays

The unit has the following LED indicators:

- Operating status (Status)
- Output power in % (%-LEDs)

| LED % | Meaning |
|---|---|
| 0…100 % | |
| Green | The DC output power is 20…100 % of the max. output power. |
| > 100 % | |
| Orange | The DC output power above 100 % of the max. output power. |

| STATUS LED | Meaning |
|---|---|
| Green | The DC output voltage is above 90 % of the setpoint voltage. All outputs operate according to their settings. |
| Off | Possible causes:<br>■ The DC output voltage is below 90 % of the setpoint voltage:<br>■ An output channel has tripped:<br>■ The power supply is not switched on: |
| Red | AC input voltage too low |
| Orange flashing | Output switched off and in Hiccup Plus mode (18 s) |
| Red flashing | The device has switched off due to overtemperature. As soon as the temperature reaches the normal operating range, the output switches on again and the STATUS LED lights up permanently green. |

## 9.3 Process data (cyclic IO-Link data)

The process data is sent cyclically to the IO-Link master. The device sends 2 bytes of process data.

| Data | Resolution | Sub index | Data type | Length in bit | Bit offset | Description |
|---|---|---|---|---|---|---|
| Actual output total current | $2^{-8}$ A/bit | 1 | UINT16 | 16 | 104 | Total output current (actual value) |
| Actual output voltage 1 | $2^{-8}$ V/bit | 2 | UINT16 | 16 | 88 | Actual Output Voltage |

## 9.4 Diagnostic and status messages (acyclic IO-Link data)

| | Index<br>Hex.<br>(dec.) | Sub index | Data type | Bit offset | Resolution/ unit | Description/comment |
|---|---|---|---|---|---|---|
| EEPROM Status | 0x40<br>(64) | 0 | UINT8 | 7…0 | | 0: Ok<br>1: recoverable error detected<br>2: unrecoverable error |
| PSU events | 0x41<br>(65) | 0 | UINT16 | | | Parameter access via sub index 0 only |
| | | 1 | BOOL | 0 | | Bit 0: Output ok<br>Output voltage > 90 % of the set output voltage, no output triggered |
| | | 2 | | 1 | | Bit 1: DC-Warning:<br>Output voltage dropped by more than 10 % below set output voltage |
| | | 3 | | 2 | | Bit 2: additional power:<br>PSU delivers additional power for more than 1 s |
| | | 4 | | 3 | | Bit 3: Overtemperature CAP |
| | | 5 | | 4 | | Bit 4: Overtemperature PSU:<br>The temperature of the internal unit is too high |
| | | 6 | | 5 | | Bit 5: Overload:<br>Total output load higher than permitted |
| | | 7 | | 6 | | Bit 6: High voltage input:<br>AC input voltage exceeds operating range |
| | | 8 | | 7 | | Bit 7: Low voltage input:<br>AC input voltage falls below operating range |
| | | 9 | | 8 | | Bit 8: Power supply failed:<br>no internal connection from IO-Link transceiver to power supply |
| | | 10 | | 9 | | Bit 9: Predictive maintenance power supply:<br>Estimated remaining lifetime 10 %, power supply performance possibly limited due to component aging effects. |
| | | 11 | | 10 | | Bit 10: 2-phase operation:<br>One line of the 3-phase system is missing |
| | | 14 | | 13 | | Bit 13: PSU hardware failure:<br>Internal hardware error in PSU |
| Stress level | 0x42<br>(66) | 0 | UINT8 | 0…7 | | Current load:<br>0: < 5 %<br>1: > 5 %<br>2: > 25 %<br>3: > 50 %<br>4: > 75 % |

| | Index Hex. (dec.) | Sub index | Data type | Bit offset | Resolution/ unit | Description/comment |
|---|---|---|---|---|---|---|
| Remaining endurance LED coded | 0x43 (67) | 0 | UINT8 | 0…7 | | Endurance:<br>0: <10 %<br>1: > 10 %<br>2: > 25 %<br>3: > 50 %<br>4: > 75 % |
| Remaining Endurance | 0x44 (68) | 0 | UINT8 | 0…7 | % | Value range 10… **99** % |
| Temperature secondary inside | 0x45 (69) | 0 | INT16 | 15…0 | $2^{-7}$ °C/bit | Value range: -5120…32640 |
| Max. temperature secondary inside | 0x46 (70) | 0 | INT16 | 15…0 | $2^{-7}$ °C/bit | Value range: -5120…32640 |
| Temperature primary inside | 0x47 (71) | 0 | INT16 | 15…0 | $2^{-7}$ °C/bit | Value range: -5120…32640 |
| Max. temperature primary inside | 0x48 (72) | 0 | INT16 | 15…0 | $2^{-7}$ °C/bit | Value range: -5120…32640 |
| AC input voltage RMS | 0x4E (78) | 0 | UINT16 | 15…0 | $2^{-4}$ V/bit | Actual input voltage RMS (phase-phase)<br>Value range: 0…24000 (0…1500 V) |
| Actual output voltage | 0x4F (79) | 0 | UINT16 | 15…0 | $2^{-8}$ V/bit | Value range: 0…12544 (0…49 V) |
| Converter average current | 0x51 (81) | 0 | UINT16 | 15…0 | $2^{-8}$ A/bit | Value range: 0…12800 (0…50 V) |

## Counter

| | Index Hex. (dec.) | Sub index | Data type | Bit offset | Resolution/ unit | Description/comment |
|---|---|---|---|---|---|---|
| Operating hours (total) | 0x49 (73) | 0 | | | | Parameter access via sub index 0 only |
| ■ Hours | | 1 | UINT32 | 39…8 | h | |
| ■ Minutes | | 2 | UINT8 | 7…0 | min | Value range: 0…59 |
| Transient VDE-0160 Counter overall | 0x4A (74) | 0 | UINT32 | 31…0 | | Value range: 0…59 |
| Transient VDE-0160 counter overall last 2 minutes | 0x4B (75) | 0 | UINT32 | 31…0 | | Value range: **0**…150000 |
| Turn-on Counter | 0x52 (82) | 0 | UINT32 | 31…0 | | Value range: **0**…150000 |
| Uptime since last turn-on | 0x53 (83) | 0 | | | | Parameter access via sub index 0 only |
| ■ Hours | | 1 | UINT32 | 39…8 | h | |
| ■ Hours | | 2 | UINT8 | 7…0 | min | Value range: 0…59 |

Device status

| | Index<br>Hex.<br>(dec.) | Sub index | Data type | Bit offset | Description/comment |
|---|---|---|---|---|---|
| Device status | 0x24 (36) | 0 | UINT8 | 7…0 | 0: Device is operating properly<br>1: Maintenance-Required<br>2: Out-of-Specification<br>3: Functional-Check<br>4: Failure |
| Detailed Device Status | 0x25 (37) | 0 | 3-Byte string (array [5]) | 120 | Shows up to 5 present events, access only via sub index 0<br>3 bytes per sub index :<br>Byte 1: Event Qualifier<br>Byte 2, 3: Event code |
| Item [1] | | 1 | 3-Byte string | 119…96 | |
| Item [2] | | 2 | | 95…72 | |
| Item [3] | | 3 | | 71…48 | |
| Item [4] | | 4 | | 27…24 | |
| Item [5] | | 5 | | 23…0 | |

## 9.5 IO-Link Events

The device sends the IO-Link events below to the IO-Link master.

| Event code | Event | Event-type | Description |
|---|---|---|---|
| 0x1800 | DC warning | Warning | The output voltage has dropped more than 10 % below the value for the set output voltage. |
| 0x1801 | Bonus Power | Notification | The output current is 5 % higher than the maximum value for longer than 3 s. |
| 0x1802 | Overload | Warning | The total output load is higher than permitted. |
| 0x1803 | High voltage input | Warning | The AC input voltage exceeds the operating range. |
| 0x1804 | Low voltage input | Warning | The AC input voltage is below the operating range. |
| 0x1805 | Power supply down | Warning | No internal connection from IO-Link transceiver to power supply |
| 0x1806 | Predictive maintenance — power supply | Warning | The estimated remaining lifetime has reached 10 %. Performance of PSU might be limited due to aging effects of components. |
| 0x1807 | 2-phase operation | Warning | One leg of the 3-phase system is missing |
| 0x1809 | PSU setting changed via HMI | Notification | Settings were changed via the man-machine interface of the PSU. |
| 0x1825 | PSU hardware failure | Warning | Critical PSU hardware failure detected. PSU shut down. |
| 0x1830 | Converter 1 — pre-alarm output current | Warning | The total output current of the converter has exceeded the pre-alarm level for more. |
| 0x4210 | Permissible device temperature exceeded | Warning | The temperature in the device is too high. |
| 0x6320 | Parameter error | Error | The parameter settings of the device are invalid. |

## 9.6 IO-Link error codes

| Error code | Description | |
|---|---|---|
| 0x8000 | No details | Application error in device<br>Service was denied by device, no detailed information available |
| 0x8011 | Index not available | |
| 0x8012 | Sub index not available | |
| 0x8020 | Service temporarily not available | No access to parameters possible, device does not allow access in current state |
| 0x8021 | Service temporarily not available, local control | No access to parameters possible, device in local operating mode, operation only via operator interface on device |
| 0x2022 | Service temporarily not available, device control | No access to parameters possible, device in remote operating mode, operation only via IO-Link |
| 0x8023 | Access denied | Access denied, index not writable |
| 0x8030 | Parameter value out of range | |
| 0x8031 | Parameter value above limit | |
| 0x8032 | Parameter value below limit | |
| 0x8033 | Parameter length overrun | Length of data to be written does not match the length defined for this parameter. |
| 0x8034 | Parameter length underrun | |
| 0x8035 | Function not available | Command not supported by the device |
| 0x8036 | Function temporarily unavailable | Command not supported by the device |
| 0x8040 | Interfering parameter | Invalid parameter set, a written single parameter value does not fit to other parameter settings |
| 0x8041 | Inconsistent parameter set | Parameters inconsistent, device plausibility check failed |
| 0x8082 | Application not ready | Device not ready, access denied |

# 10 Maintenance

- Clean the devices at regular intervals with a damp cloth.

# 11 Repair

The device must not be repaired by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

## 11.1 Returning devices

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from
**https://www.turck.de/en/retoure-service-6079.php**
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

# 12 Disposal

The devices must be disposed of correctly and must not be included in general household garbage.

# 13 Technical data

## 13.1 AC input

| Technical data | | |
|---|---|---|
| Input voltage | | |
| ■ Nominal range | 3 AC, 380…480 VAC, ±15 % | |
| ■ Operating range AC input | 3 × 323…552 VAC | |
| External fuse | B-6A, C-6A | |
| Mains frequency | 50…60 Hz ±6 % | |
| Inrush current | Typ. 1.9$_{peak}$/1.8 A$_{peak}$ at 3 × 400/480 VAC | |
| Turn-on voltage | Typ. 3 × 320 VAC, steady-state end value,<br>s. fig.: Voltage range – input voltage AC | |
| Turn-off voltage | Typ. 3 × 300 VAC, steady-state end value,<br>s. fig.: Voltage range – input voltage AC | |
| Switch-on delay | Typ. 2 s, at 500 W, symmetrical phase voltages,<br>s. fig.: Switch-on behavior | |
| Rise time | Typ. 10 ms, at 500 W constant current load, 0 mF load,<br>s. fig.: Switch-on behavior | |
| | Typ. 12 ms, at 500 W constant current load, 12.5 mF load,<br>s. fig.: Switch-on behavior | |
| Input current | At 500 W, symmetrical phase voltages,<br>s. fig.: Input current vs. output power (at 24 VDC output voltage) | |
| | ■ 3 AC, 400 V | Typ. 0.8 A |
| | ■ 3 AC, 480 V | Typ. 0.66 A |
| Power factor | S. fig.: Power factor vs. output power (at 24 VDC output voltage) | |
| | ■ 3 AC, 400 V | typ. 0.94, at 500 W |
| | ■ 3 AC, 480 V | typ. 0.95, at 500 W |

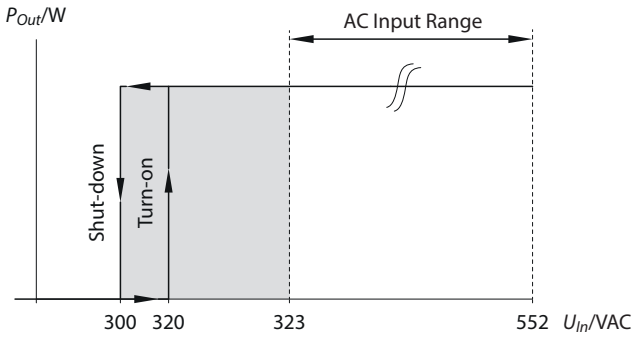



Fig. 11: Voltage range – input voltage AC

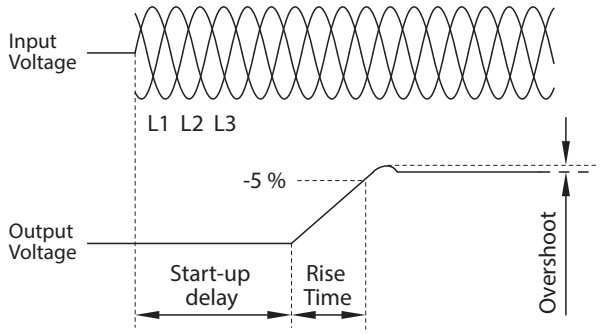



Fig. 12: Switch-on behavior

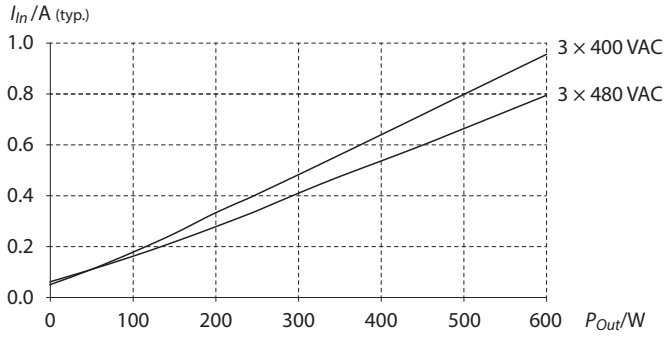



Fig. 13: Input current vs. output power (at 24 VDC output voltage)

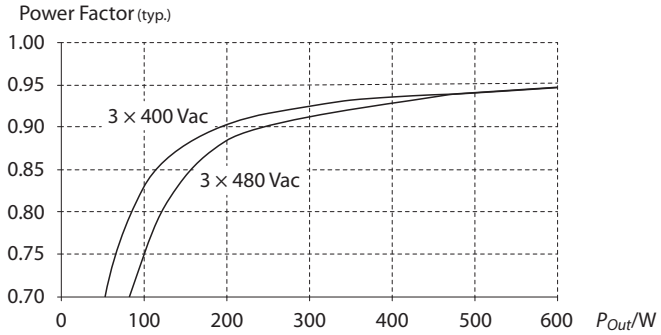



Fig. 14: Power factor vs. output power (at 24 VDC output voltage)

## 13.2 DC output

| Technical data | | |
|---|---|---|
| Number of outputs | 1 | |
| Output voltage | | |
| ■ Nominal | 24 VDC | Default-setting: 24.5 V |
| ■ Adjustment range | 24… 28 V | Settable in steps: 24 V, 24,5 V, 25 V, 25.5 V, 26 V, 26.5 V, 27 V and 28 V |
| Factory setting | Typ. 24.5 V, ± 0,2 %, at nominal load | |
| Line regulation | Max. 10 mV | Linear voltage regulation |
| Load regulation | Typ. 100 mV | 0…600 W output load, static value |
| Ripple and noise voltage | Max. 100 $mV_{pp}$ | Bandwidth 20 Hz…20 Mhz, 50 Ω |
| Output power 24 V…28 V, continuous at ambient temperature: | ■ At 45 °C<br>■ At 55 °C<br>■ At 70 °C | 600 W<br>500 W<br>350 W |
| Linear derating between +45 °C and +70 °C, s. fig.: Derating output power vs. ambient temperature | | |
| Total output power, short-term, up to 5 s, at ambient temperature: | ■ Up to 55 °C<br>■ Up to 70 °C | 1000 W<br>700 W |
| Overload and short-circuit behavior | Typ. 42 A/0 A<br>In the event of a severe overload (output voltage falls below 13 V), the device supplies a continuous output current for 2 s. The output is then switched off for approx. 18 s before the device automatically attempts to restart. This process is repeated until the overload has been eliminated. When the overload is removed, the device continues to operate in normal mode [▶ 30]. | |

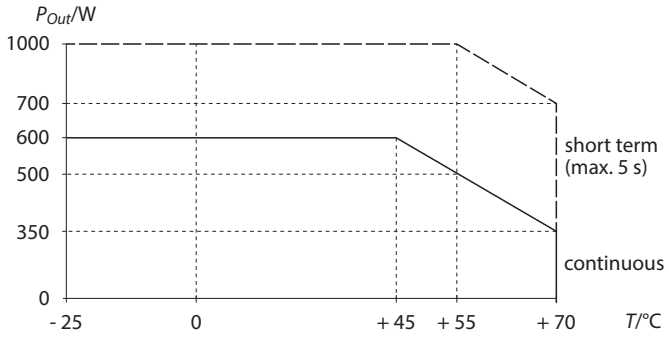



Fig. 15: Derating – output power vs. ambient temperature

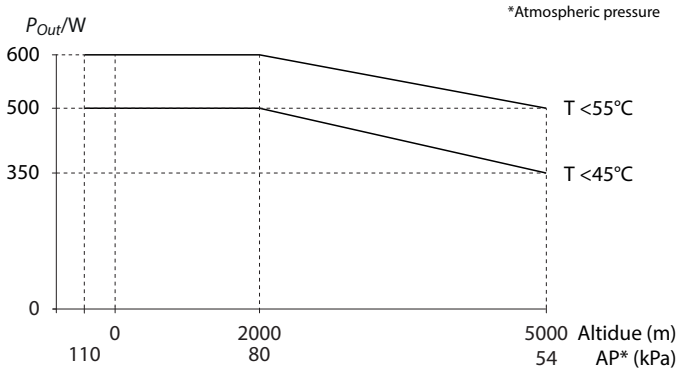



Fig. 16: Derating – output power vs. altitude

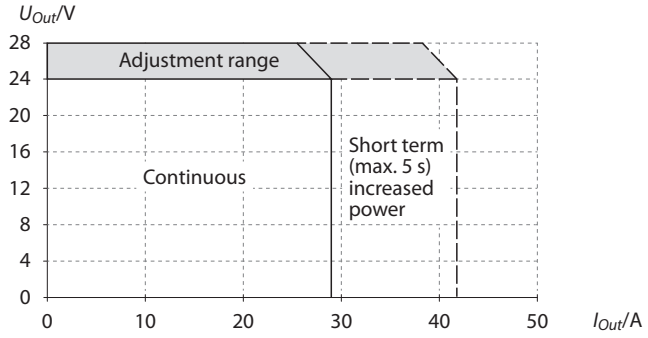



Fig. 17: Output voltage vs. output current, at continuous load, typ.

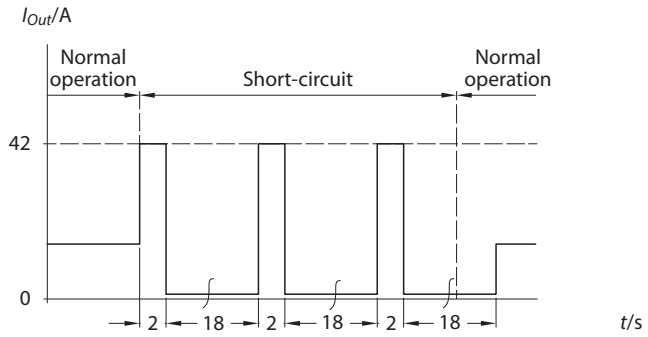



Fig. 18: Short-circuit at output, Hiccup mode, typ.

## 13.3 Efficiency and power losses

| | 3 AC, 400 V | 3 AC, 480 V | |
|---|---|---|---|
| Efficiency | Typ. 95.8 % | Typ. 95.6 % | At 24 VDC, 500 W |
| Power losses | Typ. 2.5 W | Typ. 2.5 W | At 24 VDC, 0 W (no load) |
| | Typ. 12 W | Typ. 13 W | At 24 VDC, 250 W (half load) |
| | Typ. 22 W | Typ. 23 W | At 24 VDC, 500 W (full load) |

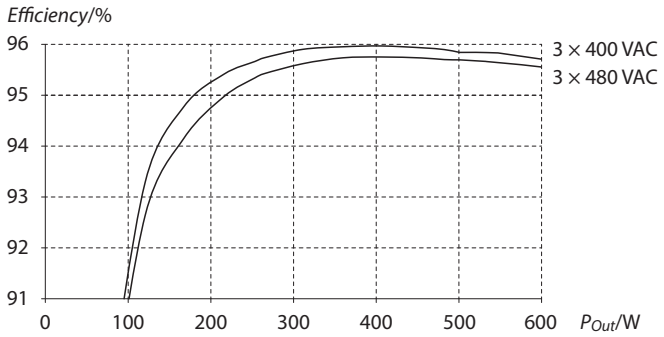



Fig. 19: Power factor vs. output power at 24 VDC (typ.)

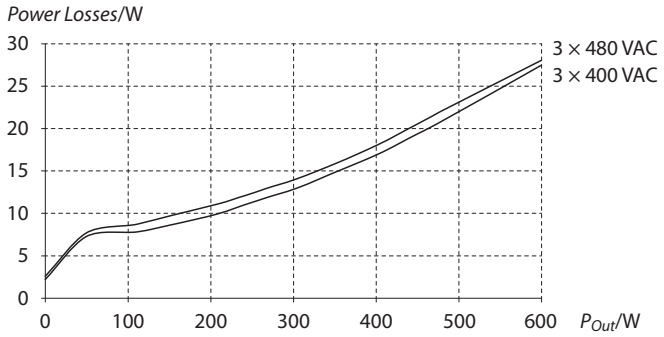



Fig. 20: Power losses vs. output power at 24 VDC (typ.)

## 13.4 IO-Link interface

| Technical data | |
|---|---|
| Connector | M12 male connector, 5-pole, A-coded |
| IO-Link version | V1.1 |
| Baud rate | COM3 (230.4 kBaud) |
| Cycle Time | 2 ms |
| SIO Mode | Supported |
| Process data length | 23 byte |

## 13.5 General technical data

| Technical data | | |
|---|---|---|
| **Calculated lifetime expectancy** | | |
| | 3 AC, 400 V | 3 AC, 480 V |
| ■ At 24 V, 500 W, 40 °C | 78000 h | 74000 h |
| ■ At 24 V, 250 W, 40 °C | 218000 h | 185000 h |
| ■ At 24 V, 500 W, 25 °C | 139000 h | 525000 h |
| ■ At 24 V, 250 W, 25 °C | 615000 h | 133000 h |
| **MTBF** | | |
| MTBF SN 29500, IEC 61709 | 3 AC, 400 V | 3 AC, 480 V |
| ■ At 24 V, 500 W, 40 °C | 315000 h | 290000 h |
| ■ At 24 V, 500 W, 25 °C | 580000 h | 537000 h |
| MTBF MIL HDBK 217F | | |
| ■ At 24 V, 500 W and 40 °C, Ground Benign GB40 | 120000 h | 127000 h |
| ■ At 24 V, 500 W and 25 °C, Ground Benign GB25 | 193000 h | 184000 h |
| ■ At 24V, 500W and 40°C, Ground Fixed GF40 | 33000 h | 35000 h |
| ■ At 24V, 500W and 25 °C, Ground Fixed GF25 | 47000 h | 45000 h |
| **EMC** | According to EN 1000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-2 and EN 61000-3-3 | |
| **Ambient conditions** | | |
| Operating temperature | -25°C…+70 °C (-13°F…158 °F) | Operational temperature is the same as the ambient or surrounding temperature and is defined as the air temperature 2 cm below the unit. |
| Storage temperature | -40°C…+85 °C (-40°F…185 °F) | For storage and transportation |
| Output derating | 10 W/°C | Between +45 °C and +70 °C (113 °F and 140 °F) |
| 33 W/1000 m or 5 °C/1000 m | For altitudes >2000 m (6560 ft), s. fig.: Output power vs. ambient temperature [▷ 29] | |
| The derating is not hardware controlled. Observe reduced current limits to avoid overloading the device. | | |
| Humidity | 5…95 % r.h. | According to IEC 60068-2-30 |
| Atmospheric pressure | 54…110 kPa | S. fig.: Output power vs. ambient temperature [▷ 29] |
| Altitude | Max. 5000 m (16 400 ft) | S. fig.: Output power vs. altitude [▷ 29] |

| Technical data | | |
|---|---|---|
| Overvoltage category | | According to IEC 60664-1 |
| | III | For TN, TT mains systems with earthed neutral and IT star mains systems with insulation monitoring for altitudes up to 2000 m |
| | II | For TN, TT mains systems with earthed neutral and IT star mains systems with insulation monitoring for altitudes between 2000 m and 5000 m<br>For TN, TT, IT Delta mains systems or IT star mains systems without insulation monitoring for altitudes up to 2000 m |
| Degree of pollution | 3 | According to IEC 62477-1, not conductive |
| Vibration sinusoidal | 2-17.8 Hz: ±1.6 mm;<br>17.8-500 Hz: 2g<br>2 hours per axis | According to IEC 60068-2-6 |
| Shock | 30 g 6 ms, 20 g: 11 ms<br>3 bumps per direction,<br>18 bumps in total | According to IEC 60068-2-27 |
| Degree of pollution | 3 | According to IEC 62477-1, not conductive |
| Vibration sinusoidal | 2-17.8 Hz: ±1.6 mm;<br>17.8-500 Hz: 2g<br>2 hours per axis | According to IEC 60068-2-6 |
| Shock | 30 g 6 ms, 20 g: 11 ms<br>3 bumps per direction,<br>18 bumps in total | According to IEC 60068-2-27 |
| LABS compatibility | Yes | |
| Audible noise | Some audible noise may be emitted from the power supply during no load, overload or short circuit. | |
| **Safety and protection features** | | |
| Isolation resistance | | |
| ▪ Input to output<br>▪ Input to PE | Min. 500 MΩ | As delivered, measured with 500 VDC |
| PE resistance | Max. 0.1 Ω | Resistance between PE terminal and the housing |
| Input/Output separation | PELV | IEC/EN/UL 61010-2-201, IEC/EN 62368-1, IEC/EN 60950-1 |
| Output over-voltage protection | Typ. 31.8 VDC<br>Max. 32.5 VDC | In case of an internal defect, a redundant circuit limits the maximum output voltage. The output shuts down and automatically attempts to restart. |

| Technical data | | |
|---|---|---|
| Protection class | | According to IEC 61140, PE connection required |
| Degree of protection | IP65/IP67 | According to EN/IEC 60529 |
| Overtemperature protection | Yes, internal | Output shut down with automatic restart. |
| Input transient protection | MOV (Metal Oxide Varistor) | |
| Internal input fuse | | Not user replaceable, slow-blow high-breaking capacity fuse |
| Touch current (leakage current) | Max. 0.45/ 1.5 mA | At 3 × 480 AC, 60 Hz, TN-,TT-mains/IT-mains, lower currents at lower voltages and frequencies. |
| Installing | 4 × M4 screw | Standard orientation: vertical, connection level downwards with two screws each at the upper and lower mounting holes<br>Other mounting orientations: reduce the output current, derating:<br>max. output power ar max. ambient temperature (s. fig.: Derating – standard mounting orientation):<br>■ max. 500 W at max. 45 °C<br>■ max. 350 W at max. 60 °C |

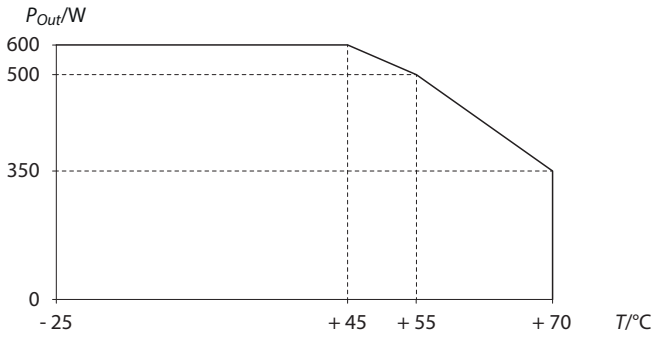



Fig. 21: Derating – standard mounting orientation

# 14 Turck subsidiaries — contact information

| | |
|---|---|
| **Germany** | Hans Turck GmbH & Co. KG<br>Witzlebenstraße 7, 45472 Mülheim an der Ruhr<br>**www.turck.de** |
| **Australia** | Turck Australia Pty Ltd<br>Building 4, 19-25 Duerdin Street, Notting Hill, 3168 Victoria<br>**www.turck.com.au** |
| **Austria** | Turck GmbH<br>Graumanngasse 7/A5-1, A-1150 Wien<br>**www.turck.at** |
| **Belgium** | TURCK MULTIPROX<br>Lion d'Orweg 12, B-9300 Aalst<br>**www.multiprox.be** |
| **Brazil** | Turck do Brasil Automação Ltda.<br>Rua Anjo Custódio Nr. 42, Jardim Anália Franco, CEP 03358-040 São Paulo<br>**www.turck.com.br** |
| **Canada** | Turck Canada Inc.<br>140 Duffield Drive, CDN-Markham, Ontario L6G 1B5<br>**www.turck.ca** |
| **China** | Turck (Tianjin) Sensor Co. Ltd.<br>18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381 Tianjin<br>**www.turck.com.cn** |
| **Czech Republic** | TURCK s.r.o.<br>Na Brne 2065, CZ-500 06 Hradec Králové<br>**www.turck.cz** |
| **France** | TURCK BANNER S.A.S.<br>11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE Cedex 4<br>**www.turckbanner.fr** |
| **Great Britain** | TURCK BANNER LIMITED<br>Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex<br>**www.turckbanner.co.uk** |
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| **India** | TURCK India Automation Pvt. Ltd.<br>401-403 Aurum Avenue, Survey. No 109 /4, Near Cummins Complex, Baner-Balewadi Link Rd., 411045 Pune - Maharashtra<br>**www.turck.co.in** |
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| | |
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| **Korea** | Turck Korea Co, Ltd.<br>B-509 Gwangmyeong Technopark, 60 Haan-ro, Gwangmyeong-si,<br>14322 Gyeonggi-Do<br>**www.turck.kr** |
| **Malaysia** | Turck Banner Malaysia Sdn Bhd<br>Unit A-23A-08, Tower A, Pinnacle Petaling Jaya, Jalan Utara C,<br>46200 Petaling Jaya Selangor<br>**www.turckbanner.my** |
| **Mexico** | Turck Comercial, S. de RL de CV<br>Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga,<br>Coahuila<br>**www.turck.com.mx** |
| **Netherlands** | Turck B. V.<br>Ruiterlaan 7, NL-8019 BN Zwolle<br>**www.turck.nl** |
| **Poland** | TURCK sp.z.o.o.<br>Wroclawska 115, PL-45-836 Opole<br>**www.turck.pl** |
| **Romania** | Turck Automation Romania SRL<br>Str. Siriului nr. 6-8, Sector 1, RO-014354 Bucuresti<br>**www.turck.ro** |
| **Russian Federation** | TURCK RUS OOO<br>2-nd Pryadilnaya Street, 1, 105037 Moscow<br>**www.turck.ru** |
| **Sweden** | Turck Sweden Office<br>Fabriksstråket 9, 433 76 Jonsered<br>**www.turck.se** |
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