TRIO67/1AC/24DC/20/4C/IOL/ M12

Data sheet
111820_en_01

 2026-04-23

1 Description

- Quick and easy installation with M12 connectors
- Convenient, intuitive parameterization and diagnostics with HMI and IO-Link interface
- Prioritized shutdown and reliable short-circuit and capacity detection
- Safe starting of heavy loads with dynamic boost of 200% for 5 s
- Convenient on-site installation thanks to clear pin assignment directly on the device
- Increased electrical safety with NEC Class 2
- Robust die-cast aluminum housing with degree of protection IP65/67 ensures reliable protection against dust and water
- IO-Link communication interface for connection to a higher-level control system
- This device meets the requirements of the EU Cyber Resilience Act EU 2024/2487

Technical data (short form)	
Input voltage range	100 V AC ... 240 V AC - 15 % ... +10 % 100 V DC ... 240 V DC ±10 %
Mains buffering time	typ. 36 ms (120 V AC) typ. 37 ms (230 V AC)
Nominal output voltage (U_N)	24 V DC (PELV)
Setting range of the output voltage (U_{Set})	23.5 V DC ... 28.5 V DC
Output current I_N / $I_{Stat.Boost}$ / $I_{Dyn.Boost}$	20 A (I_{SUM}) / 25 A (Input ≥ 110 V AC/155 V DC ±10%/ ≤ +45°C) / max. 40 A (5 s/input ≥ 110 V AC/155 V DC ±10%)
Output power P_N / $P_{Stat.Boost}$ / $P_{Dyn.Boost}$	480 W / 600 W (Input ≥ 110 V AC/155 V DC ±10%/≤ +45°C) / max. 960 W (5 s/input ≥ 110 V AC/155 V DC ±10%)
Efficiency (for nominal values)	≥ 92.7 % (120 V AC) ≥ 94.3 % (230 V AC)
Residual ripple	typ. 10 mV_{PP}
MTBF (IEC 61709, SN 29500)	230 V AC / > 564860 h (25 °C) 230 V AC / > 295410 h (40 °C) 230 V AC / > 136070 h (60 °C)
Ambient temperature (operation)	-25 °C ... 70 °C (> 50 °C: 1.25 %/K)
Startup type tested	-40 °C
Dimensions (W x H x D)	235 x 212 x 87 mm
Weight	2665 g

2 Table of contents

3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Primary-switched power supply unit TRIO POWER IP67, M12 circular connector, 4-channel electronic circuit breaker, IO-Link, Panel mounting (with accessories as an option), input: 1-phase, output: 24 V DC / 20 A, adjustable from 23.5 V DC ... 28.5 V DC	TRIO67/1AC/24DC/20/4C/IOL/M12	1376354	1

Accessories	Type	Item no.	Pcs./Pkt.
Power cable, 3-position, PUR halogen-free, black, free cable end, on Socket straight M12, coding: S, cable length: 5 m, For alternating current up to 16 A/690 V	SAC-3P- 5,0-PUR/M12FSS PE	1176846	1
Power cable, 3-position, PUR halogen-free, black, free cable end, on Socket angled M12, coding: S, cable length: 5 m, For alternating current up to 16 A/690 V	SAC-3P- 5,0-PUR/M12FRS PE	1176919	1
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, free cable end, on Socket straight M12, coding: S, cable length: 5 m, for AC current up to 12 A/690 V	SAC-4P- 5,0-PUR/M12FSS PE	1408845	1
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, free cable end, on Socket angled M12, coding: S, cable length: 5 m, for AC current up to 12 A/690 V	SAC-4P- 5,0-PUR/M12FRS PE	1408853	1
Sensor/actuator cable, 3-position, PUR halogen-free, black-gray RAL 7021, free cable end, on Socket straight M12, coding: A, cable length: 5 m	SAC-3P- 5,0-PUR/M12FS	1683510	1
Sensor/actuator cable, 3-position, PUR halogen-free, black-gray RAL 7021, free cable end, on Socket angled M12, coding: A, cable length: 5 m	SAC-3P- 5,0-PUR/M12FR	1694525	1
Sensor/actuator cable, 4-position, PUR halogen-free, black-gray RAL 7021, free cable end, on Socket straight M12, coding: A, cable length: 5 m	SAC-4P- 5,0-PUR/M12FS	1668124	1
Sensor/actuator cable, 4-position, PUR halogen-free, black-gray RAL 7021, free cable end, on Socket angled M12, coding: A, cable length: 5 m	SAC-4P- 5,0-PUR/M12FR	1668247	1
Sensor/actuator cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug straight M12, coding: A, on Socket straight M12, coding: A, cable length: 5 m	SAC-4P-M12MS/ 5,0-PUR/ M12FS	1694075	1
Sensor/actuator cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug straight M12, coding: A, on Socket angled M12, coding: A, cable length: 5 m	SAC-4P-M12MS/5,0-PUR/ M12FR	1696400	1
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug straight M12, coding: L, on free cable end, cable length: 5 m, For direct current up to 12 A/63 V	SAC-4P-M12MSL/ 5,0-105	1425027	1
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug straight M12, coding: L, on free cable end, cable length: 5 m, for direct current up to 16 A/63 V	SAC-4P-M12MSL/ 5,0-PUR	1425067	1

Accessories	Type	Item no.	Pcs./Pkt.
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug angled M12, coding: L, on free cable end, cable length: 5 m, For direct current up to 12 A/63 V	SAC-4P-M12MRL/ 5,0-105	1425031	1
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug angled M12, coding: L, on free cable end, cable length: 5 m, for direct current up to 16 A/63 V	SAC-4P-M12MRL/ 5,0-PUR	1425071	1
Power cable, 5-position, PUR halogen-free, gray RAL 7001, Plug straight M12, coding: L, on free cable end, cable length: 5 m, For direct current up to 12 A/63 V	SAC-5P-M12MSL/ 5,0-290 FE	1424595	1
Power cable, 5-position, PUR halogen-free, gray RAL 7001, Plug straight M12, coding: L, on free cable end, cable length: 5 m, for direct current up to 16 A/63 V	SAC-5P-M12MSL/ 5,0-280 FE	1414891	1
Power cable, 5-position, PUR halogen-free, gray RAL 7001, Plug angled M12, coding: L, on free cable end, cable length: 5 m, For direct current up to 12 A/63 V	SAC-5P-M12MRL/ 5,0-290 FE	1424599	1
Power cable, 5-position, PUR halogen-free, gray RAL 7001, Plug angled M12, coding: L, on free cable end, cable length: 5 m, for direct current up to 16 A/63 V	SAC-5P-M12MRL/ 5,0-280 FE	1414858	1
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug straight M12, coding: L, on Socket straight M12, coding: L, cable length: 5 m, For direct current up to 12 A/63 V	SAC-4P-M12MSL/5,0-105/ FSL	1913438	1
Power cable, 4-position, PUR halogen-free, black-gray RAL 7021, Plug straight M12, coding: L, on Socket straight M12, coding: L, cable length: 5 m, for direct current up to 16 A/63 V	SAC-4P-M12MSL/ 5,0-PUR/ FSL	1261835	1
Power cable, 5-position, PUR halogen-free, gray RAL 7001, Plug straight M12, coding: L, on Socket straight M12, coding: L, cable length: 5 m, For direct current up to 12 A/63 V	SAC-5P-M12MSL/5,0-290/ FSL FE	1914471	1
Power cable, 5-position, PUR halogen-free, gray RAL 7001, Plug straight M12, coding: L, on Socket straight M12, coding: L, cable length: 5 m, for direct current up to 16 A/63 V	SAC-5P-M12MSL/5,0-280/ FSL FE	1289468	1
Power connector, 4-position, unshielded, Socket straight M12, coding: S, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg9, external cable diameter 6 mm ... 8 mm, for AC current up to 12 A/630 V	SACC-M12FSS-3PECON-PG 9-M	1107269	1
Power connector, Power, 4-position, Socket straight M12, coding: S, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg11, external cable diameter 8 mm ... 10 mm, for AC current up to 12 A/ 630 V	SACC-M12FSS-3PECON-PG11-M	1404642	1
Power connector, 3-position, unshielded, Socket straight M12, coding: S, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg9, external cable diameter 6 mm ... 8 mm, for alternating current up to 16 A/630 V	SACC-M12FSS-2PECON-PG 9-M	1419640	1

Accessories	Type	Item no.	Pcs./Pkt.
Power connector, 4-position, Socket angled M12, coding: S, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg9, external cable diameter 6 mm ... 8 mm, for AC current up to 12 A/630 V	SACC-M12FRS-3PECON-PG 9-M	1107272	1
Power connector, 4-position, Socket angled M12, coding: S, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg11, external cable diameter 8 mm ... 10 mm, for AC current up to 12 A/630 V	SACC-M12FRS-3PECON-PG11-M	1408987	1
Power connector, 3-position, Socket angled M12, coding: S, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg9, external cable diameter 6 mm ... 8 mm, for alternating current up to 16 A/630 V	SACC-M12FRS-2PECON-PG 9-M	1419642	1
Connector, Universal, 4-position, unshielded, Socket straight M12 Push-Pull, coding: A, Push-lock spring connection, knurl material: Plastic, external cable diameter 4 mm ... 8 mm	SACC-P12FS-4PL-CM M	1438151	1
Connector, Universal, 4-position, unshielded, Socket straight M12, coding: A, Push-lock spring connection, knurl material: Zinc die-cast, nickel-plated, external cable diameter 4 mm ... 8 mm	SACC-M12FS-4PL M	1424655	1
Connector, Universal, 4-position, Socket straight M12, coding: A, Insulation displacement connection, knurl material: Zinc die-cast, nickel-plated, external cable diameter 3.5 mm ... 6 mm	SACC-M12FS-4QO-0,34-M	1641688	1
Connector, Universal, 4-position, Socket straight M12, coding: A, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg7, external cable diameter 4 mm ... 6 mm	SACC-M12FS-4CON-PG7-M	1681127	1
Connector, Universal, 4-position, unshielded, Socket angled M12 Push-Pull, coding: A, Push-lock spring connection, knurl material: Plastic, external cable diameter 4 mm ... 8 mm	SACC-P12FR-4PL-CM M	1438155	1
Connector, Universal, 4-position, unshielded, Socket angled M12, coding: A, Push-lock spring connection, knurl material: Zinc die-cast, nickel-plated, external cable diameter 4 mm ... 8 mm	SACC-M12FR-4PL M	1424656	1
Connector, Universal, 4-position, Socket angled M12, coding: A, Screw connection, knurl material: Zinc die-cast, nickel-plated, cable gland Pg7, external cable diameter 4 mm ... 6 mm	SACC-M12FR-4CON-PG7-M	1681143	1
Power connector, Power, 5-position, unshielded, Plug straight M12, coding: L, Push-lock spring connection, knurl material: Zinc die-cast, nickel-plated, external cable diameter 8 mm ... 13 mm	SACC-M12MSL-4FEPL-CL M	1646349	1
Power connector, Power, 5-position, unshielded, Plug straight M12, coding: L, Push-lock spring connection, knurl material: Brass, nickel-plated, external cable diameter 8 mm ... 13 mm	SACC-M12MSL-4FEPL-CL	1151368	1
Screw plug	PROT-M12	1680539	5

Accessories	Type	Item no.	Pcs./Pkt.
Sealing cap	PROT-M12 FS	1560251	5
Grounding material	VS-ES-100-6	1055164	1
Y distributor, 4-position, shielded, Plug straight M12, coding: S, on Socket straight M12, coding: S and Socket straight M12, coding: S, for alternating current up to 16 A/630 V, Parallel distributor	SAC-4PY-FS/MS-FS F VP SH	1080243	1
H distributor, 4-position, shielded, Plug straight M12, coding: S, on Socket straight M12, coding: S and Socket straight M12, coding: S, for alternating current up to 16 A/630 V, Parallel distributor	SAC-4PH-MS-FS/2XFS F VP SH	1080242	1
Y distributor, 5-position, shielded, Plug straight M12, coding: L, on Socket straight M12, coding: L and Socket straight M12, coding: L, for direct current up to 16 A/63 V, Parallel distributor	SAC-5PY-FL/ML-FL F VP SH	1080249	1
H distributor, 5-position, shielded, Plug straight M12, coding: L, on Socket straight M12, coding: L and Socket straight M12, coding: L, for direct current up to 16 A/63 V, Parallel distributor	SAC-5PH-ML-FL/2XFL F VP SH	1080248	1
Torque screwdriver, black	TSD 04 SAC	1208429	1
Tool	SAC BIT M12-D15	1208432	1
Tool	SAC BIT M12-D16	1200305	1
Programming adapter, IO-Link	USB IO-LINK ADAPTER	1533311	1
Sensor/actuator cable, 4-position, PVC, black RAL 9005, Plug straight M12, coding: A, on Socket straight M12, coding: A, cable length: 0.6 m	SAC-4P-M12MS/ 0,6-PVC/ M12FS	1415612	1
Axioline E, IO-Link master, PROFINET, M12 connector, D-coded, IO-Link ports Class A: 4, connection method: M12 connector, A-coded, connection technology: 3-conductor, IO-Link ports Class B: 4, connection method: M12 connector, A-coded, connection technology: 5-conductor, Digital inputs at pin 2 for class A ports: 4, 24 V DC, connection technology: 3-conductor, Digital outputs at pin 2 for class A ports: 4, 24 V DC, 2 A, connection technology: 2-conductor, degree of protection: IP65/IP67/IP69	AXL E PN IOL4/4 EF M12 6M-L	1300926	1

You will find the latest accessories for the item at phoenixcontact.com/products.

Documentation	Type	Item No.	Pcs./Pkt.
Application note, English, Measures to protect network-capable devices with Ethernet connection against unauthorized access	AH EN INDUSTRIAL SECURITY	-	-

4 Technical data

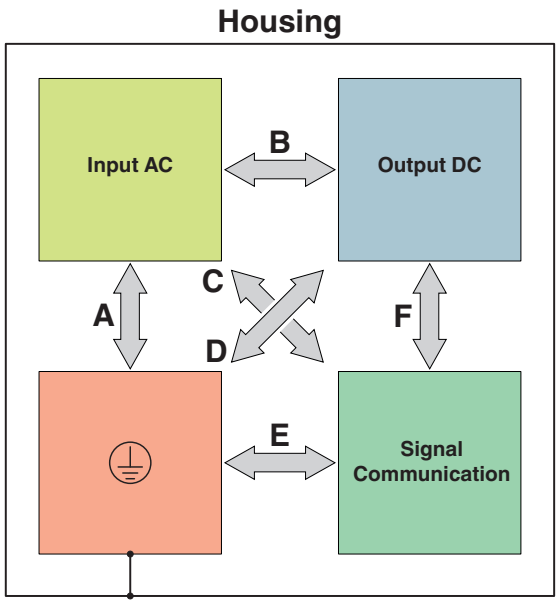
Input data	
 Unless otherwise specified, all information is valid for mounting in the normal mounting position.	
Input voltage range (for DC, connect a suitable fuse)	100 V AC ... 240 V AC -15 % ... +10 % 100 V DC ... 240 V DC ±10 %
Derating	 > 50 °C: 1.25 %/K
Electric strength, max.	≤ 300 V AC 15 s
Frequency range (f_N)	50 Hz ... 60 Hz
Typical national grid voltage	120 V AC / 230 V AC
Network type	Star network (TN, TT, IT (PE))
Current consumption 100 V AC / 240 V AC 100 V DC / 240 V DC	 5.6 A / 2.3 A 5.6 A / 2.2 A
Current consumption (static boost) 110 V AC / 240 V AC 155 V DC / 240 V DC	 6 A / 2.8 A 4.2 A / 2.7 A
Discharge current to PE	typ. 0.5 mA
Mains buffering time 120 V AC / 230 V AC	 typ. 36 ms / typ. 37 ms
Inrush current (25 °C)	< 3 A
Inrush current integral (I^2t)	< 0.39 A^2s
Device mains fuse , internal (device protection)	10 A
Recommended breaker for input protection Characteristic B, C, D, K or comparable	8 A ... 12 A
Recommended breaker for input protection UL Compliance Testing - Branch circuit protection (US/CAN)	≤ 20 A

Input protection, AC (to be connected externally upstream)							
Input current I_{In} Input protection	Circuit breaker					Neozed fuse or equivalent	Circuit breaker
Characteristics	A	B	C	D	K	gG	≤ 13 x I_{In} (maximum magnetic tripping)
4 A	-	-	(✓)	(✓)	(✓)	(✓)	(✓)
6 A	-	(✓)	(✓)	(✓)	(✓)	(✓)	(✓)
8 A	-	✓	✓	✓	✓	-	✓
10 A	-	✓	✓	✓	✓	✓	✓
12 A	-	✓	✓	✓	✓	-	✓

(✓) Possible fuse protection with an input voltage of ≥ 220 V AC
✓ Fuse protection for the complete input voltage range

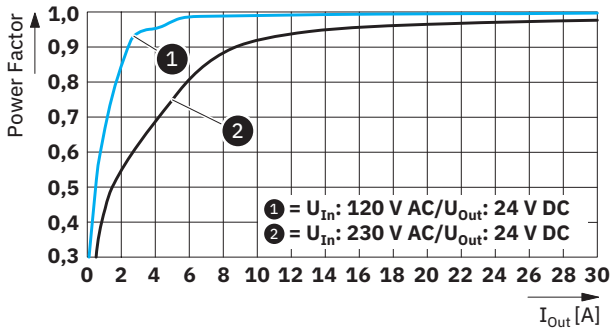
Protective circuit	
Type of protection	Transient protection
Protective circuit/component	Varistor

Electric strength of the insulation



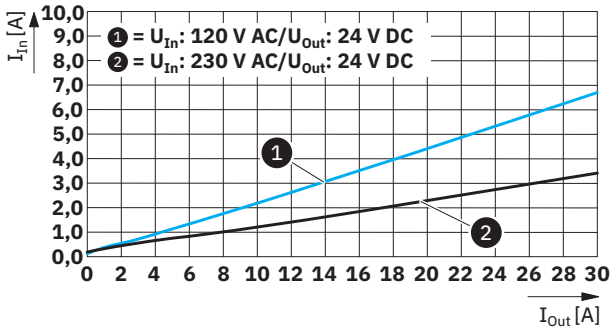
Test voltage	A	B	C	D	E	F
Type test (IEC/EN 61010-1)	2.35 kV AC	3.76 kV AC	3.76 kV AC	--	--	--
Production test	3.1 kV DC	3.1 kV DC	3.1 kV DC	--	--	--

POWER factor



Crest factor	120 V AC	230 V AC
	typ. 1.52	typ. 1.69

Input current vs. output current



Connection data: Input	
Position identifier	1 (L/+), 2 (n.c.), 3 (N/-), PE
Connection method	M12 circular connector
Contact connection type	Male connector
Locking type	M12 screw locking
Insertion/withdrawal cycles	≥ 100
Coding	S
Number of positions	4
Number of connections	3
Tightening torque	0.4 Nm

Output data	
Nominal output voltage (U_N)	24 V DC (PELV)
Setting range of the output voltage (U_{Set}) > 24 V DC, constant capacity restricted Default setting	 23.5 V DC ... 28.5 V DC (adjustable in 0.1 V steps) 24 V DC ±0,2 %
Output current I_N $I_{Stat.Boost}$ $I_{Dyn.Boost}$	 20 A (I_{SUM}) 25 A (Input ≥ 110 V AC/155 V DC ±10%/≤ +45°C) max. 40 A (5 s/input ≥ 110 V AC/155 V DC ±10%)
Output power P_N / $P_{Stat.Boost}$ / $P_{Dyn.Boost}$	 480 W / 600 W (Input ≥ 110 V AC/155 V DC ±10%/≤ +45°C) / max. 960 W (5 s/input ≥ 110 V AC/155 V DC ±10%)
Control deviation change in load, static 10 % ... 90 % change in load, dynamic 10 % ... 90 % change in input voltage ±10 %	 < 1 % < 3 % < 0.1 %
Short-circuit-proof	yes
No-load proof	yes
Residual ripple	typ. 10 mV_{PP}
Connection in parallel	no
Connection in series	no
Feedback voltage resistance	≤ 35 V DC
Protection against overvoltage at the output (OVP)	≤ 35 V DC
Rise time U_{Out} = 10 % ... 90 %	 ≤ 1 s
Max. capacitive load	30 mF

Electronic circuit breaker	
No. of channels	4
Nominal current per channel	1 A, 2 A, 3 A, 3.8 A, 4 A, 5 A, 6 A, 7 A, 8 A, 9 A, 10 A
Waiting time after switch off of a channel	5 s
Switch-on delay of the channels	100 ms
Rated current (pre-adjusted)	1 A

NEC Class 2 tripping value

The 1 A, 2 A, 3 A, or 3.8 A tripping thresholds, which can be set on a channel-by-channel basis, fully comply with the normative requirements of NEC Class 2.

All trip thresholds of 4 A and above are assigned to NEC Class 1 unlimited general control circuits.

Connection data: Output CH1/CH2	
Position	CH1/CH2
Position identifier	1 (24 V+/CH1), 2 (0V-/CH2), 3 (0V-/CH1), 4 (24V+/CH2), FE
Connection method	M12 circular connector
Contact connection type	Female connector
Locking type	M12 screw locking
Insertion/withdrawal cycles	≥ 100
Coding	L

Connection data: Output CH1/CH2	
Number of positions	5
Number of connections	5
Tightening torque	0.4 Nm

Connection data: Output CH3/CH4	
Position identifier	1 (24 V+/CH3), 2 (0 V-/CH4), 3 (0V-/CH3), 4 (24V+/CH4), FE
Connection method	M12 circular connector
Contact connection type	Female connector
Locking type	M12 screw locking
Insertion/withdrawal cycles	≥ 100
Coding	L
Number of positions	5
Number of connections	5
Tightening torque	0.4 Nm

IO-Link port: Class A	
Number of ports	1
Connection method	M12 connector, A-coded (Push-pull fast connection according to IEC 61076-2-010 or screw connection according to IEC 61076-2-101)
Connection technology	3-, 4-conductor
Specification	V1.1.4
Reverse polarity protection	yes
Transmission speed	38.4 kbps (COM2)
Cycle Time	40 ms
Process data update	40 ms
Amount of process data	8 Byte (Input data) 2 Byte (Output data)
Cable length	20 m

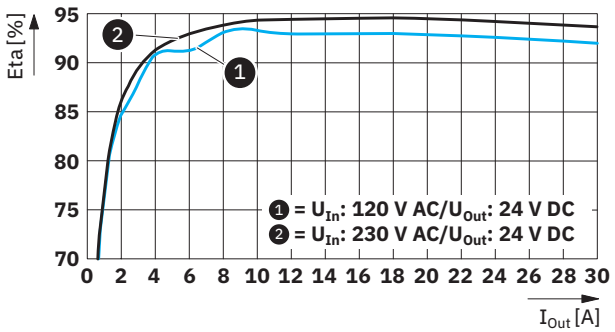
IO-Link port supply (L+/L-)	
Nominal voltage for I/O supply	24 V DC (Provided via the IO-Link interface of the IO-Link master.)
Supply voltage range	18 V DC ... 30 V DC (including all tolerances, ripple included, SELV/PELV)
Nominal current per device	typ. 30 mA (Pin 4: C/Q) 80 mA (Pin 4: DI/DO, including all tolerances) 20 mA (Pin 2: DO, including all tolerances)
Current consumption	max. 100 mA (Device-dependent including all tolerances; observe the current of the IO-Link master that is made available via L+/L-)
Reverse polarity protection	yes

Connection data: Signal	
Position identifier	1 (L+), 2 (DO), 3 (L-), 4 (C/Q / DI/DO), 5 (n.c.)
Connection method	M12 circular connector
Contact connection type	Male connector
Locking type	Push Pull
Insertion/withdrawal cycles	≥ 100
Coding	A
Number of positions	5
Number of connections	4
Locking type	0.4 Nm

Reliability	25 °C	40 °C	60 °C
MTBF (IEC 61709, SN 29500)			
230 V AC	> 564860 h	> 295410 h	> 136070 h

Power dissipation	120 V AC	230 V AC
No load	< 3.8 W	< 3 W
Nominal load	< 38 W	< 30 W

Efficiency	120 V AC	230 V AC
	≥ 92.7 %	≥ 94.3 %



Ambient conditions	
Ambient temperature (operation)	-25 °C ... 70 °C (> 50 °C: 1.25 %/K)
The ambient temperature (operation) refers to IEC 61010 surrounding air temperature.	
Ambient temperature (start-up type tested)	-40 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Max. permissible relative humidity (operation)	≤ 93 % (at 40 °C)
Vibration (operation) IEC 60068-2-6	5 Hz ... 100 Hz resonance search 2.3g, 90 min., resonance frequency 2.3g, 90 min. (according to DNV GL Class C)
Shock (operation) IEC 60068-2-27	18 ms, 30g, per spatial direction
Degree of pollution	3
Climate class	
Overvoltage category EN 61010-1 EN 61010-2-201	III (≤ 2000 m) / II (≤ 5000 m) III (≤ 2000 m) / II (≤ 5000 m)

General data	
Degree of protection	IP65/IP67
Protection class	I
Flammability rating UL 94	V0
Housing material	Die-cast aluminum
Dimensions (W x H x D)	235 x 212 x 87 mm
Weight	2665 g

Standards/specifications	
Electrical safety	IEC 61010-1
Safety for equipment for measurement, control, and laboratory use	IEC 61010-1
Protective extra-low voltage	IEC 61010-1 IEC 61010-2-201 (PELV)
Safe isolation	IEC 61010-2-201
Limitation of harmonic line currents	EN 61000-3-2
Mains variation/undervoltage	SEMI F47 EN 61000-4-11
Security for industrial automation and control systems	IEC 62443-4-1

Conformance/Approvals	
UL	UL/C-UL Listed UL 61010-1 UL/C-UL Listed UL 61010-2-201 UL 2367 (Standard for Safety for Solid State Overcurrent Protectors)
UL/CSA	UL 1310 / CSA C22.2 No. 223 (NEC Class 2)

You will find the latest approvals for the item at phoenixcontact.com/products.

Electromagnetic compatibility Conformance with EMC Directive 2014/30/EU		
Interference emission in accordance with EN 61000-6-3 (residential and commercial) and EN 61000-6-4 (industrial)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice covered**
Conducted noise emission EN 55016	EN 61000-6-4 (Class A)	EN 61000-6-3 (Class B)
Noise emission EN 55016	EN 61000-6-4 (Class A)	EN 61000-6-3 (Class B)
Harmonic currents EN 61000-3-2	EN 61000-3-2 (Class A) --	EN 61000-3-2 (Class A) 0 kHz ... 2 kHz
Flicker EN 61000-3-3	not required	EN 61000-3-3 --

Immunity in accordance with EN 61000-6-1 (residential), EN 61000-6-2 (industrial)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice covered**
Electrostatic discharge EN 61000-4-2		
Contact discharge	4 kV (Test Level 2)	6 kV (Test Level 3)
Discharge in air	8 kV (Test Level 3)	8 kV (Test Level 3)
Comments	Criterion B	Criterion B
Electromagnetic HF field EN 61000-4-3		
Frequency range	80 MHz ... 1 GHz	80 MHz ... 1 GHz
Test field strength	10 V/m (Test Level 3)	10 V/m (Test Level 3)
Frequency range	1.4 GHz ... 6 GHz	1 GHz ... 6 GHz
Test field strength	3 V/m (Test Level 2)	10 V/m (Test Level 3)
Comments	Criterion A	Criterion A
Fast transients (burst) EN 61000-4-4		
Input	asymmetrical 2 kV (Test Level 3)	asymmetrical 4 kV (Test Level 4)
Output	asymmetrical 1 kV (Test Level 2)	asymmetrical 2 kV (Test Level 3)
Signal	asymmetrical 1 kV (Test Level 3)	asymmetrical 2 kV (Test Level 3)
Comments	Criterion B	Criterion B
Surge voltage load (surge) EN 61000-4-5		
Input	symmetrical 1 kV (Test Level 3) asymmetrical 2 kV (Test Level 3)	symmetrical 2 kV (Test Level 3) asymmetrical 4 kV (Test Level 4)

Immunity in accordance with EN 61000-6-1 (residential), EN 61000-6-2 (industrial)		
CE basic standard	**Minimum normative requirements**	**Higher requirements in practice covered**
Output	symmetrical 0.5 kV (Test Level 2) asymmetrical 1 kV (Test Level 2)	symmetrical 1 kV (Test Level 2) asymmetrical 2 kV (Test Level 3)
Signal	asymmetrical 1 kV (Test Level 2)	asymmetrical 1 kV (Test Level 2)
Comments	Criterion B	Criterion B
Conducted interference EN 61000-4-6		
Input/output/signal	asymmetrical	asymmetrical
Frequency range	0.15 MHz ... 80 MHz	0.15 MHz ... 80 MHz
Voltage	10 V (Test Level 3)	10 V (Test Level 3)
Comments	Criterion A	Criterion A
Voltage dips EN 61000-4-11 Input voltage (230 V AC, 50 Hz)		
Voltage dip	70 %, 25 periods (Class 3)	70 %, (Class 3)
Comments	Criterion C	Criterion A
Voltage dip	40 %, 10 periods (Class 3)	50 %, 12 periods (Class 3)
Comments	Criterion C	Criterion A
Voltage dip	0 %, 1 period (Class 3)	0 %, 1 period (Class 3)
Comments	Criterion B	Criterion A

Key	
Criterion A	Normal operating behavior within the specified limits.
Criterion B	Temporary impairment to operational behavior that is corrected by the device itself.
Criterion C	Temporary adverse effects on the operating behavior, which the device corrects automatically or which can be restored by actuating the operating elements.

5 Safety and installation notes

5.1 Symbols used

Instructions and possible hazards are indicated by corresponding symbols in this document.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible personal injuries.

There are different categories of personal injury that are indicated by a signal word.

WARNING

This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

The following symbols are used to indicate potential damage, malfunctions, or more detailed sources of information.

NOTE

This symbol together with the signal word NOTE and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

The symbol indicates potential security risks in devices, solutions, or services from Phoenix Contact.

5.2 Safety and warning notes

Prior to commissioning, read the installation note and check the power supply for damage.

WARNING: Danger to life by electric shock!

- Only skilled persons may install, start up, and operate the device.
- Never carry out work when voltage is present.
- Establish connection correctly and ensure protection against electric shock.
- The power supply must be switched off from outside (e.g. via the line protection on the primary side).

NOTE

- The power supply is maintenance-free. Repairs may only be carried out by the manufacturer. The warranty no longer applies if the housing is opened.
- Observe the national safety and accident prevention regulations.
- Assembly and electrical installation must correspond to the state of the art.
- The die-cast aluminum housing and the device connectors comply with IP65/IP67 degree of protection. To ensure compliance with the degree of protection, only use IP65/IP67-tested mating connectors and connecting cables for the field connection.
- The power supply is only suitable for indoor use.
- Observe mechanical and thermal limits.
- Mount the power supply in the standard installation position (connector below).
- The protective conductor connection ⏚ must be connected in the field connector (mating connector) for the AC/DC supply.
- Make sure that the wiring on the primary side and the secondary side is adequately dimensioned and protected.
- Observe the contact assignments of the device connectors and the minimum required cross-section for the field connecting cables. The device can be permanently connected to the mains or operated as a plug-in device.
- Observe the technical data and connection parameters in the installation instructions for the relevant field connector (mating connector), such as current carrying capacity and required stripping lengths.
- Use copper cables for operating temperatures of >100 °C.
- The power supply is approved for connection to TN, TT, and IT (PE) power grids (star networks). Observe the maximum permissible phase-to-phase voltage.
- Protect the device against foreign bodies penetrating it, e.g., paper clips or metal parts.

- Ensure the degree of protection. Pay attention to the sealing of the cable feed-throughs and use protective caps for unused connections or cable ends with rubber seals.
- An additional protective conductor connection is optionally available on the housing for proper installation. Applicable regulations must be observed in full.

5.3 Intended use

- Use this power supply to convert the electrical energy fed in by the power grid. The AC input voltage is electrically isolated from the DC output voltage.
- Protection may be impaired if the equipment is used in a manner not specified by the manufacturer.
- The adjustable DC output voltage U_{Out} is a protective extra-low voltage.
- The integrated compact multi-channel electronic circuit breakers are used to selectively protect multiple load circuits against overloads, short circuits, and impermissible operating states. Each channel monitors the respective load current and disconnects only the affected circuit in the event of a fault. This protects connected components and reduces system downtimes. The channels can be switched on or off, or reset, either by pressing the channel button on the user interface or via IO-Link. Operating locks can be used to prevent unauthorized access via the user interface or the IO-Link interface.
- The power supply (IO-Link device) is equipped with an integrated IO-Link interface. To connect to a higher-level control system, a corresponding gateway (IO-Link master) is required which serves as a fieldbus interface for conversion to the required communication protocol. This communication protocol is used to send application-specific electrical measurements, load data, and status information to the higher-level control system for processing. The control unit can also be used to display and change relevant power supply settings (e.g., voltage and trigger current values). This enables early detection of overload or error states in the central system monitoring.

This power supply is a specialist product. Only qualified specialist personnel with electrotechnical expertise may install, start up, and operate this power supply.

NOTE: Observe mechanical loads

Avoid any mechanical loads on the connecting cables, otherwise the electrical contact is at risk.

Observe the maximum output ratings of the power supply. The average output power must not exceed the maximum nominal power limit (P_N/ $P_{stat.Boost}$).

If the input voltage falls to a value <100 V AC/ <140 V DC during normal operation, the static boost and dynamic boost operating characteristics are not possible.

6 Cybersecurity measures

The power supply has been developed in accordance with the international safety standards of IEC 62443-4-1.

6.1 Protection requirements and risk assessment

The power supply does not process any personal data, but operating data and control commands are transmitted via the interface. Always prevent unauthorized access.

6.2 Security measures

The power supply is classified in accordance with DIN EN 60529. Installation and operation at a suitable installation location are therefore required. The access-protected installation location constitutes the physical barrier required by security measures at company level.

If a security vulnerability exists for products, solutions, or services from Phoenix Contact, it will be published on the website of PSIRT (Product Security Incident Response Team): see www.phoenixcontact.com/psirt.

To enable quick initial commissioning, the power supply is delivered from the factory without access protection (e.g., without a password) and without any access lock or button lock.

Ensure that only authorized persons have physical access to the communication interfaces during initial commissioning.

After commissioning, suitable access protection must be activated immediately, e.g., by assigning a numerical password.

Access can be restricted to an authorized group of people by means of various operating locks, in order to ensure compliance with requirements for security, responsibilities, and error prevention.

The IO-Link communication protocol does not have any safety functions. Protect the communication connections from unauthorized access.

Classic IO-Link networks do not provide any security functions such as authentication or integrity protection. To ensure segmentation and access control, additional measures such as the use of a firewall or a security gateway are required at the zone boundaries. Observe the IO-Link Security Guideline: https://io-link.com/downloads

Additional measures for protection against unauthorized network access can be found in the “INDUSTRIAL SECURITY” application note. The application note can be downloaded via the item (www.phoenixcontact.com/products).
German: AH DE INDUSTRIAL SECURITY, 107913
English: AH EN INDUSTRIAL SECURITY, 107913

6.3 Regulatory requirements

The power supply falls under the requirements of the EU's Cyber Resilience Act (CRA) and IEC 62443 (IT security for industrial automation systems).

Safety functions to reduce security vulnerabilities are implemented through measures such as security by design and security by default.

There is an obligation to provide recurring security updates during the support period.

The support period is the period during which the manufacturer provides security updates and patches in accordance with IEC 62443.

This power supply meets the requirements of the EU Cyber Resilience Act EU 2024/2487.

6.4 Responsibilities throughout the product lifecycle

The defined safety measures and regulatory requirements apply across the entire product lifecycle of the power supply and cover the responsibilities of both the manufacturer/distributor and the operator.

6.4.1 Manufacturer or distributor

The manufacturer or distributor is obliged to take all safety-relevant requirements into account starting from the development and design phase, to implement suitable protective mechanisms, to carry out regular risk analyses, and to provide safety-relevant updates, technical documentation, and documentary evidence.

6.4.2 Operator

The operator is responsible for proper installation, safe operation, continuous maintenance, and the implementation of the safety measures specified by the manufacturer.

The operator must also ensure that all regulatory requirements are met during operation, updates are installed, and any security incidents are documented and reported.

In order to safely delete all user-specific data and configurations when decommissioning, you the operator should load the default settings. This sets the power supply to a defined initial state (see section: Hardware reset).

7 High-voltage test (HIPOT)

This protection class I power supply is subject to the Low Voltage Directive and is factory tested. During the HIPOT test (high-voltage test), the insulation between the input circuit and output circuit is tested for the prescribed electric strength values, for example. The test voltage in the high-voltage range is applied at the input and output terminal blocks of the power supply. The operating voltage used in normal operation is a lot lower than the test voltage used.

High-voltage tests can be performed as described.

The test voltage should rise and fall in ramp form. The relevant rise and fall time of the ramp should be at least two seconds.

7.1 High-voltage dielectric test (dielectric strength test)

In order to protect the user, power supplies (as electric components with a direct connection to potentially hazardous voltages) are subject to more stringent safety requirements. For this reason, permanent safe electrical isolation between the hazardous input voltage and the touch-proof output voltage as safety extra-low voltage (SELV) must always be ensured.

In order to ensure permanent safe isolation of the AC input circuit and DC output circuit, high-voltage testing is performed as part of the safety approval process (type test) and manufacturing (routine test).

7.2 High-voltage dielectric test during the manufacturing process

During the power supply manufacturing process, a high-voltage test is performed as part of the dielectric test in accordance with the specifications of IEC/UL/EN 61010-1. Routine manufacturing tests are inspected regularly by a certification authority.

7.3 High-voltage dielectric test performed by the customer

Apart from routine and type tests to guarantee electrical safety, the end user does not have to perform another high-voltage test on the power supply as an individual component. According to EN 60204-1 (Safety of machinery - Electrical equipment of machines) the power supply can be disconnected during the high-voltage test and only installed once the high-voltage test has been completed.

7.3.1 Performing high-voltage testing

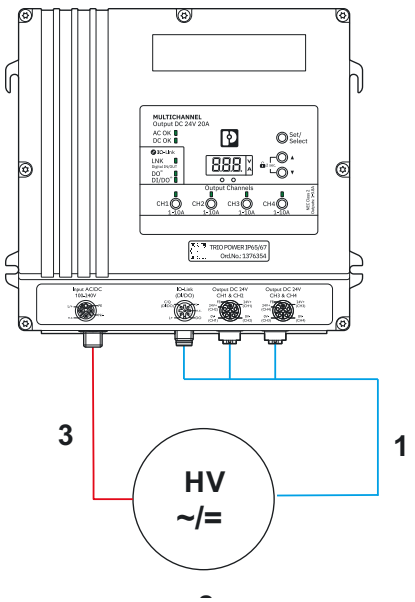
If high-voltage testing of the control cabinet or the power supply as a stand-alone component is planned during final inspection and testing, the following features must be observed.

- The power supply wiring must be implemented as shown in the wiring diagram.
- The maximum permissible test voltages must not be exceeded.

Avoid unnecessary loading or damage to the power supply due to excessive test voltages.

For the relevant applicable test voltages and insulation distances, refer to the corresponding table (see technical data: electric strength of the insulation section).

Figure 1 Potential-related wiring for the high-voltage test



Key

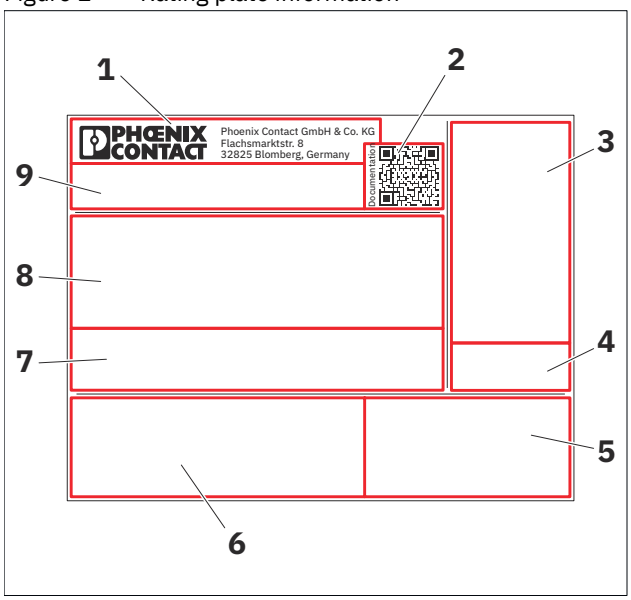
No.	Designation	Color coding	Potential levels
1	DC output circuit	Blue	Potential 2
2	High-voltage tester	--	--
3	AC input circuit	Red	Potential 1

8 Design

8.1 Rating plate

The power supply device rating plate is located on the right-hand side of the housing (as viewed from the front).

Figure 2 Rating plate information

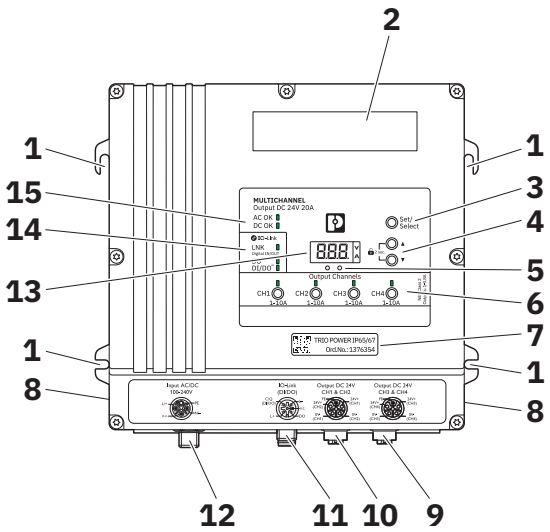


Key

No.	Designation
1	Identification of the provider
2	QR code as web link to the device documentation
3	Device approvals
4	Degree of protection
5	Barcode and serial number, device version, production date, production location
6	Device-specific warning notice and designation of device documentation accompanying the product
7	Ambient conditions
8	Connection data
9	Order designation and item number

8.2 Device front

Figure 3 Position of the connections, function elements, and operating elements

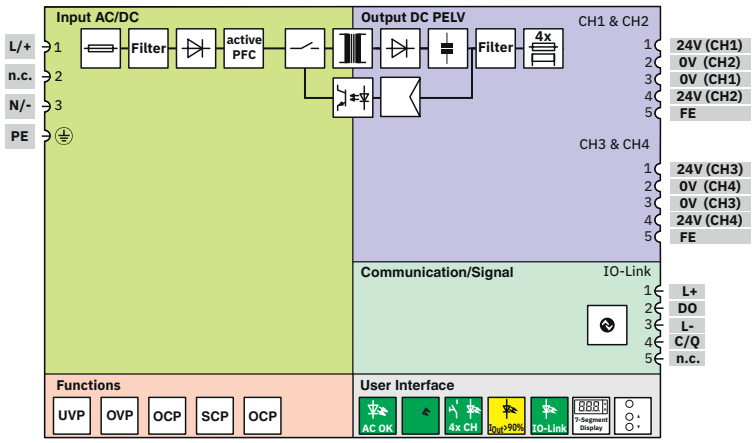


Key

No.	Designation	Connection labeling
1	Mounting holes (∅ 6 mm)	
2	Marking field, e.g., for plant and location identification	
3	“Set/Select” button	
4	Arrow keys up/down	
5	Infrared interface for service and maintenance purposes (not intended for user operation)	
6	Channel button and channel LED (4 x)	
7	QR code web link	
8	Housing grounding point	
9	Screw connecting plug (female connector) for output voltage	
10	Screw connecting plug (female connector) for output voltage	
11	Screw connecting plug (male connector) for IO-Link/SIO mode	
12	Screw connecting plug (male connector) for input voltage	
13	7-segment display for displaying current and voltage values	
14	Signaling: communication interface (IO-Link/SIO mode)	
15	Signaling: AC OK LED and DC OK LED	

8.3 Block diagram

Figure 4 Block diagram



Key

Symbol	Designation – Input AC, Output DC
	Input fuse, internal device protection
	EMC filter
	Rectification
	Power factor correction (PFC)
	Switching transistor
	Transmitter with electrical isolation
	Smoothing capacitor
	Electrically isolated signal transmission (optocoupler)
	Control equipment
	Electronic circuit breaker with adjustable tripping threshold (channel by channel)

Symbol	Designation – Functions
	Undervoltage protection protects the AC input of the power supply against damage in the event of an AC undervoltage.
	Overvoltage protection protects the DC output of the power supply and the connected load against damage in the event of an overvoltage
	Overtemperature protection protects the power supply against damage in the event of impermissibly high intrinsic external heating.
	Overcurrent protection protects the DC output of the power supply against damage in the event of an impermissibly high current load.
	Short-circuit protection protects the DC output of the power supply against damage in the vent of an output-side short circuit.

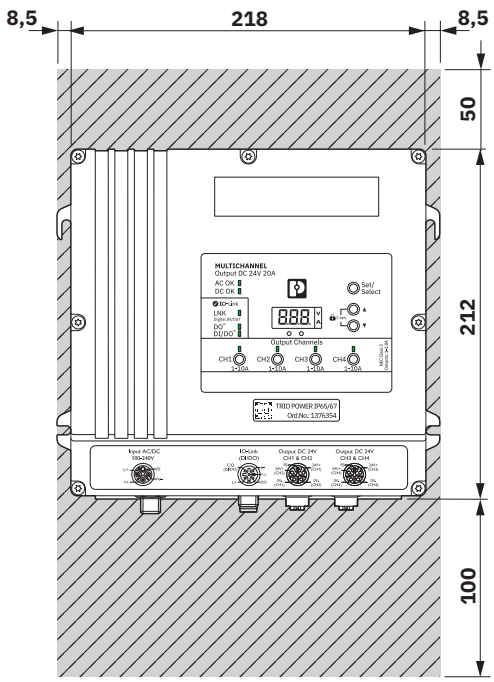
Symbol	Designation – Signal
	IO-Link communication interface/SIO mode for data exchange between the power supply (IO-Link device) and gateway (IO-Link master).

Symbol	Designation – User interface
AC OK	AC OK LED indicates whether the AC input voltage for power supply is present
DC OK	DC OK LED, indicates the operating status of the power supply
IO-Link	IO-Link LED, visualizes the operating status of the IO-Link interface.
4x CH	Channel LED, signals the status of the channels.
7-Segment Display	7-segment display for displaying current and voltage values
	Button for selecting channels and settings

8.4 Device dimensions and keep-out areas

To protect the power supply against thermal overload, observe the required keepout areas during configuration. The specified dimensions of the keepout areas are based on the normal mounting position of the power supply.

Figure 5 Device dimensions and minimum keep-out areas (in mm)



9 Mounting/remove

The power supply is mounted on a flat, load-bearing mounting surface (panel mounting). When selecting the mounting location, ensure that the mounting prerequisites are met.

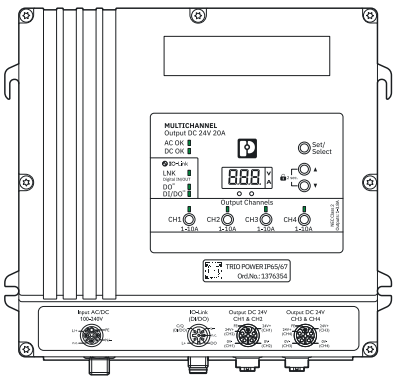
9.1 Mounting prerequisites

– Mount the power supply unit indoors.
– Mount the power supply in the normal mounting position (connector plug at the bottom).
– To allow sufficient air convection, observe the required minimum clearances when mounting (see section: Keep-out areas).
– Observe the ambient conditions regarding installation altitude and ambient temperature. In the event of deviating ambient conditions, observe the derating information (see section: Derating).
– To mount the power supply, use 4 screws (M5), 4 spring washers (according to ISO 10670) and mounting material suitable for the surface (threaded or dowel mounting).

9.2 Mounting position

The specified technical data is based on installation in the normal mounting position.

Figure 6 Normal mounting position

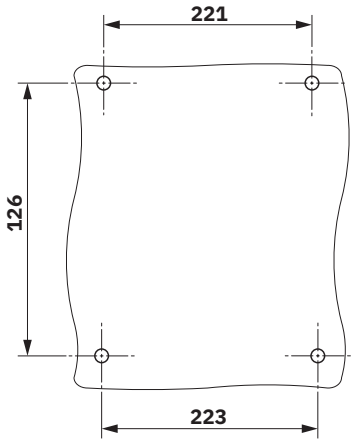


The power supply is not subject to position-dependent derating.

The power supply can also be mounted horizontally, overhead, or side-mounted.

9.3 Drilling pattern for fixing holes

Figure 7 Drilling pattern for fixing holes (dimensions in mm)



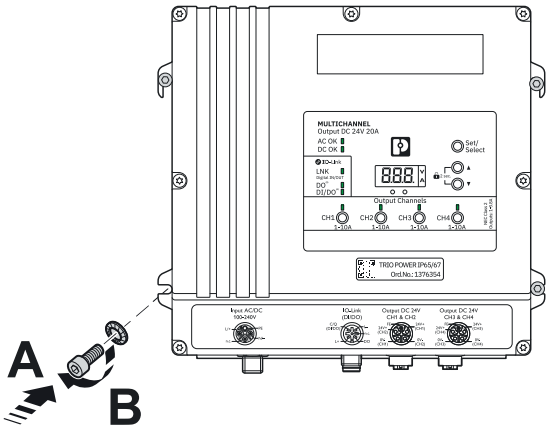
9.4 Mounting the power supply unit

9.4.1 Panel mounting

Proceed as follows to mount the power supply:

1. Copy the entire drilling pattern onto the substructure or mounting wall.
2. Select suitable fixing material according to the substructure or mounting wall. (Mounting holes: ∅ 6 mm)
3. Drill the necessary number of drill holes using a suitable drill, depending on the type of fixing (threaded or wall plug mounting).
4. Fix the die-cast housing in place using four screws and four spring washers
5. Check that the die-cast housing is securely mounted

Figure 8 Schematic diagram of panel mounting



9.5 Removing the power supply unit

To remove the power supply, perform the same procedure for the relevant type of fixing (panel mounting, structural profile mounting) in reverse.

10 Electrical connection

On the device side, all the connection contacts of the power supply are circular connectors. For the respective contact assignment of the circular connectors for the device supply or load supply, please refer to the relevant section on the input, output, or communication.

For protection against fatal electric shock, the die-cast housing is wired internally to the protective conductor connection of the device-side circular connector for the AC input voltage.

Optionally available circular connectors are required for the field-side connection of the power supply (see accessories).

Only remove or plug in the device connector when the voltage is disconnected.

10.1 Coding of field-side circular connectors

Each field-side circular connector that is required is assigned its special function with different coding. Incorrect plugging between input, output, and communication is therefore impossible.

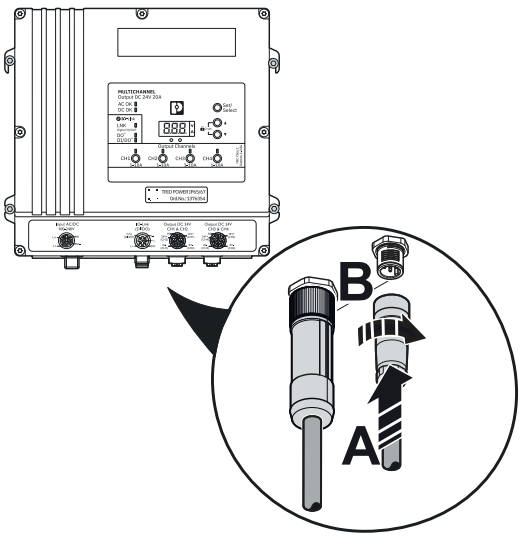
For the coding of field-side circular connectors, refer to the table below:

Device-side marking	Coding
Input	S-coded
Output DC	L-coded
Communication (IO-Link)	A-coded

10.2 Connecting field-side circular connectors

The field-side circular connectors to be used are coded like the device-side circular connectors. This ensures clear assignment between AC device supply, DC load supply, and the signal contact. Unintentional incorrect connection is prevented.

Figure 9 Schematic diagram, connecting field-side circular connectors



Proceed as follows to connect the field-side circular connectors:

A Depending on their assigned functionality and coding, securely attach the field-side circular connectors to the device-side circular connectors.

B To lock the circular connectors, tighten the screw locking mechanism by turning it clockwise. Observe the tightening torque of the circular connector.

10.3 Releasing field-side circular connectors

To release the field-side circular connectors, perform the same procedure in reverse.

10.4 Input

The power supply is approved for connection to TN, TT, and IT (PE) power grids (star networks) with a maximum phase-to-phase voltage of 240 V AC/DC.

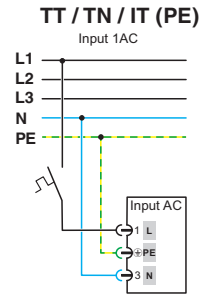
Connection is via the device-side circular connector Input AC/DC.

10.4.1 Primary-side connection and fuse protection

The installation of the power supply must conform to the regulations of EN 61010. It must be possible to switch off the power supply using a suitable disconnect device outside the power supply. For example, the primary-side line protection is suitable for this (see technical data).

10.4.2 1AC supply network

Figure 10 Permissible network types for AC supply



In the 1AC supply network, it is permissible to swap the L and N connections.

10.4.3 DC supply network

Operation on DC power grids is also possible in accordance with the DC nominal input voltage.

DANGER: Hazardous voltage

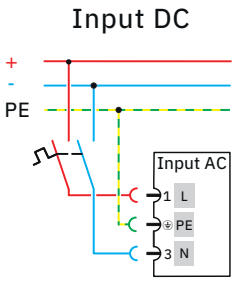
When operating the power supply on a DC voltage system, observe the maximum permissible input voltage (see section: Technical data).

The primary-side fuse protection in DC operation must cover all poles.

NOTE: Damage possible if an incorrect fuse is used

In DC operation, only use fuses that are approved for DC voltages.

Figure 11 Schematic diagram, two-phase fuse protection



10.4.4 Position of circular connector Input AC/DC

Figure 12 Device-side position and contact assignment of circular connector Input AC

Contact assignment	Description
Male contact 1	L/+ (mains supply)
Male contact 2	Not used (N/C)
Male contact 3	N/- (mains supply)
Male contact 4	Protective conductor terminal PE

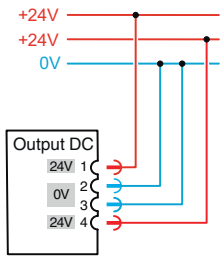
10.5 Output

A DC voltage for supplying the load is provided at the output of the power supply.

Upon delivery, the power supply is preset to a nominal output voltage of 24 V DC. The level of the output voltage can be adjusted (see section: Operation).

Connection is via device-side circular connector Output DC.

Figure 13 Wiring principle, DC output



10.5.1 Protection of the secondary side

The power supply is electronically short-circuit-proof and no-load-proof. In the event of an error, the output voltage is limited

Overvoltage protection (OVP) limits surge voltages at the DC output to ≤ 30 V DC (EN 61131-2).

10.5.2 Position of circular connectors Output DC

Figure 14 Device-side position and contact assignment of the circular connectors for Output DC

Contact assignment	Description
Output DC 24 V CH1 & CH2	
Female contact 1	+24 V DC (CH1)
Female contact 2	0 V DC (CH2)
Female contact 3	0 V DC (CH1)
Female contact 4	+24 V DC (CH2)
Contact socket 5	FE (functional ground)
Output DC 24 V CH3 & CH4	
Female contact 1	+24 V DC (CH3)
Female contact 2	0 V DC (CH4)
Female contact 3	0 V DC (CH3)
Female contact 4	+24 V DC (CH4)
Contact socket 5	FE (functional ground)

10.6 Communication/signal

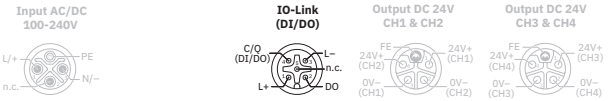
The IO-Link interface can be used either for IO-Link communication with an IO-Link master or in SIO mode for connecting conventional standard IO peripheral devices.

In the delivery state, the interface is parameterized as a digital input (DI – remote reset of the output channels). When the device is started, the interface automatically detects whether the device is operated on an IO-Link master or on a standard periphery. Switching between IO-Link and SIO mode takes place automatically when the device is restarted.

The interface can be parameterized via IO-Link so that the function of the interface is variable in SIO mode.

10.6.1 Position of circular connector IO-Link

Figure 15 Device-side position and contact assignment of circular connector for IO-Link



Contact assignment	Description
Male contact 1	L+
Male contact 2	DO
Male contact 3	L-
Male contact 4	C/Q (DI/DO)
Male contact 5	not used

The interface can be parameterized via IO-Link so that the function of the interface is variable in SIO mode.

The digital output pin 2 (DO) can be parameterized with various operating functions and is available in IO-Link and SIO mode.

- DC OK ≥ 21 V
- P ≤ 90%
- Temperature OK
- Runtime limit not reached
- No channel triggered
- No channel faulty
- No channel switched off
- AC OK

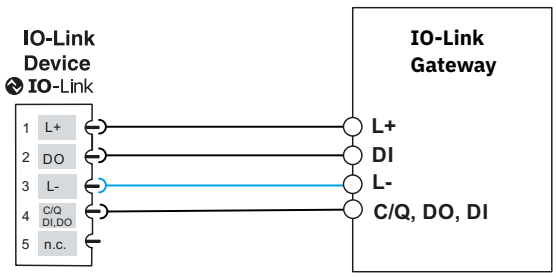
After changing the function of PIN 4 from DI to DO or DO to DI, a complete restart of the power supply unit is required. The input voltage and the power supply of the IO-Link interface must be disconnected and reconnected in order to correctly adopt the changed configuration.

Pin 4 C/Q (DI/DO) can be parameterized as a digital input (DI) or digital output (DO). When used as a digital output, various operating functions can be parameterized.

– DC OK ≥ 21 V
– P ≤ 90%
– Temperature OK
– Runtime limit not reached
– No channel triggered
– No channel faulty
– No channel switched off
– AC OK

Both digital outputs can be parameterized independently of each other as N/C or N/O contacts.

Figure 16 Wiring principle of the IO-Link interface



10.7 PE connection

10.7.1 PE connection of the mains supply

The PE connection of the grid connection (input plug) must be connected to the protective ground (PE) of the mains installation. It ensures the primary protective grounding of the device and is required for safe operation in accordance with applicable standards. The complete die-cast aluminum housing and the connector housing of the mains power supply (input plug) are fully connected to the PE contact of the grid connection (input plug).

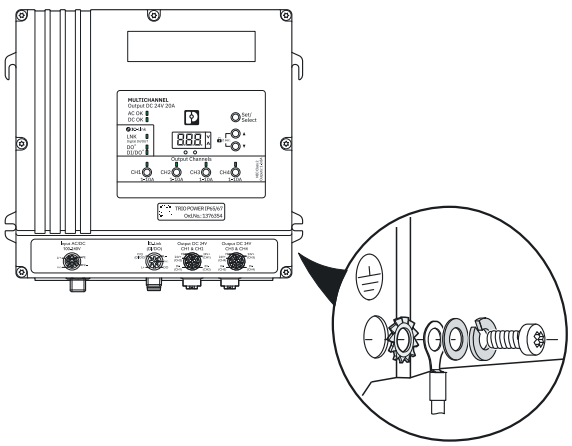
10.7.2 Housing grounding point

Several grounding points (with M4 screw threads) are available on the housing. When in operation, use only one of the grounding points.

The grounding point on the housing can also be used on the system side to connect the metal housing of the power supply unit directly to the protective conductor (PE), equipotential bonding, the machine frame, or the system. The use of this connection depends on the requirements of the application and must comply with the locally applicable standards and regulations.

The grounding point is designed as an M4 screw thread. Use grounding material suitable for the application, e.g., grounding material VS-ES-100-6, item no. 1055164, and a suitable M4 screw and lock washer.

Figure 17 Example of housing grounding



11 Operation

The power supply offers various operating options via the user interface (7-segment display, arrow keys, channel buttons) and the IO-Link interface.

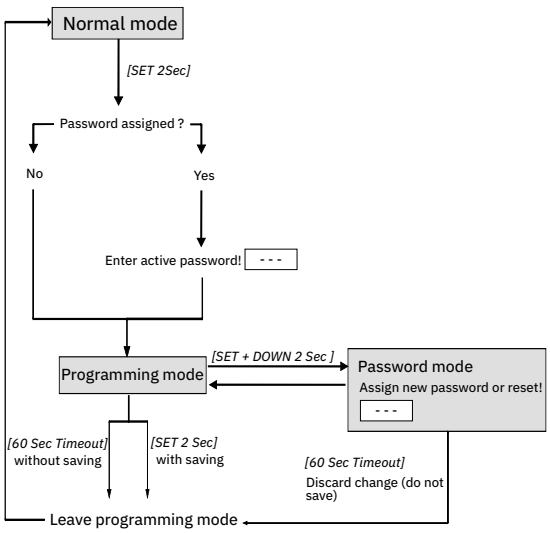
11.1 Operating modes

The appliance has three different operating modes with different operating options:

– Normal mode
– Programming mode
– Password mode

You can switch between operating modes via the user interface as follows.

Figure 18 Changing operating modes



11.2 Operating locks

To enable quick initial commissioning, the power supply is delivered from the factory without access protection (e.g., without a password) and without any access lock or button lock.

Ensure that only authorized persons have physical access to the communication interfaces during initial commissioning.

After commissioning, suitable access protection must be activated immediately, e.g., by assigning a numerical password.

11.2.1 IO-Link operating locks

Various locking functions (“locks”) are available within IO-Link communication, which regulate access to specific device functions:

– Parameterization lock: prevents parameters or settings on the device from being changed. It is still possible to use the arrow buttons to view and output the actual voltage, actual total currents, and the individual channel currents.
– Local user interface lock: prevents operation on the device (all buttons). 7-segment display is switched off
– Activation/deactivation of password protection and assignment of a 3-digit password (000 ... 999), which restricts access to the operating elements. It is still possible to use the arrow buttons to view and output the actual voltage, actual total currents, and the individual channel currents.

The centrally controlled operating locks offer increased security and flexibility, as they can be customized quickly and efficiently throughout the IO-Link network. The locking signals transmitted via IO-Link always have priority over the locking functions configured via the user interface.

11.2.2 Operating locks of the user interface

Two locking functions are available via the user interface to restrict access to the device.

With both locking functions, it is still possible to use the arrow button menu to view and output the actual voltage, actual total currents, and the individual channel currents.

Lock button

The button lock prevents settings on the device from being changed directly via the operating buttons. This reliably prevents unauthorized operation. These include switching the output channels on and off and resetting them, as well as access to device parameterization.

Press and hold the “up” and “down” arrow buttons for 2 seconds to activate the button lock.

Assigning a password

A password (000 ... 999) can be assigned via the user interface. In that case, the device can only be parameterized after entering a valid password. This provides increased security against unauthorized access and ensures that only authorized persons can make changes to the device settings.

Information on setting the password can be found in the section “Assigning a new password”.

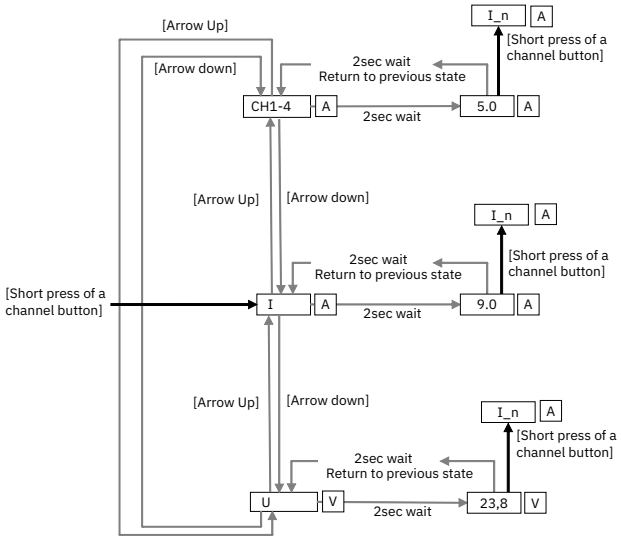
To reset a previously set password, select “- - -” as the password.

11.3 Normal mode

11.3.1 7-segment display

In normal mode, you can display the set output voltage U_{Is}, the output current I_{Is}, or the set current value per channel on the 7-segment display of the user interface. You can switch between the different views using the arrow buttons.

Figure 19 Display navigation in normal mode



11.3.2 Channel button

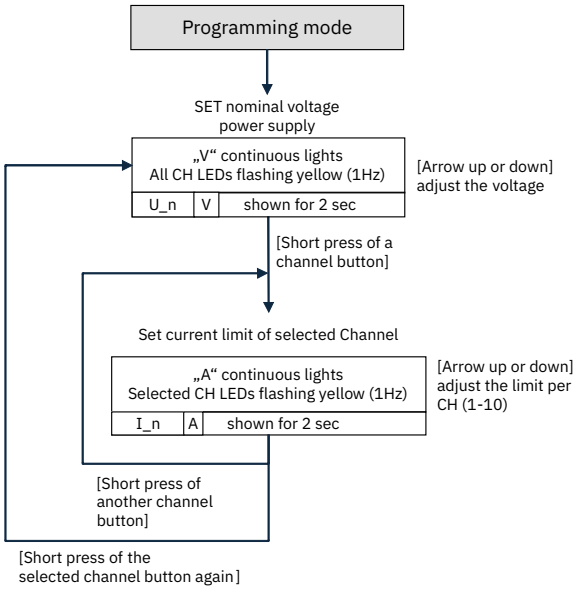
Depending on the status of the output channels, the following settings can be made by pressing the channel button for 2 seconds in normal mode:

Channel status	Action via channel button [2s]
Channel is switched on	Channel is switched off
Channel is switched off	Channel is switched on
Channel switched off by prioritized switch-off	Channel is switched on
Channel tripped (5s recovery time)	Channel is switched on Short circuit still present: Channel trips again
Channel Error	-

11.4 Programming mode

In programming mode, you can set the output voltage or the current value for each channel.

Figure 20 Setting options in programming mode



Setting the output voltage

To set the output voltage, proceed as follows:

1. Start the programming mode by pressing and holding the “SET” button for 2 seconds. The “V” display lights up permanently, and the channel LEDs flash yellow.
2. Use the arrow buttons to set the nominal current for the channel. Possible settings: 1 A (NEC2), 2 A (NEC2), 3 A (NEC2), 3.8 A (NEC2), 4 A, 5 A, 6 A, 7 A, 8 A, 9 A, 10 A.
3. Set the nominal current of the channels directly after that, or press the “SET” button for 2 seconds to save the output voltage setting and exit programming mode.

Setting the nominal current per channel

To set the nominal current per channel, proceed as follows:

1. Start the programming mode by pressing and holding the “SET” button for 2 seconds.
2. Press the channel button of the channel for which you want to set the current value. The “A” indicator lights up permanently, and the channel LED flashes yellow.
3. Use the arrow buttons to set the nominal current for the channel. Possible settings: 1 A (NEC2), 2 A (NEC2), 3 A (NEC2), 3.8 A (NEC2), 4 A, 5 A, 6 A, 7 A, 8 A, 9 A, 10 A.
4. Use another channel button to select the next channel to set the nominal current, or press and hold the “SET” button for 2 seconds to save and exit programming mode.

If no button is pressed for 60 seconds, programming mode is exited without saving.

11.5 Password mode

11.5.1 Assigning a new password

To assign a password, proceed as follows:

1. Press and hold the “SET” button for 2 seconds. The device switches to programming mode.
2. Press and hold the “SET” button and the “down” arrow button for 2 seconds. The device switches to password mode and placeholders for 3 digits - - - appear in the 7-segment display.
3. The placeholder for digit 1 flashes. Use the arrow buttons to select the desired value (0 ... 9) and confirm your selection with the “SET” button.
4. The placeholder for digit 2 flashes. Use the arrow buttons to select the desired value (0 ... 9) and confirm your selection with the “SET” button.
5. The placeholder for digit 3 flashes. Use the arrow buttons to select the desired value (0 ... 9) and confirm your selection with the “SET” button.
6. Press and hold the “SET” button again for 2 seconds to save and exit programming mode.

To reset a previously set password, select “- - -” as the password.

11.5.2 Entering the active password

If the active password needs to be entered, 3 digits “0 - -” are visible in the 7-segment display.

1. Use the arrow buttons to select the first digit of your password (0-9) and confirm your entry with the “SET” button.
2. Repeat the procedure for the second and third digits.

If the password is entered incorrectly, “Err” appears on the display for 2 seconds. The device then switches back to normal mode.

12 IO-Link interface

The IO-Link communication protocol does not have any safety functions. Protect the communication connections from unauthorized access.

Classic IO-Link networks do not provide any security functions such as authentication or integrity protection. To ensure segmentation and access control, additional measures such as the use of a firewall or a security gateway are required at the zone boundaries. Observe the IO-Link Security Guideline: https://io-link.com/downloads

The power supply has an IO-Link interface for communication with higher-level control systems. The following modes and settings, among others, can be parameterized via IO-Link.

For IO-Link-specific information on register tables, refer to the additional document “Process data and status information” in the download area.

12.1 Channel status after voltage recovery

The behavior of the output channels in the event of an interruption in the supply voltage can be parameterized via the IO-Link interface. The configuration defines how the device handles the initial state when the supply voltage is switched off and later restored.

The following options are available via IO-Link:

1. Save channel status (Delivery status)

In this mode, the device automatically saves the current status of all output channels when the supply voltage is switched off.

– Output channels that were switched on before the voltage interruption are switched on again when the supply voltage is restored.
– Output channels that were previously switched off remain switched off.

2. Do not save channel status (restart status)

In this setting, no channel status is saved when the voltage is switched off.

– When the supply voltage is restored, the device starts with all output channels switched off.
– The output channels must then be activated via IO-Link or manually using the buttons on the device.

12.2 Static and dynamic boost

The current boost status of the device can be read using the process data, via the IO-Link interface. The read status enables the user to precisely monitor the current device status and supports diagnostics and optimum system design.

The device distinguishes between two operating modes.

Static boost

The static boost provides information on whether the device is permanently operating in an increased power mode. This mode is used when constant extra power is required.

Dynamic boost

The dynamic boost indicates whether the device is providing increased output power for a short time. This mode is activated automatically if additional energy is required at short notice.

12.3 ECO mode

In ECO mode, the behavior of the 7-segment display can be parameterized via IO-Link to reduce the energy requirement in standby mode and to extend the service life.

The available modes are:

ECO mode 0 - display permanently active

If the ECO mode is set to 0, the appliance is in normal operation. In this setting, the 7-segment display behaves as follows:

- The 7-segment display is permanently switched on.
- There is no automatic switch-off or dimming.

ECO mode 1 - energy saving mode active

Energy efficiency is optimized in the ECO mode 1 setting. In this setting, the 7-segment display behaves as follows:

- The 7-segment display is switched off by default.
- Pressing any button switches the 7-segment display on.
- After a button is pressed, the 7-segment display remains switched on for 10 minutes.
- At the end of this time, the display switches off again automatically if no other button has been pressed.

12.4 IO-Link system commands

The following system commands can be executed via the IO-Link interface:

Reset device (soft restart)

The input voltage and the output channels are switched off. After one second, the input voltage and the output channels that were switched on before are switched on again.

Reset the application

The device will be reset to the default settings:

- Output channels off
- Output voltage 24 V
- Password reset
- Lock resets
- Reset diagnostic state (except Total Runtime)

Restore the delivery state

The device will be reset to the default settings:

- Output channels off
- Output voltage 24 V
- Password reset
- Lock resets
- Text tags are reset to the default value “***”

Back to box

The device will be reset to the default settings:

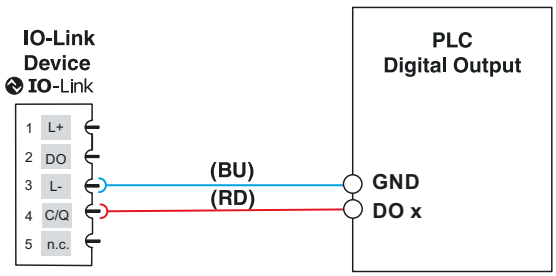
- Output channels off
- Output voltage 24 V
- Password reset
- Lock resets
- Reset diagnostic state
- Deactivation of IO-Link communication
- Text tags are reset to the default value “***”

This option is particularly suitable for safety-relevant applications in which a defined switched-off start status is required.

12.5 Remote reset operating mode

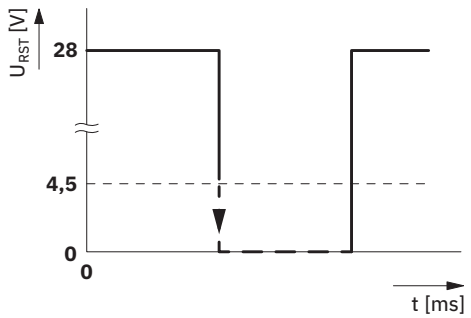
The power supply has an integrated remote reset operating mode as an alternative to the IO-Link interface. In this operating mode, all triggered output channels of the power supply that are ready to be switched on again (flashing red) are automatically switched on. Select the following alternative wiring of the IO-Link interface for this.

Figure 21 Wiring principle of the remote reset operating mode



If you want to switch the triggered output channels back on again with a central reset signal, you can do this with a digital output (DO) of a PLC, for example. The IO-Link communication input C/Q is designed in such a way that the voltage level of the reset voltage (U_{RST}) must fall below the value 4.5 V DC on a falling edge to trigger the remote reset operating mode. The input voltage for wiring the IO-Link communication input must not exceed 28 V DC.

Figure 22 Activation of the triggered channel via a falling edge



The power supply automatically detects and distinguishes between IO-Link communication and remote reset operating mode. Dual operation of IO-Link communication and remote reset operating mode is not possible. To change between IO-Link communication and remote reset operating mode, a device restart of the power supply is always required.

13 Signaling

The power supply has various multicolor LEDs to visually indicate the current operating state.

– AC OK LED
– DC OK LED
– IO-Link LED
– DO LED
– DI/DO LED
– 4x channel LEDs

13.1 AC OK LED

The AC OK LED is available for function monitoring of the input voltage. For the color coding of the multicolor LED to the various operating states of the power supply, refer to the following table:

Multi-color LED	Color	Description
●	green	1 AC: $U_{IN} \geq 85$ V DC: $U_{IN} \geq 90$ V
●	yellow	1AC: device is switched on and $U_{IN} < 85$ V DC: device is switched on and $U_{IN} < 90$ V
●	red	1AC/DC: $U_{IN} \geq 274$ V (hysteresis to green ≤ 264 V)
○	without	Input voltage not present.

Key:

○ = off, ● = on, ✹ = flashing

13.2 DC OK-LED

A DC OK LED is available for visual and preventive function monitoring of the power supply. For the color coding of the multicolor LED to the various operating states of the power supply, refer to the following table:

Multi-color LED	Color	Description
○	without	Input voltage not present or too low.
●	green	The power supply unit is in normal operation. $U_{OUT} \geq 21$ V & $I_{OUT} \leq 0.9 \times I_N$.
●	yellow	Power supply unit is in normal operation, however the pre-alarm threshold $I_{Out} > 0.9 \times I_N$ (90%) has been exceeded.
●	red	Overload or short circuit at the output.
✹	red (3 Hz)	Internal overvoltage detected at the output (OVP).
✹	red (6 Hz)	Internal communication error.

Key:

○ = off, ● = on, ✹ = flashing

13.3 IO-Link LED

An IO-Link LED is available for visual monitoring of IO-Link communication. For the color coding of the multicolor LED to the various operating states of the power supply, refer to the following table:

Multi-color LED	Color	Description
●	green	IO-Link supply voltage 24 V+ is within the permissible range.
✹	green	IO-Link supply voltage 24 V+ is within the permissible range, and IO-Link communication is active.
○	without	IO-Link supply voltage is not present or is not within the permissible range.

Key:

○ = off, ● = on, ✹ = flashing

13.4 DO LED

The DO LED is available for visual monitoring of the DO signal. For the color coding of the multicolor LED to the various operating states of the power supply, refer to the following table:

Multi-color LED	Color	Description
●	green	IO-Link supply voltage 24 V+ available & DO output 24 V high signal.
○	without	IO-Link supply voltage 24 V+ not available or DO output 0 V low signal

Key:

○ = off, ● = on

13.5 DI/DO LED

The DI/DO LED is available for visual monitoring of the DI/DO signal. For the color coding of the multicolor LED to the various operating states of the power supply, refer to the following table:

Multi-color LED	Color	Description
●	green	IO-Link supply voltage 24 V+ available & DI input/DO output 24 V high signal.
○	without	IO-Link supply voltage 24 V+ not available or DI input/DO output 0 V low signal.

Key:

○ = off, ● = on

13.6 Channel LEDs (4x)

During operation of the power supply, the channel LED indicates the actual operating status for each channel.

For the color-coded assignment of the multicolor LED to the relevant operating state of the power supply, refer to the following table:

Multi-color LED	Color	Description
●	green	Channel is switched on and fuse-protected.
☀	green, all (4x 4 Hz)	Button lock is deactivated.
●	yellow	Channel utilization is 80%.
☀	yellow (1 Hz)	Channel setting is active.
☀	yellow, all (1 Hz)	Output voltage setting is active (all channels)
☀	yellow, all (4x 4 Hz)	Button lock was activated.
☀	yellow, all (8x 4 Hz)	Button lock is active.
●	red	The channel has tripped and is currently in the approx. 5 second cool-down phase. It cannot be switched on again.
☀	red	The cooling phase is complete. The channel can be switched on again.
☀	red (flash code)	Channel was switched off due to channel prioritization.
☀	red/yellow (toggle flash)	Current > 120 %, channel will be switched off shortly.
○	without	Channel is switched off.

Key:

○ = off, ● = on, ☀ = flashing

14 Operating behavior

14.1 Capacity and short-circuit detection

Using its integrated detection function on the output side, the power supply distinguishes between short circuits in the event of an error or short-circuit-like behavior, e.g., when charging capacitive loads.

Loads with bouncing switching behavior and pronounced inrush current peaks can cause false triggering of the internal short-circuit detection. As a result, the output channel in question is automatically switched off.

For the maximum switchable combinations of ohmic/inductive or capacitive loads, please refer to the following table:

Ohmic/inductive load	Capacitive load
I [A]	C [mF]
10	10
8.9	22
3.5	30

14.2 Change in channel behavior with regenerative voltages

This function is supported from device version V/C 00 onward.

The current device version can be found on the rating plate on the device.

NOTE: Overvoltages from regenerative power supplies can damage loads

If the channel behavior changes, it must be ensured that connected loads can withstand the voltage level fed back.

If a voltage of ≥ 30 V DC is fed back to the outputs of the electronic circuit breakers, all output channels are switched off for safety reasons. This measure protects all other connected loads from this overvoltage as a precautionary measure. If the fed-back voltage value falls below 29 V DC, the electronic circuit breakers are automatically switched on again.

To prevent a channel switch-off due to a voltage feedback, this function is deactivated on a channel-by-channel basis exclusively via the IO-Link parameters.

The IO-Link parameters for changing the channel behavior can be found in the additional document in the download area.

14.3 Tripping characteristic

The output is switched off at a variable time as a function of the load current in the event of a fault.

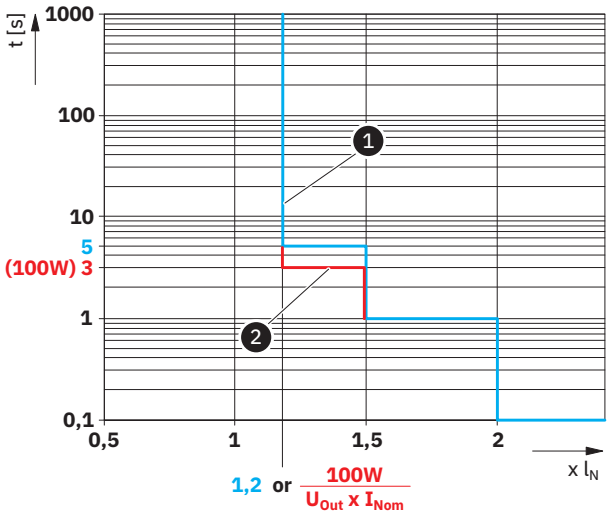
If the load on the output side permanently exceeds 15.5 A, then the channel current will be limited to this value. This can trigger the internal short-circuit detection mechanism, which in turn leads to the shutdown of the channel (< 0.1 second).

The following diagram shows the tripping behavior of the outputs.

The current and time values of the tripping characteristic are subject to the following tolerance values:

Current value: 0% ... +8%

Time value: 0.1 t[s]: ±100 ms, > 0.1 t[s]: ±200 ms



Key

No.	Channel current
❶	1 A, 2 A, 3 A (NEC Class 2)
	4 A, 5 A, 6 A, 7 A, 8 A, 9 A, 10 A
❷	3 A, 3,8 A (NEC Class 2)

15 Output characteristic curves

CAUTION: Hot surface

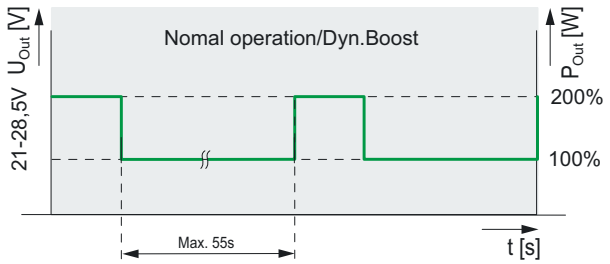
Depending on the ambient temperature and load on the power supply, the housing can become hot.

In normal mode, the power supply constantly supplies the output power in accordance with the nominal data of the device. On the device side, the static and dynamic boost are regarded as an extended operating characteristic of normal operation.

The power supply provides the following operating characteristics depending on the load:

– Normal operation
– Static boost of up to 125% (P_N) for a sustained period
– Dynamic boost of up to 200% (P_N) for 5 s

Figure 23 Output characteristic curves depending on the DC load behavior



15.1 Normal operation / static boost / dynamic boost

In normal operation, the power supply supplies a DC output voltage that is within the voltage range from ≥ 23.5 V DC ... < 28.5 V DC on the load side.

If the DC output current supplying the loads increases due to increased current consumption ($I_{Out} > I_N$), the power supply switches to the dynamic boost.

This operating behavior can occur, for example, when starting up a DC drive or when DC loads are connected in parallel. At that moment, the power supply provides additional power of up to 200% of the nominal power for max. 5 s. If the increased current consumption lasts longer than 5 s and is less than 1.25 x I_N, the power supply switches to static boost.

The multicolor LED indicates the current consumption (I_{Out} > 90%) and lights up yellow.

The maximum available dynamic boost time is directly dependent on the required additional power and can be calculated for the specific application (see section: Example: Boost capability and recovery time).

If the input voltage falls to a value <100 V AC/ <140 V DC during normal operation, the static boost and dynamic boost operating characteristics are not possible.

Observe the maximum output ratings of the power supply. The average output power must not exceed the maximum nominal power limit (P_N/ $P_{stat.Boost}$).

15.2 Cascaded switching on of the channels

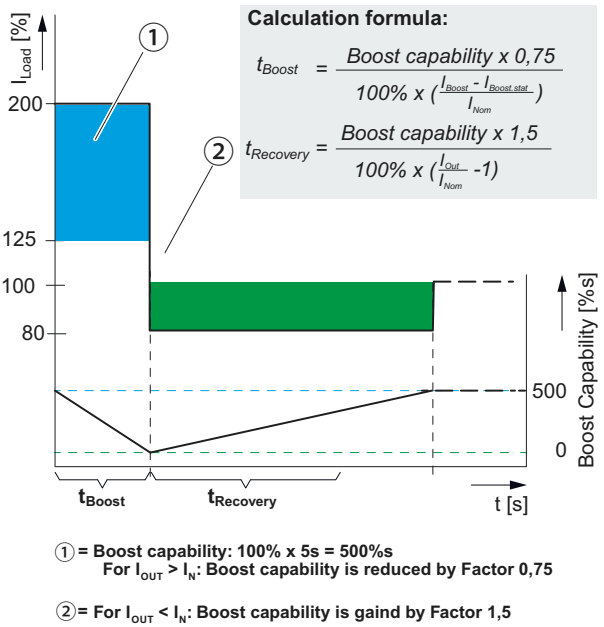
To reduce the inrush current on the secondary side in the power supply switch-on process, the channels are connected to the DC load supply in a cascade at intervals of 100 ms.

15.2.1 Example: Boost capability and recovery time

Depending on the DC load to be supplied, the max. boost time (t_{Boost}) and the corresponding required recovery time ($t_{Recovery}$) need to be calculated for the power supply.

The following data is used as the calculation basis for determining the boost time (t_{Boost}) and the recovery time ($t_{Recovery}$):

Figure 24 General representation and calculation basis, dynamic boost



Key:

Designation	Description
t_{Boost}	Min. time [s] within which the boost current is supplied
I_{Boost}	Max. expected boost current (100% ... 200%)
I_N	Nominal current of the power supply (100%)
Boost Capability	Max. boost capability [%s]
$t_{Recovery}$	Recovery time [s]
K-Factor	Default fixed value (K = 1,5) for determining $t_{Recovery}$

15.2.2 Example: Calculation of t_{Boost}, $t_{Recovery}$

The following example illustrates the formulas that can be used in principle to calculate t_{Boost} and $t_{Recovery}$.

In this example, it is assumed that your application uses the maximum additional power of 100% for the minimum dynamic boost time (5 s).

Assumptions for the calculation

Max. boost capability:	500 % s
ΔI_{Boost} (max) zu $I_{N\,(100\,\%)}$ = 100 %:	I_N x 2
I_{Out} in normal operation, 80%:	I_N x 0.8

Calculated values

t_{Boost}:	5 s
$t_{Recovery}$:	37.5 s

Sample calculation:

$$t_{Boost} = \frac{\text{500\%s x 0,75}}{100\% \text{ x } (\frac{40\text{ A} - 25\text{ A}}{20\text{ A}})} = 5\text{ s}$$

$$t_{Recovery} = \frac{\text{500\%s x 1,5}}{100\% \text{ x } (\frac{16\text{ A}}{20\text{ A}} - 1)} = 37{,}5\text{ s}$$

15.3 Priority-controlled shutdown of output channels

To ensure maximum system availability, the power supply is equipped with priority-controlled shutdown of the output channels. Priority-controlled shutdown of the output channels takes place immediately before the maximum power supply capacity is exceeded.

The dynamic boost function is supported without restrictions.

To prevent a voltage dip in the output voltage, the highest channel-side output current in the event of a power supply overload is determined at the factory and the channel is switched off as a preventive measure. All other DC loads continue to be safely supplied.

Alternatively, in the event of an overload, channel number-oriented shutdown can also be programmed via the integrated IO-Link interface.

Channel no.	instantaneous load current	Priority*		
		A	B	C
1	1 A	2	1	1
2	0.5 A	1	2	3
3	4 A	4	3	2
4	2 A	3	4	4

*Example: Priority 1 = highest priority (e.g., voltage supply of the PLC)

A = factory-set

B = channel-oriented

C = channel-oriented UA before US

16 Hardware reset (power cycle)

A hardware reset can only be carried out by the operator if there is no active IO-Link lock. Otherwise, deactivate the active IO-Link lock beforehand.

The hardware reset resets the power supply to the default settings.

The hardware reset (power cycle) is used to completely reset the device to the default settings. This resets all user-specific settings, including:

– Deactivation of all output channels
– Resetting the output channels to 1 A
– Resetting the output voltage from 24 V
– Resetting the device password
– Resetting the button lock

Proceed as follows to carry out the hardware reset:

1. Disconnect the device completely from the input voltage supply.
2. Press and hold the “SET” button and the “down” arrow button at the same time.
3. Continue to hold down the two buttons and switch the input power supply back on.
4. Continue to hold down the two buttons for at least 10 seconds until the reset has been carried out.

When all the channel LEDs flash yellow 8 x, the device has been reset completely to the default settings.

17 Derating

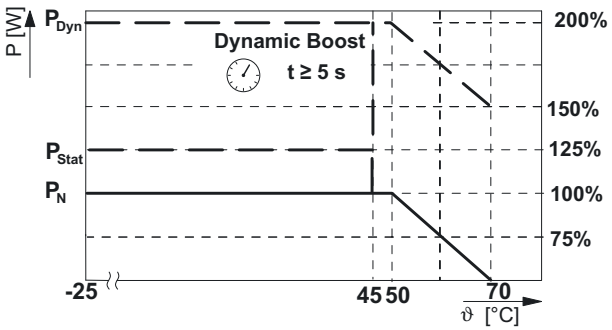
17.1 Ambient temperature

When mounted in the standard mounting position and operated within the permissible temperature range for nominal operation, the power supply provides full output power. If the power supply is operated beyond the temperature range for nominal values, note the reduced output power for the supply of DC loads.

NOTE: Damage due to thermal overload

If the power supply is operated in a different temperature range, only a reduced amount of power can be drawn. Otherwise, the power supply will be thermally loaded disproportionately and the device service life significantly reduced. This thermal load may even damage the power supply such that it is no longer operational.

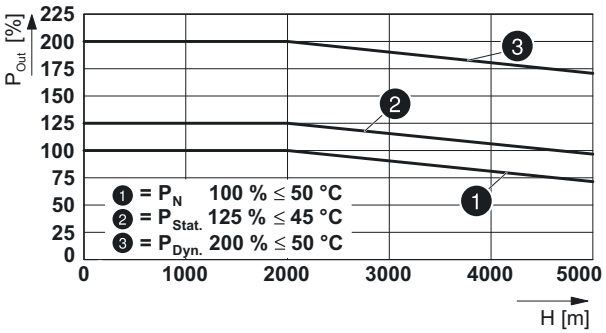
Figure 25 Output power depending on the ambient temperature



17.2 Installation height

The power supply can be operated at an installation height of up to 2000 m without any limitations. Different data applies for installation locations above 2000 m due to the differing air pressure and the reduced convection cooling associated with this.

Figure 26 Output power depending on the installation height



18 Firmware upgrade/downgrade

Device-side service and maintenance services, such as firmware updates, are carried out by Phoenix Contact service technicians via the infrared interface on the front of the power supply. The infrared interface cannot be used by the operator.

The firmware update is transferred from the service PC to the connected power supply unit via a point-to-point connection.

The infrared interface on the device side of the power supply is used for this purpose, which enables direct, localized communication. A cross-network firmware update to other power supply units is not possible.

It is not possible to update the firmware via the IO-Link interface.

19 Disposal and recycling

Ensure the correct disposal of electronic components

Do not dispose of the power supply as household waste.

Observe the applicable national standards and regulations.

Ensure correct disposal or recycling

Dispose of or recycle packaging material that is no longer needed as household waste.

Observe the applicable national standards and regulations.

In order to safely delete all user-specific data and configurations when decommissioning, you the operator should load the default settings. This sets the power supply to a defined initial state (see section: Hardware reset).

20 Help with technical questions

Should you have any technical questions, you can contact our Support team
E-mail: de-ps-support@phoenixcontact.com