Your Global Automation Partner

TURCK

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

Compact 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** DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
	**WARNING** WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.
	**CAUTION** CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
	**NOTICE** NOTICE indicates a situation which may lead to property damage if not avoided.
	**NOTE** 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** This symbol denotes actions that the user must carry out.
⇨	**RESULTS OF ACTION** 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 (ID 100028239)

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. [▷ 27].

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

Mating connectors

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

4.1 Device overview

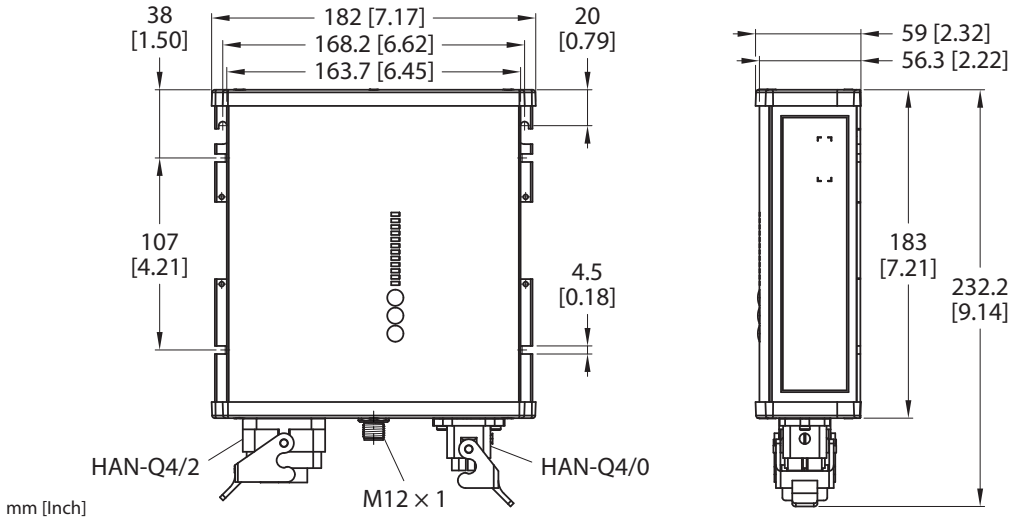

Fig. 1: Dimensions

4.1.1 Block diagram

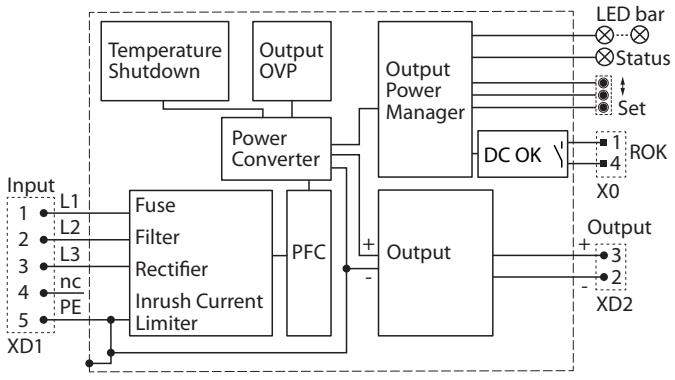

Fig. 2: Block diagram

4.1.2 Operating elements

The 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 [▶ 17]) 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
- Relay-OK contact
- 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.			

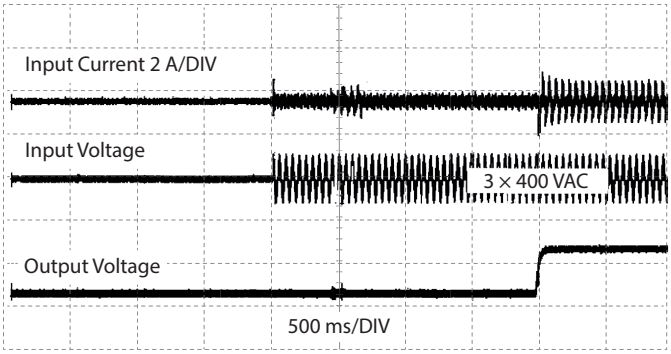

Fig. 3: Typical switch-on behavior at nominal load and 25 °C ambient temperature

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.

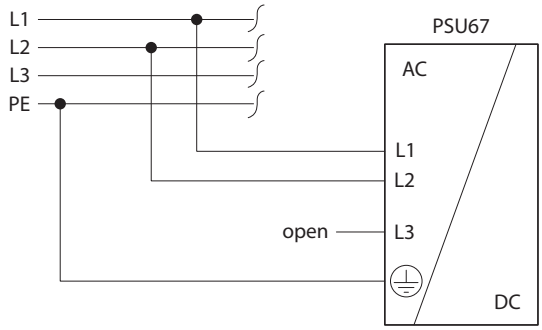

Fig. 4: 2-phase operation

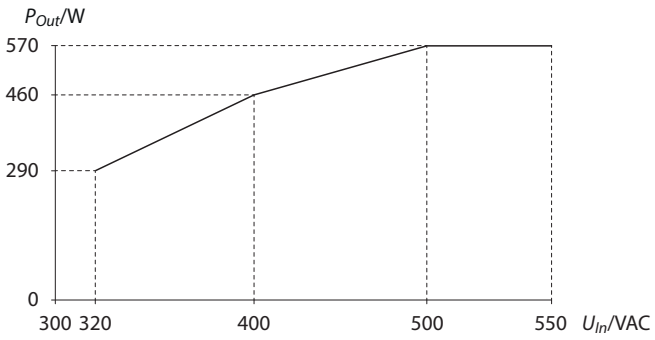

Fig. 5: Performance in 2-phase operation

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

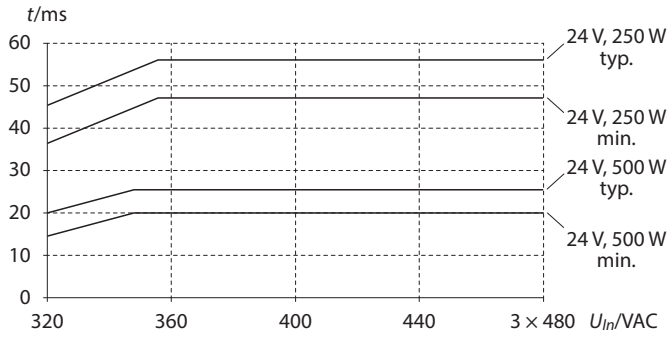

Fig. 6: Hold-up time vs. input voltage

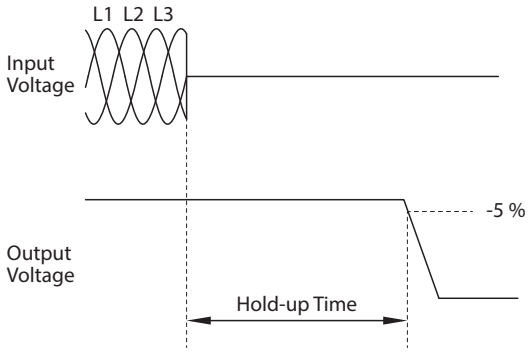

Fig. 7: Shutdown behavior

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.

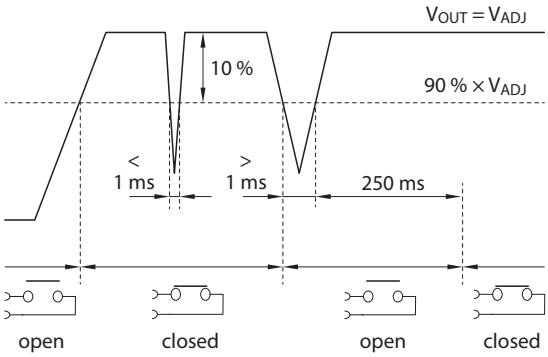

Fig. 8: Relay-OK contact - contact behavior

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 ([▷ 24]).
- ▶ 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.

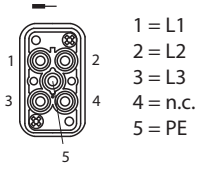

Fig. 9: Pin assignment — Han Q4/2 male connector, AC input voltage (XD1)

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.

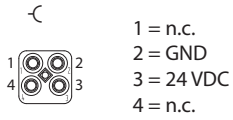

Fig. 10: Pin assignment — Han Q4/0 female connector, DC output voltage side (XD2)

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 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.

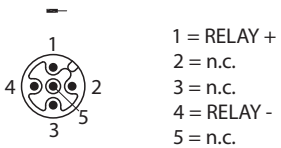

Fig. 11: Pin assignment – M12 connector, Relay-OK contact

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 [▶ 17]) 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.

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: - 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.

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, 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 ■ 3 AC, 480 V	Typ. 0.8 A Typ. 0.66 A
Power factor	S. fig.: Power factor vs. output power (at 24 VDC output voltage)	
	■ 3 AC, 400 V ■ 3 AC, 480 V	typ. 0.94, at 500 W typ. 0.95, at 500 W

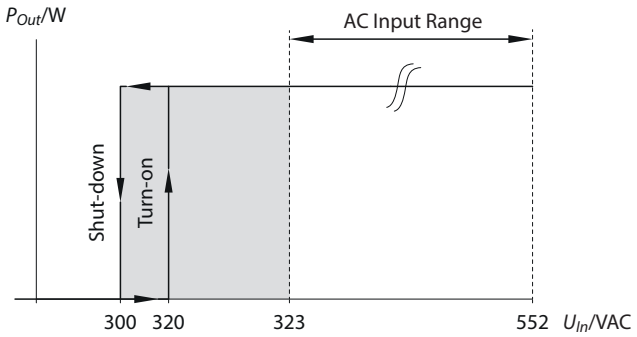

Fig. 12: Voltage range – input voltage AC

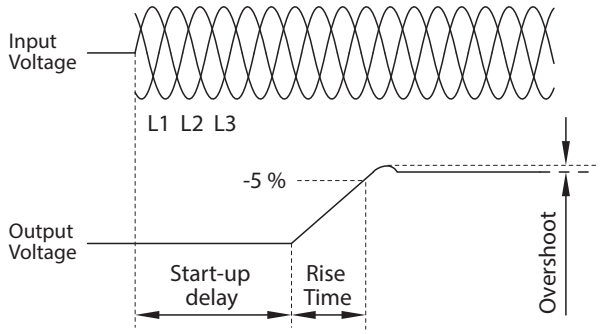

Fig. 13: Switch-on behavior

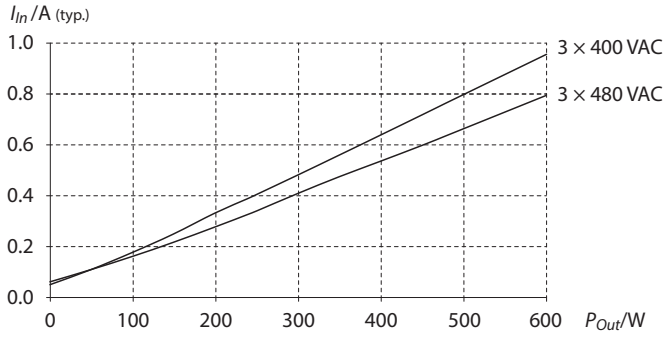

Fig. 14: Input current vs. output power (at 24 VDC output voltage)

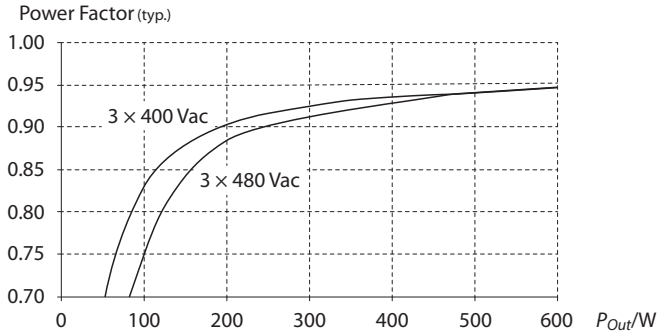

Fig. 15: Power factor vs. output power (at 24 VDC output voltage)

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 ■ 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 and short-circuit behavior	Typ. 42 A/0 A 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 [▶ 22].	

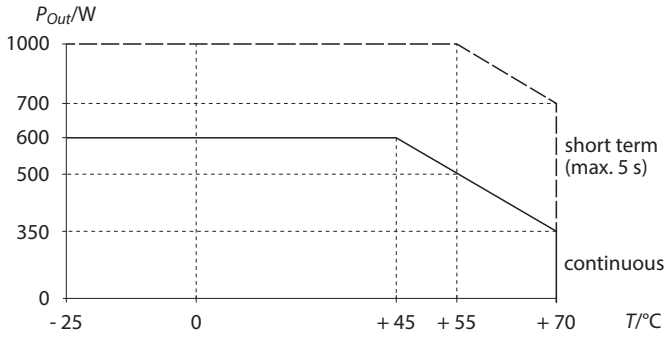

Fig. 16: Derating – output power vs. ambient temperature

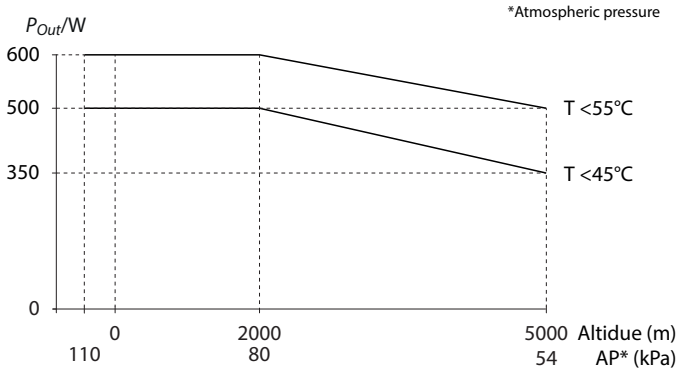

Fig. 17: Derating – output power vs. altitude

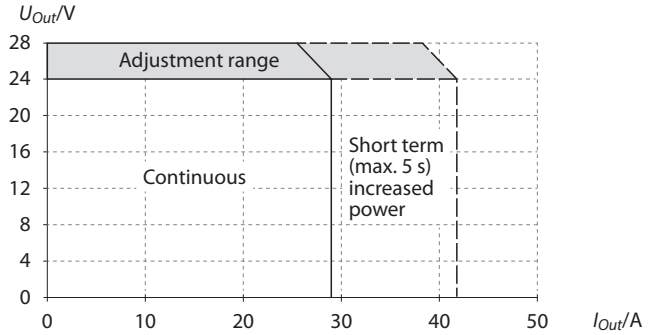

Fig. 18: Output voltage vs. output current, at continuous load, typ.

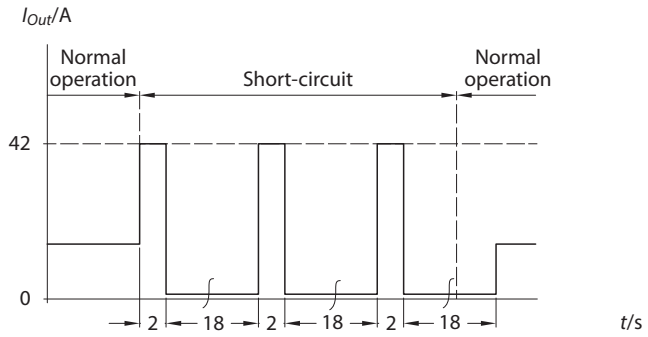

Fig. 19: Short-circuit at output, Hiccup mode, typ.

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)

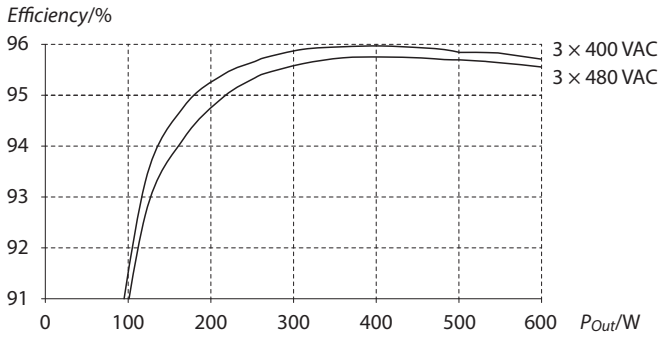

Fig. 20: Power factor vs. output power at 24 VDC (typ.)

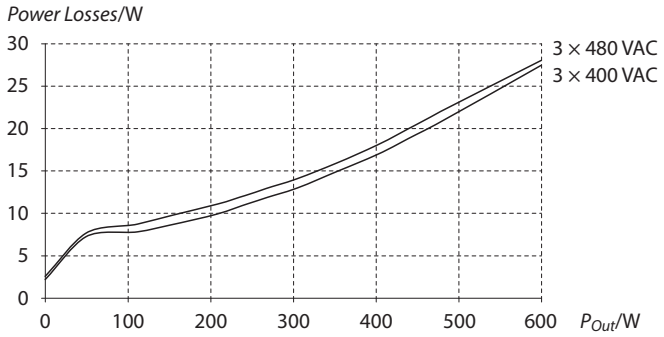

Fig. 21: Power losses vs. output power at 24 VDC (typ.)

13.4 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

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 [▶ 21]	
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 [▶ 21]
Altitude	Max. 5000 m (16 400 ft)	S. fig.: Output power vs. altitude [▶ 21]

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
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.

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 Other mounting orientations: reduce the output current, derating: max. output power ar max. ambient temperature (s. fig.: Derating – standard mounting orientation): ■ max. 500 W at max. 45 °C ■ max. 350 W at max. 60 °C

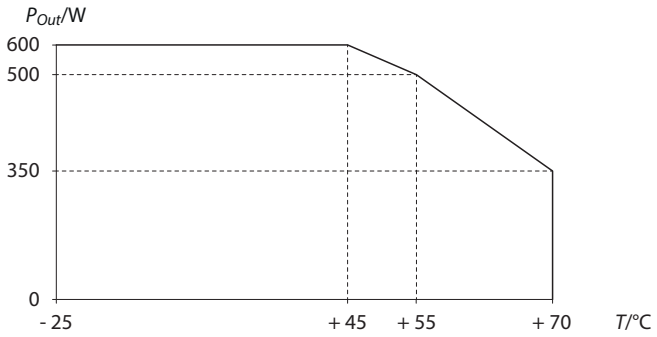

Fig. 22: Derating – standard mounting orientation

14 Turck subsidiaries — contact information

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 Wien **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**
Great Britain	TURCK BANNER LIMITED Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex **www.turckbanner.co.uk**
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**
Italy	TURCK BANNER S.R.L. Via San Domenico 5, IT-20008 Bareggio (MI) **www.turckbanner.it**

Japan	TURCK Japan Corporation ISM Akihabara 1F, 1-24-2, Taito, Taito-ku, 110-0016 Tokyo **www.turck.jp**
Korea	Turck Korea Co, Ltd. B-509 Gwangmyeong Technopark, 60 Haan-ro, Gwangmyeong-si, 14322 Gyeonggi-Do **www.turck.kr**
Malaysia	Turck Banner Malaysia Sdn Bhd Unit A-23A-08, Tower A, Pinnacle Petaling Jaya, Jalan Utara C, 46200 Petaling Jaya Selangor **www.turckbanner.my**
Mexico	Turck Comercial, S. de RL de CV Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga, Coahuila **www.turck.com.mx**
Netherlands	Turck B. V. Ruiterlaan 7, NL-8019 BN Zwolle **www.turck.nl**
Poland	TURCK sp.z.o.o. Wroclawska 115, PL-45-836 Opole **www.turck.pl**
Romania	Turck Automation Romania SRL Str. Siriului nr. 6-8, Sector 1, RO-014354 Bucuresti **www.turck.ro**
Russian Federation	TURCK RUS OOO 2-nd Pryadilnaya Street, 1, 105037 Moscow **www.turck.ru**
Sweden	Turck Sweden Office Fabriksstråket 9, 433 76 Jonsered **www.turck.se**
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South Africa	Turck Banner (Pty) Ltd Boeing Road East, Bedfordview, ZA-2007 Johannesburg **www.turckbanner.co.za**
Turkey	Turck Otomasyon Ticaret Limited Sirketi Inönü mah. Kayisdagi c., Yesil Konak Evleri No: 178, A Blok D:4, 34755 Kadiköy/ Istanbul **www.turck.com.tr**
USA	Turck Inc. 3000 Campus Drive, USA-MN 55441 Minneapolis **www.turck.us**

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