TURCK

Your Global Automation Partner

PSU67-3P-1S-2L-24250-F Smart switching power supply in IP65/IP67

Instructions for Use

Table of Contents

1 About these instructions

These instructions describe the setup, functions and use of the product and help you to operate the product according to its intended purpose. Read these instructions carefully before using the product. This will prevent the risk of personal injury and damage to property. Keep these instructions safe 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

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.
	**WARNING** WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.
	**CAUTION** CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.
	**NOTICE** CAUTION indicates a situation which, if not avoided, may cause damage to property.
	**NOTE** NOTE indicates tips, recommendations and important information about special action steps and issues. The notes simplify your work and help you to avoid additional work.
▶	**MANDATORY ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULT OF ACTION** This symbol denotes the relevant results of an action.

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-1S-2L-24250-F (ID 100028238)

2.2 Scope of delivery

The delivery consists of the following:

- IP65/IP67 power supply
- Quick Start Guide

2.3 Turck service

Turck supports you in your projects — from the initial analysis right through to the commissioning of your application. The Turck product database at www.turck.com offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

For the contact details of our branches worldwide, please see page [▶ 33].

3 For your safety

The product is designed according to state of the art technology. Residual hazards, however, still exist. Observe the following safety instructions and warnings in order to prevent danger to persons and property. Turck accepts no liability for damage caused by failure to observe these safety instructions.

3.1 Intended use

The power supply unit PSU67-3P-1S-2L-24250-F is a stand-alone power supply for three-phase mains systems for indoor use with Relay-OK contact. 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 switching power supply converts an AC input voltage of 320…550 into a 24 VDC output voltage and makes it available at two current-limited outputs. The two unit's outputs are protected by internal electronic fuses (eFuse). The unit is suitable for use at altitudes up to 5000 m (16400 ft). Above 2000 m (6560 ft), the output current and overvoltage category must be reduced.

The device must 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

- Only operate the power supply unit with AC input voltage.

3.3 General safety notes

- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- Only mount, dismount, install and maintain the device when it is de-energized. Secure against reconnection of the voltage.
- Do not open, modify or repair the device.
- The device meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- The device is a "Class of Protection I" equipment according to IEC 61140.
- Only use the device with a proper PE (Protective Earth) connection.
- Do not connect the negative potential of any output externally to PE.
- 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.

4 Product description

The 3-phase switching power supply PSU67-3P-1S-2L-24250L-F is designed in IP65/IP67. An S-coded M12 connector (XD1) is available for connecting the input voltage. The output voltage side is connected via two L-coded M12 sockets (XD2 and XD3). The device has two internal eFuses to protect the output voltage.

The Relay-OK contact is designed as an A-coded M12 male connector (X0).

Mating connectors

- Input voltage (XD1): M12 female connector, S-coded, 4-pin
- Output voltage (XD2, XD3): M12 male connector, L-coded, 5-pin
- Relay-OK (X0): M12 female connector, A-coded, 5-pin

4.1 Device overview

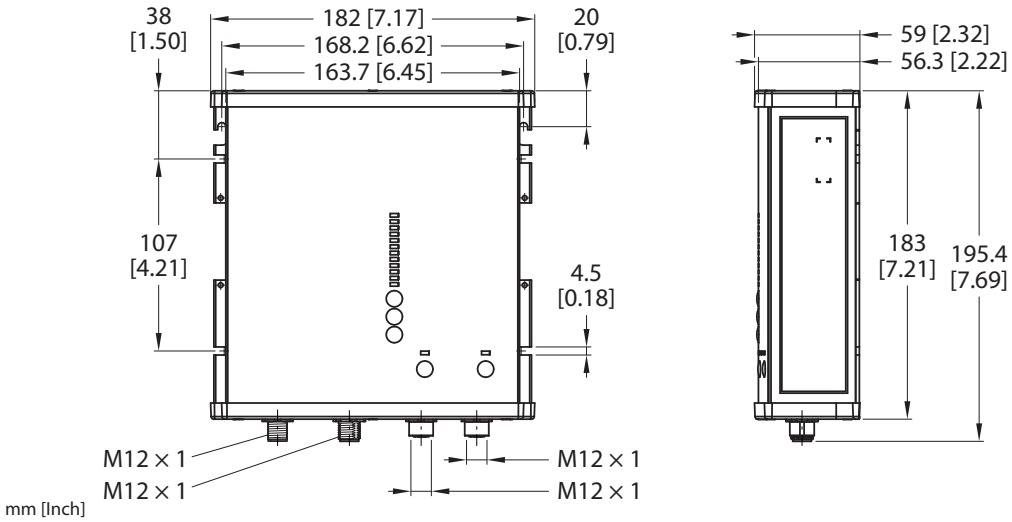


Fig. 1: Dimensions

4.1.1 Block diagram

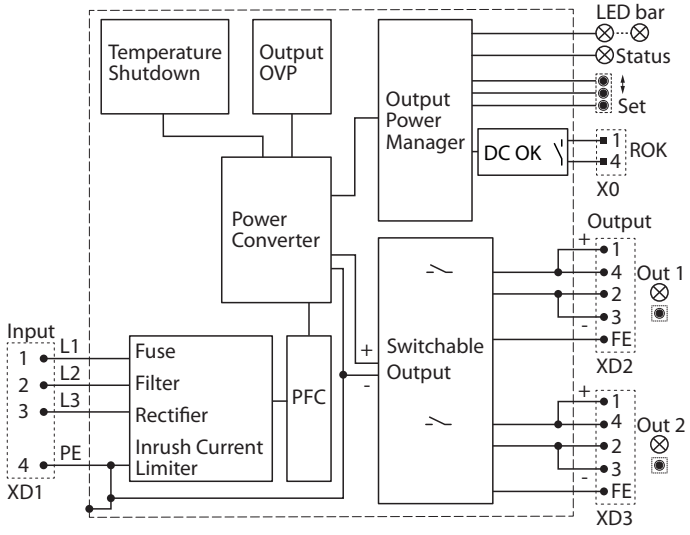


Fig. 2: Block diagram

4.1.2 Operating elements

The device has the following operating elements:

- Buttons for requesting the device settings and for configuring the device [Voltage Set] and [↑] [↓].
- Buttons for switching the outputs [OUT1 and OUT2] on and off.

4.1.3 Display elements

The device has an LED bar (monitoring mode [▷ 20]) to display:

- Total output power (in %)
- Channel output voltage (in V) and channel output current (in A)
- Channel LEDs (OUT1 and OUT2)
- Operating states (status LED)

4.2 Properties and features

- Degree of protection IP65/IP67
- 3-phase AC input, M12, S-coded
- 24 VDC output voltage, settable up to 28 VDC
- Output current 25 A
- two current limited outputs, 2 × M12, L-coded
- Fuse protection by four separate eFuses, adjustable up to 12 A
- 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 into a 24 VDC output voltage and makes it available at two current-limited outputs. The unit's outputs are protected by internal electronic fuses (eFuse).

4.4 Functions and operating modes

4.4.1 User interface

Output level control

The buttons [Voltage Set] and [↑] [↓] are used to configure output voltage and trip current in the configuration mode [▶ 18]. After commissioning the power supply, the device is in monitoring mode (normal operation) for monitoring the output power.

Output control

The output LEDs (OUT1 and OUT2) indicate the operating states of the corresponding outputs. The respective output is switched on and off via the associated button.

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.

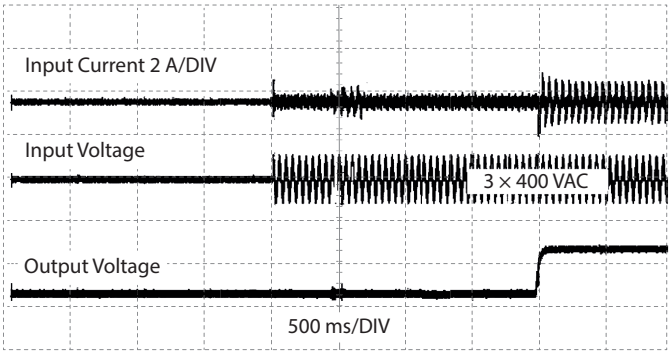


Fig. 3: Typical switch-on behavior at nominal load and 25 °C ambient temperature

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.

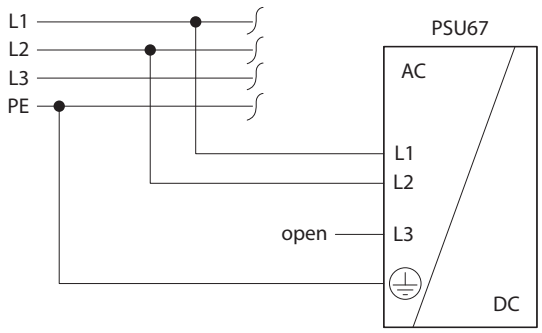


Fig. 4: 2-phase operation

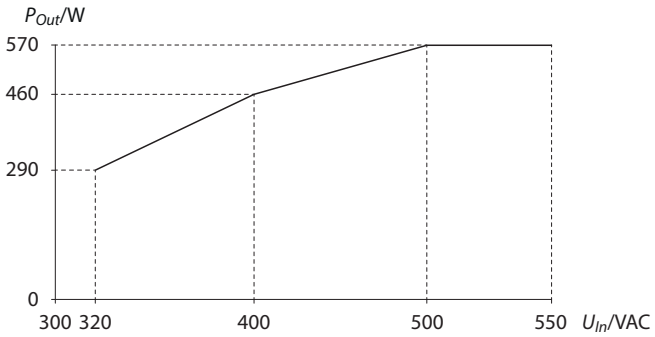


Fig. 5: Performance in 2-phase operation

4.4.3 DC voltage outputs

The DC voltage outputs OUT1 and OUT2 provide a stabilized and galvanically isolated 24 VDC output voltage (PELV/ES1). 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.

When connecting capacitors with capacitance >20 mF to an output, this output may be switched off after switching on the device or the output or connecting the load. All outputs are individually current limited. If an overload occurs, the individual output switches off and must be reset manually via the associated button or via IO-Link. The output can be reset at the earliest 5 s after it has been switched off.

The outputs of the device are switched on in the delivery state. The outputs are not switched off in a safety-related manner.

The sum of the configured output power of all outputs can exceed the total output power. In this case, the outputs switch off one after the other in reverse order (OUT2, …) until the total output power is within the permissible range again. The lower output in each case remains switched on to prevent voltage dips and to output current continuously.

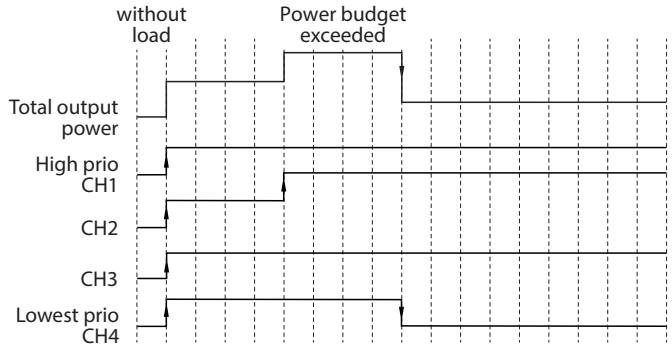


Fig. 6: Tripping of the channel with the lowest priority when the total output power is exceeded

After having been switched off, the outputs start automatically one after the other at intervals of 150 ms in the sequence OUT1 and OUT2.

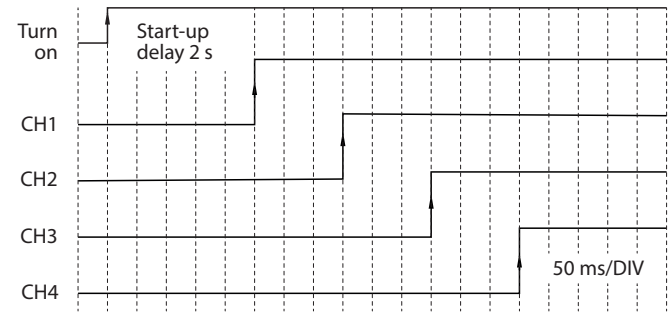


Fig. 7: Sequential start of outputs

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 Min. 47 ms	250 W
	Typ. 24 ms Min. 20 ms	500 W

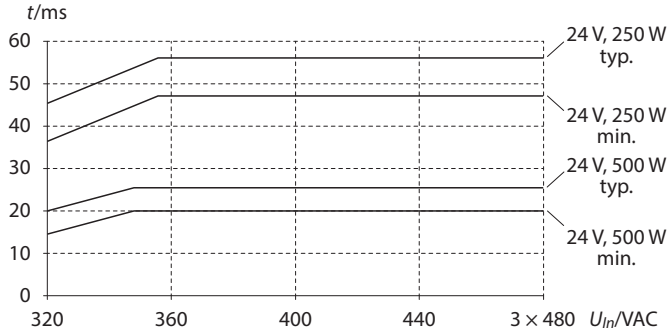


Fig. 8: Hold-up time vs. input voltage

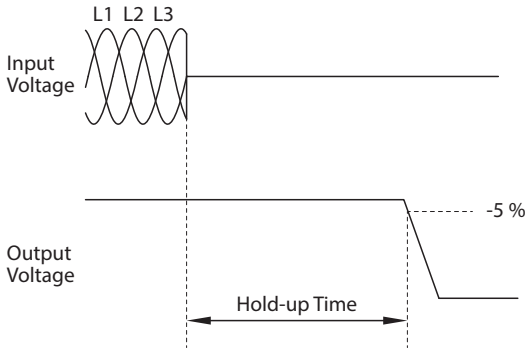


Fig. 9: Shutdown behavior

Support of short-term peak loads

The device designed to support loads with a higher short-term power demand (peak loads). Temporary peak loads cause an increased power demand for a short time, which is controlled internally in the device by an output power manager. If the average load exceeds the sum of all output powers, the output voltage collapses.

To avoid a collapse of the output voltage, observe the following rules:

- The power demand of the short-time load pulse must be below 200 % of the nominal output power.
- The duration of the load pulse must be shorter than the max. permissible duration for the additional power.
- The average power should be lower than the rated output power.
- The RMS output current must be lower than the specified continuous output current. Continuous increased RMS current may cause thermal shutdown of the device.

4.4.4 Relay-OK contact

The Relay-OK contact monitors the output voltage generated by the device itself The output voltage is independent of any external voltage present at the output of the power supply.

The contact closes when the output voltage reaches typ. 22 VDC and opens when the output voltage drops below 22 VDC. Short dips are extended to a signal length of 100 ms. Dips shorter than 1 ms are ignored.

The Relay-OK contact is synchronized with the status LED.

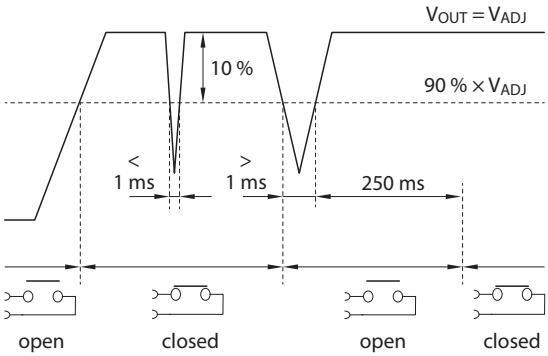


Fig. 10: Relay-OK contact - contact behavior

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, s. „General technical data".
- ▶ 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

DANGER
High voltage
Danger to life due to electric shock!
- ▶ Only connect the device when it is de-energized.
- ▶ Secure against reconnection of the voltage.

6.1 Connecting the AC input voltage

The device has a 4-pin, S-coded M12 connector for connecting the AC input voltage. The maximum tightening torque is 0.6 Nm.

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

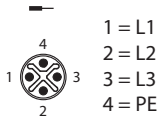


Fig. 11: Pin assignment, M12 connector AC or AC input voltage (XD1)

6.2 Connecting the DC output voltage side

The device has two 5-pin, L-coded M12 connectors to connect the DC output side. The maximum tightening torque is 0.6 Nm.

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

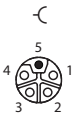


Fig. 12: Pin assignment, M12 connector, DC output voltage (XD2, XD3)

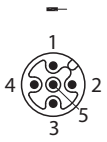
Notes on connecting loads

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

6.3 Connecting the relay-OK contact

The device has a 5-pin, A-coded M12 connector for connecting a potential-free digital input signal to the relay-OK contact. The maximum tightening torque is 0.6 Nm.

- ▶ Connect the input signal to the device according to the pin assignment below.



1 = RELAY +
2 = n.c.
3 = n.c.
4 = RELAY -
5 = n.c.

Fig. 13: Pin assignment, M12 connector, relay-OK contact

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 [▶ 20]) and for configuring output voltage and trip current. In configuration mode, the output voltage and trigger current can be set to monitor the current of the outputs OUT1 and OUT2.

In addition, a button lock can be set up and the outputs of the device can be switched on or off independently.

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.

Setting the tripping current

The tripping current is set separately for the outputs OUT1 and OUT2.

- ▶ Press and hold the [Voltage Set] button for 3 s to switch to configuration mode.
- ⇨ All LEDs flash briefly and the actual setting is indicated by a green LED on the LED bar
- ▶ Press the [Voltage Set] key 1 × to select the output for which the trigger current is to be set. The orange channel LED (OUT1 and OUT2) indicates for which output the trigger current is set.
- ▶ Press [↑] and [↓] buttons to set the setpoint (1…12 A) (Example: 20 %-LED = 3 A).
- ⇨ 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 Switching outputs on or off

The outputs can be switched on or off independently of each other. In the delivery state, all outputs of the device are switched off.

- ▶ Press and hold the button on the output channel (OUT1 and OUT2) for 1 s to switch a channel on or off manually.

8.1.3 Resetting outputs

In case of an error at the output:

- ▶ Press and hold the button on the output (OUT1 and OUT2) for longer than 1 s to reset the output.

8.1.4 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.

9 Operating

CAUTION
Hot surfaces
Risk of burns
- ▶ Do not touch the housing when switching on and immediately after switching off.

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 125-% LED flashes. Immediately after switching on, the LEDs display the total output power.

Mode: Monitoring channel output current

- ▶ In the "Monitoring output power" mode (normal operation), press [↑] [↓] buttons to switch to the " Monitoring channel output current " mode.
- ⇨ LED OUT1 lights up constantly orange. The current output current for output 1 is displayed via the LED bar (2…12 A).
- ▶ Press [↑] [↓] buttons to change the output channel.
- ▶ To change to normal operation: Press [↑] or [↓] buttons until OUT1 or OUT2 is skipped.
- ⇨ When all channel LEDs are off, the unit is back in normal mode for monitoring the total output power.

9.2 LED displays

The unit has the following LED indicators:

- Operating status (Status)
- Output power in % (%-LEDs)
- Channel LEDs (OUT1 and OUT2)

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: - The DC output voltage is below 90 % of the setpoint voltage: - An output channel has tripped: - 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.

LED OUT1 and OUT2	Meaning
Green	Output switched-on
Off	No input voltage connected or output active switched off via pushbutton
Green flashing (2 Hz)	Current/power budget exceeded The sum of the output currents exceeded the permissible total output current of the power supply. Outputs with low priority are switched off
Green flashing (4 Hz)	Pushbutton lock It is not possible to switch the output on or off via the pushbutton. Possible causes: - Pushbutton is locked by “external interface” or “button lock feature”. - Interval between charge and switch-on cycles < 5 s (MOSFET protection). - Too high temperature at the output.
Orange	Pre-alarm: Output switched on, output current exceeds pre-alarm level, overload imminent.
Orange flashing (1 Hz)	Overcurrent at output due to overload The eFuse at the output has tripped. The output has switched off. ▶ Press pushbutton at the output(OUT1 and OUT2) to restart the channel.

LED OUT1 and OUT2	Meaning
Orange flashing (2 Hz)	Installation faulty, cables or connected hardware at the outputs are not installed correctly. The output has switched off automatically. ▶ Switch off channel manually via pushbutton at output (OUT1 and OUT2). Conditions: ■ PSU with NEC outputs: Difference between positive and negative current of the output has been >1 A for 6…6.5 s ■ PSU without NEC outputs: Connector negative wire overcurrent according to negative trip curve, or Output was contributing to negative overcurrent of another output.
Orange flashing (4 Hz)	Short-circuit at output The eFuse at the output has tripped. The output has switched off (output current at channel > 48 A). Possible causes: ■ Electrical short circuit ■ Too high loads connected ■ Plugging in a large capacitance during operation ▶ Press the button at the output (OUT1 and OUT2). Outputs with eFuse try to restart automatically.
Orange/green flashing (2 Hz)	MOSFET overtemperature limit reached (125 °C) The output switches on again automatically when the temperature has dropped to max. 90 °C.
Red	Hardware Fault, MOSFET damaged (short circuit), PSU will be turned off. Cause: The power switch of a specific output is damaged. Replacing the power supply may be necessary.
Red flashing (1 Hz)	Hardware of the measuring circuit defective or values outside the permissible range. Replacement of the power supply unit may be necessary Possible causes: ■ The deviations of the internal output current sensors exceed the permissible limits. ■ Temperature sensor measurement out of range (-40 °C or +150 °C for more than 5 s).

10 Troubleshooting

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults.

If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

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

12 Repair

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

12.1 Returning devices

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at
https://www.turck.de/en/return-service-6079.php
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

The devices must be disposed of properly and do not belong in the domestic waste.

14 Technical data

14.1 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	
Internal fuse	2 separate eFuses	
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, s. fig.: Voltage range – input voltage AC	
Turn-off voltage	Typ. 3 × 300 VAC, steady-state end value, s. fig.: Voltage range – input voltage AC	
Switch-on delay	Typ. 2 s, at 500 W, symmetrical phase voltages, s. fig.: Switch-on behavior	
Rise time	Typ. 10 ms, at 500 W constant current load, 0 mF load, s. fig.: Switch-on behavior	
	Typ. 12 ms, at 500 W constant current load, 12.5 mF load, s. fig.: Switch-on behavior	
Input current	At 500 W, symmetrical phase voltages, 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

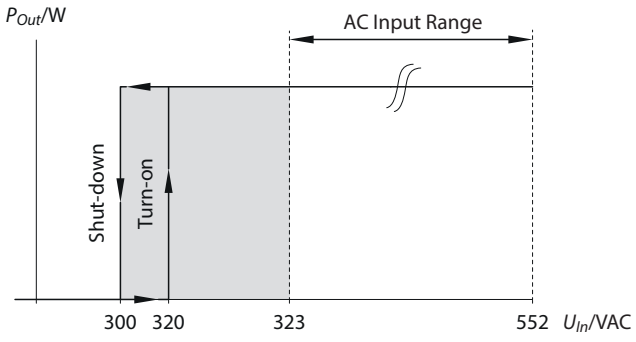


Fig. 14: Voltage range – input voltage AC

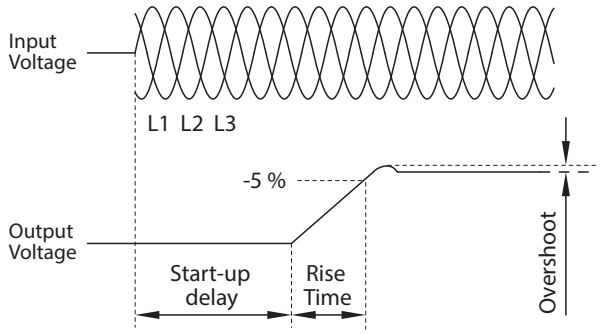


Fig. 15: Switch-on behavior

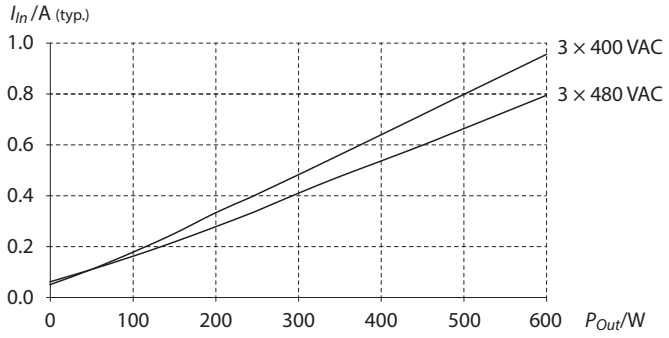


Fig. 16: Input current vs. output power (at 24 VDC output voltage)

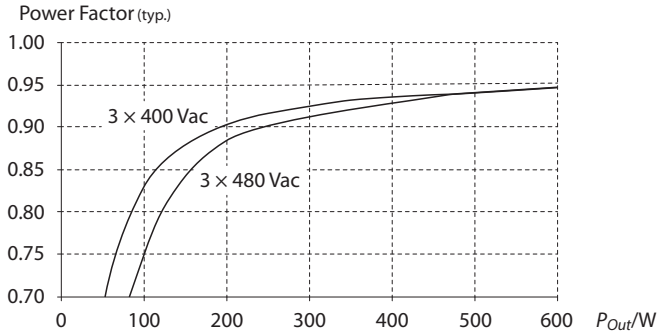


Fig. 17: Power factor vs. output power (at 24 VDC output voltage)

14.2 DC output

Technical data		
Number of outputs	2	
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 current	Max. 12 A per output, s. fig.: Trip curve diagram (max. 12 A)	
Output power 24 V…28 V, continuous at ambient temperature:	■ At 45 °C ■ At 55 °C ■ At 70 °C	600 W 500 W 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 ■ Up to 70 °C	1000 W 700 W
Overload behavior	S. fig.: Trip curve diagram (max. 12 A)	
Internal output capacitance	Typ. 12500 µF	For all outputs in total
Parallel use	No	Do not connect outputs or devices in parallel.
Back-feeding loads	Max. 35 V/4 J	For all outputs together, even when switched off

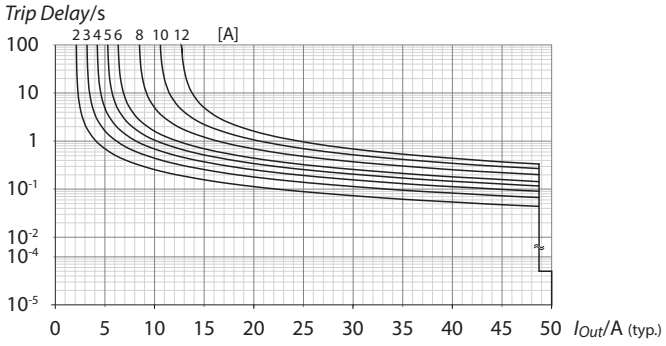


Fig. 18: Trip curve diagram (max. 12A)

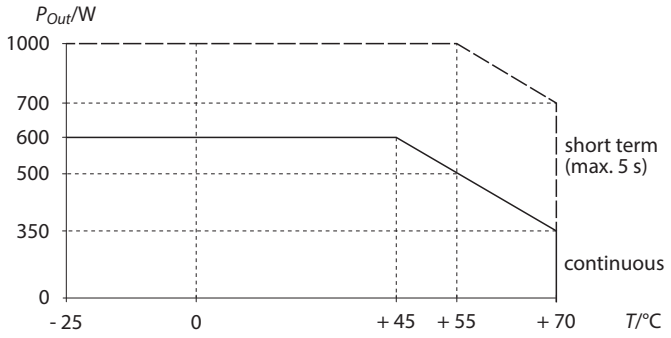


Fig. 19: Derating – output power vs. ambient temperature

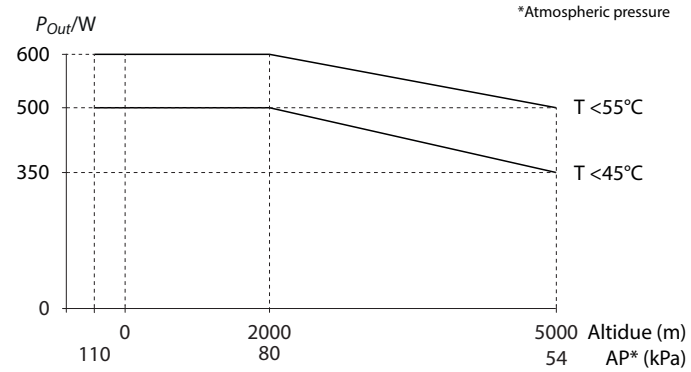


Fig. 20: Derating – output power vs. altitude

14.3 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)

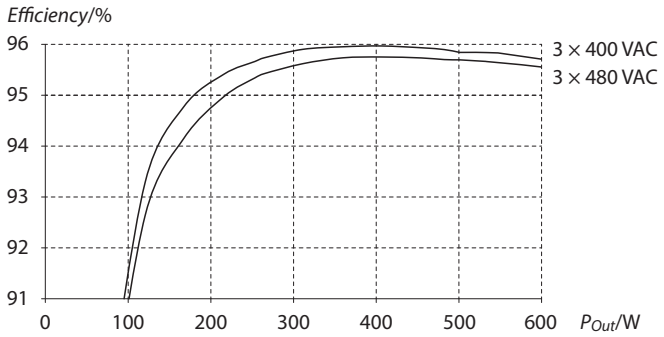


Fig. 21: Power factor vs. output power at 24 VDC (typ.)

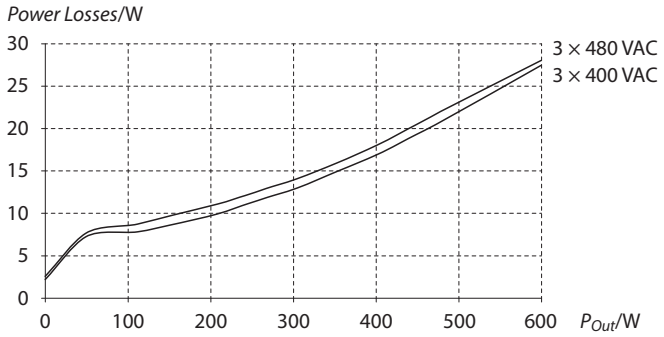


Fig. 22: Power losses vs. output power at 24 VDC (typ.)

14.4 Relay-OK contact

Technical data			
Connector	M12 male connector, 5-pole, A-coded		
Switching hysteresis	1 V		
Contact rating	Max.	Resistive load ■ 0.3 A at 60 VDC ■ 1 A at 30 VDC ■ 0.5 A at 30 VAC	
	min.	1 mA at 5 VDC	
Isolation voltage	Duration	A	D
■ Type test	60 s	2830 VAC	500 VAC
■ Routine test	5 s	2550 VAC	500 VAC

14.5 General technical data

Technical data		
Calculated lifetime expectancy		
	3 AC, 400 V	3 AC, 480 V
■ At 24 V, 500 W, 40 °C	43000 h	37000 h
■ At 24 V, 250 W, 40 °C	177000 h	168000 h
■ At 24 V, 500 W, 25 °C	135000 h	119000 h
■ At 24 V, 250 W, 25 °C	466000 h	416000 h
MTBF		
MTBF SN 29500, IEC 61709	3 AC, 400 V	3 AC, 480 V
■ At 24 V, 500 W, 40 °C	253000 h	233000 h
■ At 24 V, 500 W, 25 °C	461000 h	427000 h
MTBF MIL HDBK 217F		
■ At 24 V, 500 W and 40 °C, Ground Benign GB40	98000 h	93000 h
■ At 24 V, 500 W and 25 °C, Ground Benign GB25	144000 h	138000 h
■ At 24V, 500 W and 40°C, Ground Fixed GF40	25000 h	24000 h
■ At 24V, 500 W and 25 °C, Ground Fixed GF25	33000 h	32000 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…+70 °C (-13…158 °F)	Operational temperature is the same as the ambient or surrounding temperature and is defined as the air temperature 2cm below the unit.
Storage temperature	-40…+85 °C (-40…185 °F)	For storage and transportation
Output derating	10W/°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), see fig.: Output power vs. ambient temperature [▷ 27]	
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 [▷ 27]
Altitude	Max. 5000 m (16 400 ft)	S. fig.: Output power vs. altitude [▷ 27]

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 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; 17.8-500 Hz: 2g 2 hours per axis	According to IEC 60068-2-6
Shock	30 g 6 ms, 20 g: 11 ms 3 bumps per direction, 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 ■ 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 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.
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

Technical data		
Touch current (leakage current)	Max. 0.45/ 1.5 mA	At 3x 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 Other mounting orientations: reduce the output current, derating: max. output power or max. ambient temperature (s. fig.: Derating – standard mounting orientation): ■ max. 500 W at max. 60 °C ■ max. 350 W at max. 60 °C

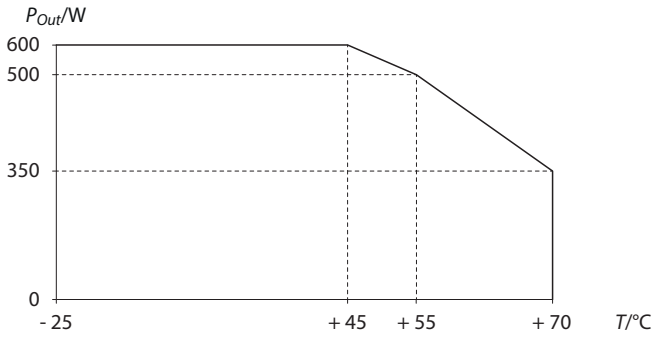


Fig. 23: Derating – standard mounting orientation

15 Turck branches — contact data

Germany	Hans Turck GmbH & Co. KG Witzlebenstraße 7, 45472 Mülheim an der Ruhr www.turck.de
Australia	Turck Australia Pty Ltd Building 4, 19-25 Duerdin Street, Notting Hill, 3168 Victoria www.turck.com.au
Austria	Turck GmbH Graumanngasse 7/A5-1, A-1150 Vienna www.turck.at
Belgium	TURCK MULTIPROX Lion d'Orweg 12, B-9300 Aalst www.multiprox.be
Brazil	Turck do Brasil Automação Ltda. Rua Anjo Custódio Nr. 42, Jardim Anália Franco, CEP 03358-040 São Paulo www.turck.com.br
Canada	Turck Canada Inc. 140 Duffield Drive, CDN-Markham, Ontario L6G 1B5 www.turck.ca
China	Turck (Tianjin) Sensor Co. Ltd. 18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381 Tianjin www.turck.com.cn
Czech Republic	TURCK s.r.o. Na Brne 2065, CZ-500 06 Hradec Králové www.turck.cz
France	TURCK BANNER S.A.S. 11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE Cedex 4 www.turckbanner.fr
Hungary	TURCK Hungary kft. Árpád fejedelem útja 26-28., Óbuda Gate, 2. em., H-1023 Budapest www.turck.hu
India	TURCK India Automation Pvt. Ltd. 401-403 Aurum Avenue, Survey. No 109 /4, Near Cummins Complex, Baner-Balewadi Link Rd., 411045 Pune - Maharashtra www.turck.co.in
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Netherlands	Turck B. V. Ruiterlaan 7, NL-8019 BN Zwolle www.turck.nl
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