

Power supply CP-S.1 24/3.0

Mid-high performance switch mode power supply

CP-S.1 power supplies: high efficiency and reliability delivered in a compact footprint.

Designed for a huge variety of applications, including machine building segments, this advanced range boosts an integrated 150 % power reserve for five seconds and operates at an efficiency of up to 94 %. With overheat protection, active power factor correction, a broad certified AC and DC input range and extensive worldwide approvals including ma-rine, the all-new CP-S.1 power supplies are a preferred choice for multiple industrial applications.



2CDC271001V0021

Characteristics

- Rated supply voltage range from 100-240 V AC / 100-250 V DC
- Rated output voltage 24 V DC
- Rated output current of 3.0 A
- Rated output power 72 W
- High efficiency of 90 %
- Power reserve design of 150 % for 5 s
- Output voltage adjustable via front-face rotary potentiometer "OUTPUT Adjust", 24-28 V
- Low power dissipation and low heating
- Free convection cooling (no forced cooling)
- Coated PCBAs
- Open-circuit, overload and short-circuit protection
- Integrated input fuse
- DC OK - signaling output "13-14" (relay)
- CP-C.1-A-RU redundancy unit offers true redundancy, available as accessory
- Various approvals and marks

Ordering details

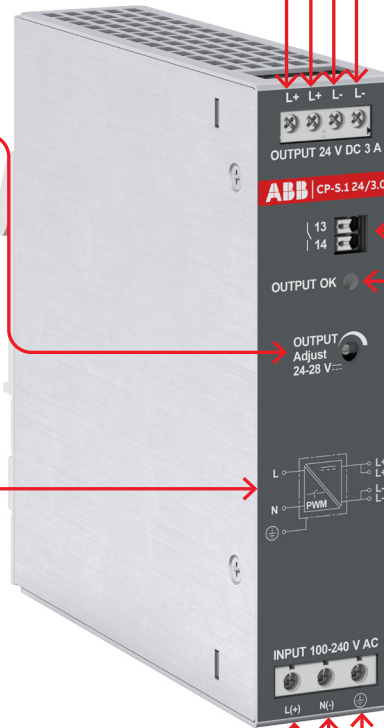
| Description | Rated input voltage | Rated output voltage | Rated output current | Output power | Order code |
|---------------|--------------------------------|----------------------|-------------------------|--------------|-----------------|
| CP-S.1 24/3.0 | 100 - 240 V AC, 100 - 250 V DC | 24 V DC | 3.0 A | 72 W | 1SVR320361R1000 |
| CP-C.1-A-RU | 10 - 56 V DC | 12 - 48 V DC | 2 x 20 A or 1 x 40 A | - | 1SVR360060R1001 |

Function

OUTPUT L+, L-:
Output terminals
24 V DC

OUTPUT Adjust:
Rotary potentiometer - Adjustment of output voltage
24-28 V DC

Circuit diagram



13-14: Relay output
Relay output to signal 'Output OK'

OUTPUT OK: green LED for indication of 24 V DC

- on: output voltage >92% of adjusted voltage
- flashes: output voltage <90% of adjusted voltage

INPUT L(+), N(-), PE:
Input terminals
100 - 240 V AC /
100 - 250 V DC

Application

The new family of CP-S.1 power supplies is the right fit for OEM machine building applications. Space-saving design, a complete 24 V DC offering of up to 960 W and a metal enclosure perfectly matches the high requirements of this segment.

The CP-S.1 has a wide certified AC or DC input voltage range. Furthermore, the CP-S.1 is equipped with capacitors that ensure a hold-up time of at least 20 ms. This enables world-wide usage and permits safe operation in fluctuating networks and battery-powered applications.

The CP-S.1 power supplies with the robust metallic housing and the reliable construction are suitable for applications in industrial environments.

The power reserve of up to 150 % for five seconds enables trouble-free starting of heavy loads eliminating the need of usage of an oversized power supply.

Power reserve

The primary switch mode power supply CP-S.1 is equipped with a power reserve functionality to handle the start-up of particularly heavy loads (e.g. of a capacitive load or a motor). To ensure that heavy loads are started up, the CP-S.1 delivers additionally up to 150 % of the rated output current for up to 5 s to secure the operation of the application.

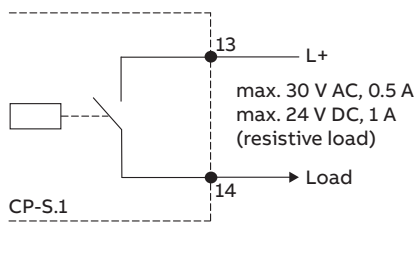
Signaling output

For the communication of the status of the power supply the CP-S.1 is equipped with a relay output to signal 'OUTPUT OK'. This signal can be used for communication to a higher level control system e.g. a PLC.

Adjustable output voltage

The CP-S.1 range power supplies feature a continuously adjustable output voltage of 24 to 28 V DC. Thus, they can be optimally adapted to the application, e.g. compensating the voltage drop caused by a long line length.

Adjustable output voltage



Output OK, relay output

Rated voltage limits of the signaling output relay:
Acc. UL 61010-1: 30 V RMS, 42.4 V peak, 60 V DC

LEDs and signaling output

| Output voltage | Output OK: LED green | Rated output voltage |
|--------------------------|----------------------|----------------------|
| $\geq 92\%$ of U_{out} | | Closed |
| $< 90\%$ of U_{out} | | Open |

It is possible to use the messaging and signaling functionality with power supplies connected in parallel. The parallel operation has no influence on the function.

Operating mode

Parallel operation

There are two main reasons for a parallel connection of power supplies:

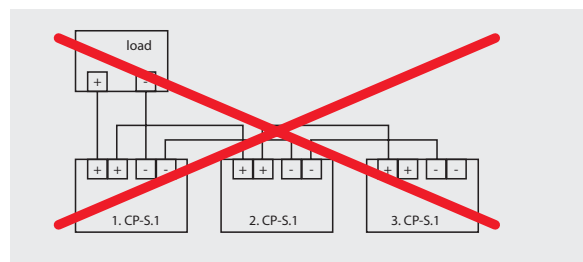
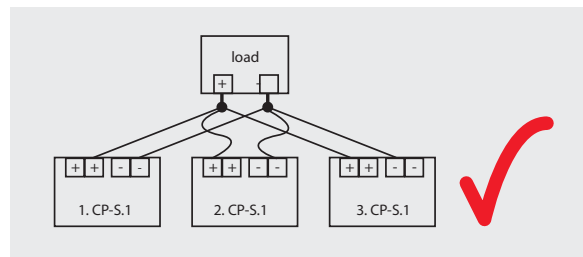
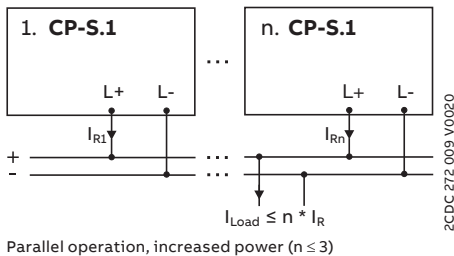
- Increase of power
- Redundancy

Up to 3 devices of the same type can be connected in parallel. For safe and reliable operation it is important to follow the recommendations given in the following section.

Parallel connection of power supplies for increased power

If the current required by the load is higher than a single power supply can deliver, for example after the expansion of an existing installation, an increase of the output power can be obtained by connecting power supplies in parallel. The following prerequisites have to be fulfilled when connecting power supplies in parallel for the purpose of increased power:

- The paralleled devices must be of the identical type.
- Repeated voltage drops on the supply lines or at the terminals would lead to unbalanced load at the common connection point. To prevent this, you have to observe the following when connecting the power supply units:
 - Identical lengths of the load supply lines.
 - Identical conductor cross sections of the load supply lines.
 - Terminal screws have to be fastened with the same torque to guarantee equal contact resistances.
 - The output voltages of the power supplies must not differ by more than 50 mV. Otherwise, safe operation is not possible.



Important

The devices must not be connected directly to each other! This could lead to an overload of the terminals since the terminals are dimensioned for the maximum output current of a single power supply only. Always use a common connection point!

Parallel connection of power supplies for redundancy

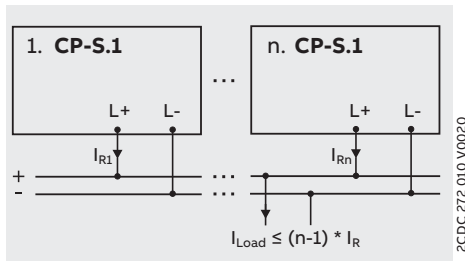
Several power supplies are connected in parallel in order to guarantee continuous operation of the system if one power supply fails. CP-S.1 can be used in two different redundancy modes depending on what type of redundancy is required:

- Simple redundancy
- True redundancy

Simple redundancy

For simple redundancy, the power supplies are connected in parallel like for the increase of capacity. To achieve redundancy the current required by the load must not exceed the maximum output power of one single power supply (in case of “1+1 redundancy”) or n power supplies (where n is max. 3).

We recommend connecting the primary sides of the power supplies to different phases of the mains in order to obtain continuous operation of the system if one phase fails.



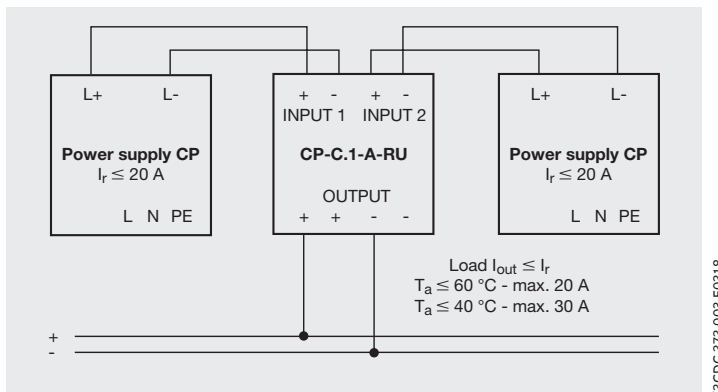
Parallel operation, redundancy ($n \leq 3$)

True redundancy

True redundancy gives higher system availability compared to simple redundancy. In a true redundancy setup the power supplies are decoupled from each other with decoupling diodes. This protects the individual power supplies from affecting each other in case of failure of one unit or short circuit on the secondary side or in the wiring.

For two inputs of up to 30 A and one output up to 60 A the ABB redundancy unit CP-C.1-A-RU (available as an accessory) can be used.

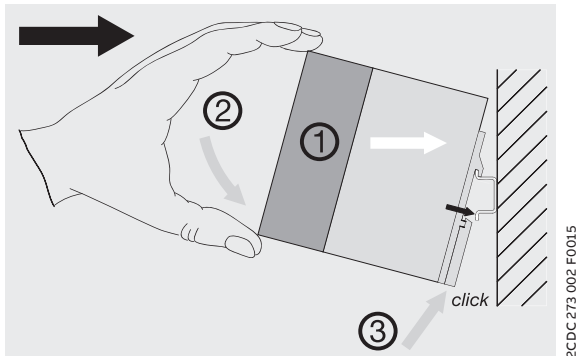
The inputs of these units are connected to the terminals L+ and L- of the power supplies. The loads are supplied directly from the outputs of the redundancy unit.



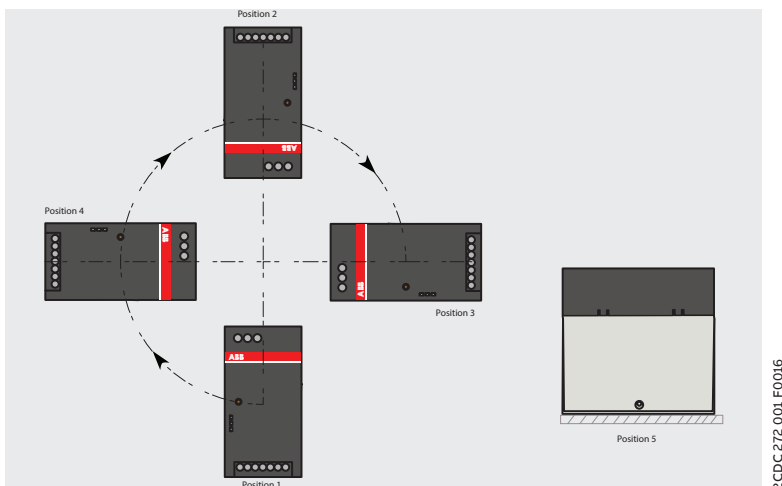
True redundancy using a CP-C.1-A-RU redundancy unit

Mounting

To mount the unit place the upper edge of the DIN rail adapter on the upper edge of the DIN rail holding the unit slightly tilted upwards as shown in the illustration. Then tilt the unit down until the latch snaps onto the DIN rail.



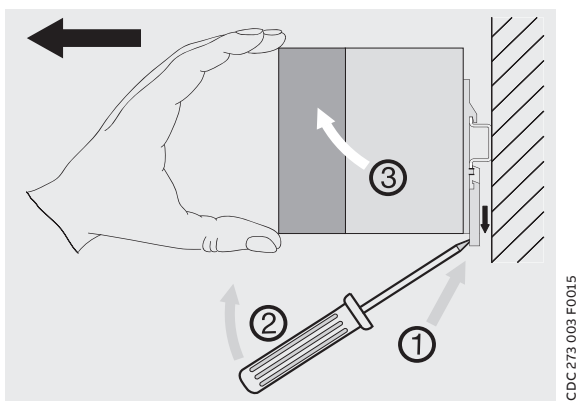
Mounting positions



In order to ensure a sufficient convection in mounting position 1, the minimum distance to other modules must not be less than 50 mm in vertical direction and 30 mm in horizontal direction. For the derating of the output current, see the characteristic curve of temperature. Details for other mounting positions on request.

Demounting

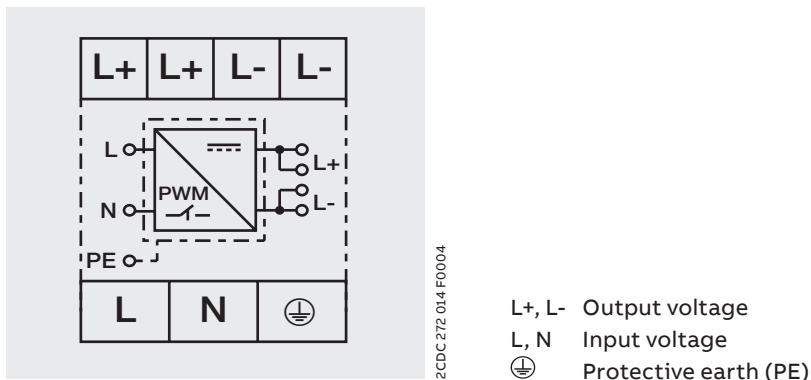
To release the unit pull the latching lever downwards with a screwdriver and press the upper side of the the latching lever down. The device can be unhinged from the DIN rail and removed.



Electrical connection

Connect the input terminals "L" to line and "N" to neutral conductor or to "+" and "-" with DC supply "+" to "L" and "-" to "N". The protective earth conductor PE must be connected before putting the device into operation. The installation must be executed acc. to EN 61010-1. Provide a suitable disconnecting device (e. g. line protection switch, MCB or fuse) in the supply line. The input side of the power supply is protected by an internal input fuse.

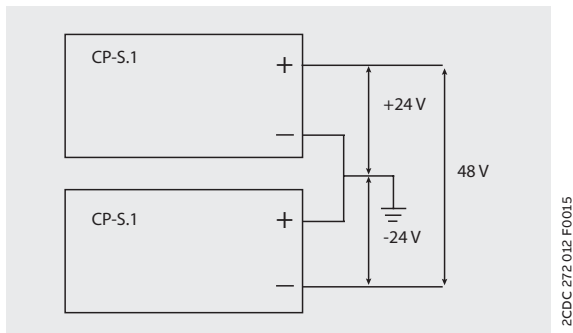
The wiring, cable choice and their protection shall comply to the local electrical standard. We recommend choosing the conductor cross-section as large as possible in order to minimize voltage drops. Check the polarity. The device is overload, short-circuit and open-circuit proof. The secondary side of the power supply is electrically isolated from the input and internally not earthed (SELV) and can be earthed for PELV.



Connection diagram

24 and 48 V DC connection

The connection diagram below shows how to setup two power supplies for +/-24 or 48 V DC output voltage.



Connection diagram for +/-24 or 48 V DC output voltage

Safety instructions and warnings



In operation pay attention to:

- Do not modify the installation (primary and secondary side)! High current! Risk of electric arcs and electric shock (danger to life)!
- Risk of burns: Depending on the operation conditions the housing can become hot.
- The device contains no user serviceable parts. In any case of device malfunction please send the unit back to manufacturer.



The device must be installed by qualified persons only and in accordance with the specific national regulations (e. g. VDE, etc.).

The CP-S.1 power supplies are chassis-mounted units. It is maintenance-free and does not contain any integral setting elements and should therefore not be opened.



Before any installation, maintenance or modification work:

- Read the operating and installation instructions carefully and completely!
- Disconnect the system from the supply network and protect against switching on!



CAUTION

Improper installation/operation may impair safety of personnel and cause operational difficulties or destruction of the unit.



WARNING

Before start of operation the following must be ensured:

- Connection to mains or DC supply according to the specific national regulations for class of protection I. Power supply cables and unit must be sufficiently fused. A disconnecting device has to be provided for the end product to disengage unit and supply cables from supply mains if required.
- Rate the output lines for the output current of the power supply and connect them with the correct polarity.
- In order to ensure sufficient convection the distance to the other devices has to be considered.



WARNING

Danger to life!

Never carry out work when voltage is present. The power supply contains components with high stored energy and circuits with high voltage! Do not introduce any objects into the unit and do not open the unit. With some units of this range the output is capable of providing hazardous energy. Ensure that the service personnel is protected against inadvertent contact with parts carrying energy. If the internal fuse is blown most probably the device is defect. In this case an examination of the device by the manufacturer is necessary.

Technical data

Data at $T_a = 25\text{ °C}$, $U_{in} = 230\text{ V AC}$ and rated values, unless otherwise indicated

| Type | | CP-S.1 24/3.0 | |
|--|--|---|---|
| Input circuit - Supply circuit (L(+), N(-)) | | | |
| Rated input voltage U_{in} | | 100 - 240 V AC, 100 - 250 V DC | |
| Input voltage range | | 85 - 264 V AC / 90 - 277 V DC | |
| Input current range at rated output power | 100 - 240 V AC 100 - 250 V DC | 0.95 - 1.46 A 0.35 - 1.0 A | |
| Typical input current | at 115 V AC at 230 V AC | 1.38 A 0.95 A | |
| Max. power consumption | at 230 V AC | 82 W | |
| Rated frequency | | DC, 50 / 60 Hz | |
| Frequency range | AC | 45 - 65 Hz | |
| Inrush current limiting, cold state | | $\leq 11\text{ A}$ | |
| Let-through energy I^2t , cold state | at 230 V AC | $< 1.5\text{ A}^2\text{s}$ | |
| Discharge current towards PE | | $< 3.5\text{ mA}$ | |
| Hold-up time | at 115 V AC at 230 V AC | $> 10\text{ ms}$ $> 20\text{ ms}$ | |
| Internal input fuse | | Yes | |
| Recommended backup fuse for wire protection at 1.5 mm^2 | | 1 pole miniature circuit breaker ABB type S 200 (for USA/CAN: use appropriate branch circuit 20 A fuse acc. to regional and national regulations) | |
| | characteristic | B or C | |
| | max. rating | 16 A | |
| Power Factor Correction (PFC) | | no | |
| Transient over-voltage protection | | yes, varistor | |
| User interface - Indication of operational states | | | |
| Output voltage | LED 'OUTPUT OK' | Green | $> 92\%$ adjusted U_{out} |
| | LED 'OUTPUT OK' | Flash | $< 90\%$ adjusted U_{out} |
| Output circuits - power output (L+, L-) | | | |
| Rated output voltage | | 24 V DC | |
| Tolerance of the output voltage | | $\pm 1\%$ | |
| Adjustment range of the output voltage | | 24...28 V DC | |
| Rated output power | | 72 W | |
| Rated output current I_R | $-25\text{ °C} \leq T_a \leq 60\text{ °C}$ | 3 A | |
| Dynamic Boost output current | $-25\text{ °C} \leq T_a \leq 60\text{ °C}$ | 4.5 A (5 s) | |
| Short-circuit current limiting | | $< 5.2\text{ A}$ | |
| Derating of the output current | $60\text{ °C} \leq T_a \leq 70\text{ °C}$ | 2.5 % / K | |
| Deviation width of output voltage | Load effect/ load regulation | static load change: 25 - 100 % | $< 1\%$ |
| | | dynamic load change: recovery time T_R | 0 % - 100 %: $< 3\%$ $< 1\text{ ms}$ |
| | Change of input voltage | within the rated input voltage | $< 0.5\%$ |
| | | | |
| Starting time after applying the supply voltage | | $< 1,500\text{ ms}$ | |
| Residual ripple and switching peaks | BW = 20 MHz | $< 75\text{ mV}_{pp}$, class A | |
| Parallel connection | | yes, up to 3 | |
| Series connection | | yes, 2 | |
| No-load, overload and short-circuit behavior | | | |
| Characteristic curve of output | | U/I characteristic curve | |
| Short-circuit protection | | continuous short-circuit stability | |
| Short-circuit behavior | | current limiting | |
| Resistance to reverse feed | | $\leq 35\text{ V DC}$ | |
| Overvoltage protection | | yes, $< 35\text{ V}$ | |
| Overload protection | | constant current limitation | |
| Overtemperature protection | | protection by switch off in case of overtemperature (thermal) | |
| No-load protection | | continuous no-load stability | |
| Starting of capacitive loads | | Yes | |

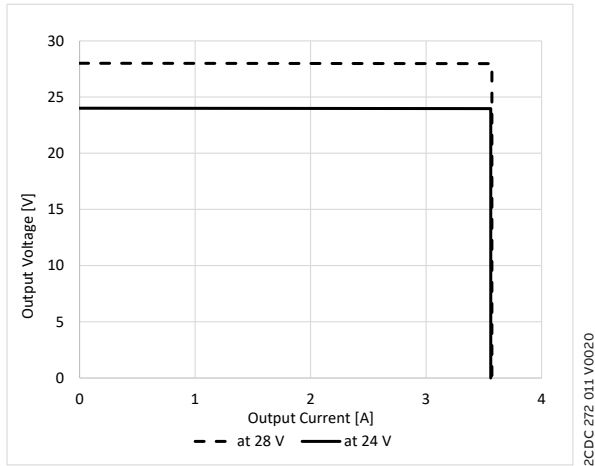
| Type | | CP-S.1 24/3.0 |
|--|--|--|
| Signaling outputs - OUTPUT OK signaling output | | |
| Type of output | 13 - 14 | relay, n/o contact |
| ON (contact closed) | | 92 % adjusted U_{out} |
| OFF (contact open) | | 90 % adjusted U_{out} |
| Contact ratings | max. switching voltage / current | 30 V AC - 0.5 A / 24 V DC - 1 A (resistive load) |
| | min. switching voltage / current | 5 V DC / 1 mA |
| General data | | |
| Efficiency | at rated load | > 89 % |
| Power losses | at rated load | < 10 W |
| | at 50 % of rated load | < 6.5 W |
| | at no load | < 2.8 W |
| Duty time | | 100 % |
| MTBF | acc. to MIL 217 HDBK GB 25 | on request |
| Dimensions (W x H x D) | | see dimensional drawings |
| Material of housing | cover | zinc-coated sheet-steel |
| | housing shell | aluminium |
| | front | plastic, PC GE8B35, V0 |
| Mounting | | DIN rail (IEC/EN 60715), snap-on mounting |
| Mounting position | | position 1 (standard orientation); other mounting positions possible with derating / deratings are available on demand |
| Minimum distance to other units | horizontal | 30 mm |
| | vertical | 50 mm |
| Degree of protection (IEC/EN 60529) | housing / terminals | IP20 / IP20 |
| Protection class (IEC/EN 61140) | | I |
| Electrical connection - Input circuits (L(+), N(-), PE) | | |
| Connecting capacity | rigid | 0.5-2.5 mm ² (20-14 AWG) |
| | fine-strand with(out) wire end ferrule | 0.5-2.5 mm ² (20-14 AWG) |
| Stripping length | | 9 mm |
| Tightening torque | | 0.5 Nm |
| | | 4.43 lb.in |
| Recommended screw driver | | PH0 / Ø 3.5 x 0.6 mm |
| Output circuits (L+, L+, L-, L-) | | |
| Stripping length | | 9 mm |
| Tightening torque | | 0.5 Nm |
| | | 4.43 lb.in |
| Recommended screw driver | | PH0 / Ø 3.5 x 0.6 mm |
| Signalling output (13-14) | | |
| Connecting capacity | rigid | 0.15 - 0.8 mm ² (26 - 18 AWG) |
| | fine-strand with(out) wire end ferrule | 0.15 - 0.8 mm ² (26 - 18 AWG) |
| Stripping length | | 7 mm |
| Connection terminals | | push-in |
| Environmental data | | |
| Ambient temperature range | operation | -25...+70 °C (-13... +158 °F) |
| | rated output power | -25...+60 °C (-13... +140 °F) |
| | storage | -40...+85 °C (-40... +185 °F) |
| | transportation | -40...+85 °C (-40... +185 °F) |
| Climatic class (IEC/EN 60721-3-1) | storage | 1K2 |
| Climatic class (IEC/EN 60721-3-2) | transportation | 2K2 |
| Climatic class (IEC/EN 60721-3-3) | operation | 3K3 |
| Damp heat, cyclic (IEC/EN 60068-2-30) | | test Db: 55 °C, 2 cycles |
| Vibration (IEC/EN 60068-2-6) | | test Fc: 10-58 Hz, amplitude ±0.15 mm, 58-150 Hz, 2 g, 10 sweep cycles each axis |
| Shock, half-sine (IEC/EN 60068-2-27) | | test Ea: 30 g, 6 ms, 3 pulses each axis; bump 20 g, 11 ms, 100 pulses each axis |
| Location classes (according DNVGL) | | temperature: B / humidity: B / vibration: A / enclosure: A |
| Coated PCBA | | yes |
| Isolation data | | |
| Rated impulse withstand voltage U_{imp} (IEC/EN 62477-1) | input circuit / output circuit | 4 kV (1.2/50 µs) |
| | input circuit / PE | 4 kV (1.2/50 µs) |
| | input circuit / relay contact | 4 kV (1.2/50 µs) |
| | output circuit / relay contact | 0.8 kV (1.2/50 µs) |
| | relay contact / PE | 0.8 kV (1.2/50 µs) |
| | output circuit / PE | 0.8 kV (1.2/50 µs) |

| Type | | CP-S.1 24/3.0 |
|---|--------------------------------|--|
| Rated insulation voltage U _i (IEC/EN 62477-1) | input circuit / output circuit | 300 V |
| | input circuit / PE | 300 V |
| | input circuit / relay contact | 300 V |
| | output circuit / relay contact | 50 V |
| | relay contact / PE | 50 V |
| | output circuit / PE | 50 V |
| Overvoltage category (IEC/EN 62477-1) | < 2000 m | III |
| | 2000...5000 m | II |
| Overvoltage category (IEC/EN 61010-1/IEC/ EN 61010-2-201) | < 2000 m | II |
| | 2000 ...5000 m | II |
| Pollution degree | input circuit / ground | 2 |
| Protective separation IEC/EN 61010-1, 61010-2-201 | input circuit / output circuit | yes |
| | input circuit / relay output | yes |
| Standards / Directives | | |
| Low Voltage Directive | | 2014/35/EU, IEC/EN 61204 |
| EMC directive | | 2014/30/EU |
| RoHS directive | | 2011/65/EU incl. 2015/863/EU |
| WEEE directive | | 2012/19/EU |
| Electrical safety | | IEC/EN 61010-1, IEC/EN 61010-2-201 |
| Process control equipment | | UL 61010-1, UL 61010-2-201/ CAN/CSA C22.2 No. 61010-1-12, CAN/CSA-IEC 61010-2-201:18 |
| Protective extra low voltage | | PELV_IEC/EN 61010-2-201 |
| Safety extra low voltage | | SELV_IEC/EN 61010-2-201 |
| Limitation of harmonic line currents | | IEC/EN 61010-2-201 |
| Electromagnetic compatibility | | |
| Low-voltage power supplies, d.c. output – Part 3: | | IEC/EN 61204-3 |
| Electromagnetic compatibility (EMC) | | |
| Interference immunity to | | IEC/EN 61000-6-2 |
| electrostatic discharge (ESD) | IEC/EN 61000-4-2 | contact discharge air discharge, level 4, 8 kV / 15 kV (criterion A) |
| radiated, radio-frequency, electromagnetic field | IEC/EN 61000-4-3 | 80 to 1000 MHz, 10 V/m (criterion A), 1.4 to 6 GHz, 3 V/m (criterion A) |
| electrical fast transient / burst | IEC/EN 61000-4-4 | level 4, 4 kV / 2 kV (criterion A) |
| surge | IEC/EN 61000-4-5 | level 4, L/N 3 kV (criterion A); level 4, L, N / PE 4 kV (criterion A) |
| conducted disturbances, induced by radio-frequency fields | IEC/EN 61000-4-6 | level 3, 10 V (criterion A) |
| voltage dips, short interruptions and voltage variations | IEC/EN 61000-4-11 | class 3 |
| harmonics and interharmonics | IEC/EN 61000-4-13 | class 3 (criterion A) |
| conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz | IEC/EN 61000-4-1 | level 3, 10 V |
| Interference emission | | IEC/EN 61000-6-3; IEC/EN 61000-6-4 |
| limits for harmonic current emissions | IEC/EN 61000-3-2 | class A |
| limitation of voltage changes etc. | IEC/EN 61000-3-3 | compliant |
| information technology equipment radio disturbance characteristics limits and methods of measurement | EC/CISPR 32, EN 55032 | class B |
| industrial scientific and medical (ISM) radio-frequency equipment electromagnetic disturbance characteristics limits and methods of measurement | EC/CISPR 11, EN 55011 EN 50204 | class B |
| Voltage sags | SEMI F47-0706 | passed |
| Federal Communications Commission | FCC15 | compliant |
| EMC according DNV/GL | DNVGL-CG-0339 | all locations including bridge and open deck class B |
| Weight | | 550 g |

Technical diagrams

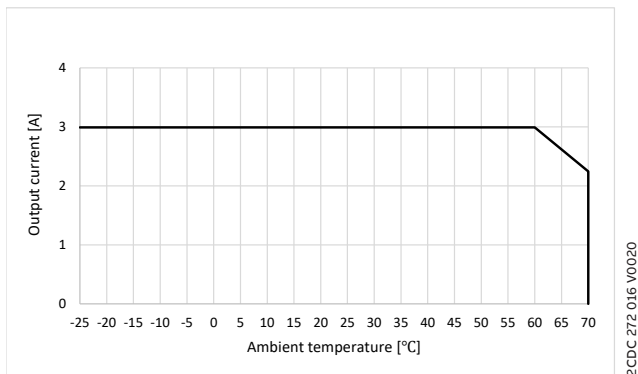
Data at $T_a = 25\text{ °C}$, $U_{in} = 230\text{ V AC}$ and rated values, unless otherwise indicated

U/I characteristic curves of output at $T_a = 25\text{ °C}$



CP-S.1 24/3.0

Characteristic curves of temperature $T_{out} = 24\text{ V DC}$



CP-S.1 24/3.0

The switch mode power supply CP-S.1 is able to supply at 24 V DC output voltage and at an ambient temperature of

- $\leq 60\text{ °C}$ the rated current of 3 A
- $\leq 60\text{ °C}$ a continuous output current of typ. $\leq 4.5\text{ A}$ for 5 s

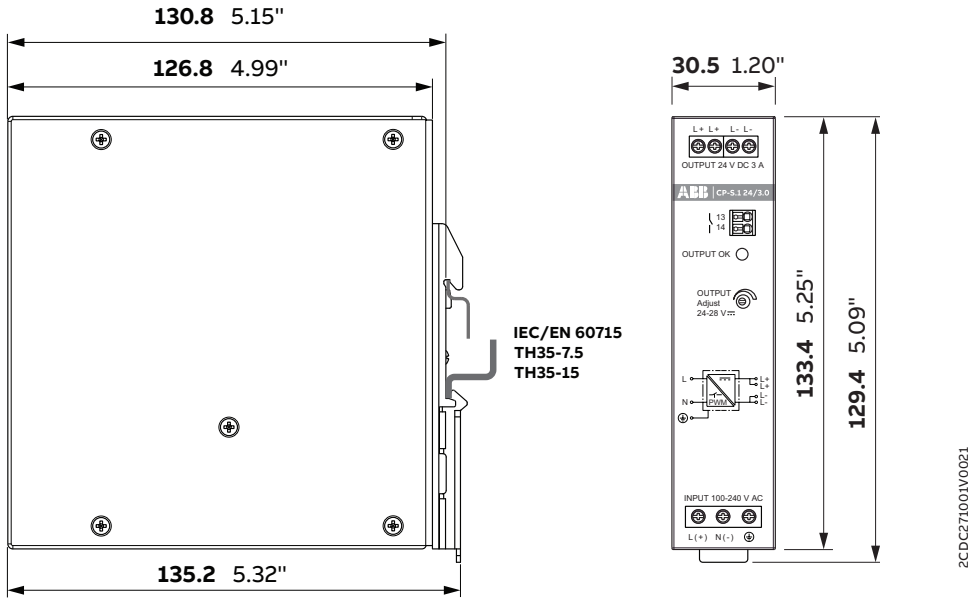
With mounting position 1 (standard) and at ambient temperatures of $> +60\text{ °C}$ the output power has to be reduced by 2.5 % per Celsius degree temperature increase. Deratings for other mounting positions on request.

At thermal overload the device will switch-off as soon as the internal temperature exceeds the acceptable level. The exact ambient temperature threshold depends on the mounting position and load of the power supply.

The device is equipped with an overtemperature protection function. It will switch-off as soon as the internal overtemperature protection function is activated.

Dimensions

in mm and inch



CP-S.1 24/3.0

Further documentation

| Document title | Document type | Document number |
|--|--------------------|-----------------|
| Electronic relays and controls | Catalog | 2CDC110004C0210 |
| Operating and installation instructions CP-S.1 | Instruction manual | 1SVC320360M0000 |
| CP-S.1 power supply range | Leaflet | 1SAC200134W0001 |

You can find the documentation at www.abb.com/lowvoltage > Automation, Control and Protection > Power supplies.

CAD system files

You can find the CAD files for CAS systems at <http://abb-control-products.partcommunity.com> > Low voltage Products & Systems > Control Products > Electronic Relays and Controls.

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abb.com/lowvoltage

Further information:



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