WITTENSTEIN | cyber motor

cyber® power supply

DIN rail power supply

Project planning guide

5022-D061303

Revision: 01

Bei technischen Fragen wenden Sie
sich an folgende Adresse:

WITTENSTEIN cyber motor GmbH
Vertrieb
Walter-Wittenstein-Straße 1
D-97999 Igersheim
Tel.: +49 7931 493-15800
Fax: +49 7931 493-10905
E-Mail: info@wittenstein-cyber-motor.de

Bei Fragen zur Installation, Inbetriebnahme und Optimierung kontaktieren Sie unsere Supporthotline:

Supporthotline WITTENSTEIN cyber motor
Tel.: +49 7931 493-14800
E-Mail: wcm-support@wittenstein.de

Bei technischen Störungen wenden Sie
sich an folgende Adresse:

Customer Service

		✉	✆
Deutschland	WITTENSTEIN cyber motor GmbH	service@wittenstein.de	+49 7931 493-15900
Benelux	WITTENSTEIN BVBA	service@wittenstein.biz	+32 9 326 73 80
Brasil	WITTENSTEIN do Brasil	vendas@wittenstein.com.br	+55 15 3411 6454
中国	威腾斯坦（杭州）实业有限公司	service@wittenstein.cn	+86 571 8869 5856
Österreich	WITTENSTEIN GmbH	office@wittenstein.at	+43 2256 65632-0
Danmark	WITTENSTEIN AB	info@wittenstein.dk	+45 4027 4151
France	WITTENSTEIN sarl	info@wittenstein.fr	+33 134 17 90 95
Great Britain	WITTENSTEIN Ltd.	sales.uk@wittenstein.co.uk	+44 1782 286 427
Italia	WITTENSTEIN S.P.A.	info@wittenstein.it	+39 02 241357-1
日本	ヴィッテンシュタイン株式会社	sales@wittenstein.jp	+81-3-6680-2835
North America	WITTENSTEIN holding Corp.	technicalsupport@wittenstein-us.com	+1 630-540-5300
España	WITTENSTEIN S.L.U.	info@wittenstein.es	+34 93 479 1305
Sverige	WITTENSTEIN AB	info@wittenstein.se	+46 40-26 50 10
Schweiz	WITTENSTEIN AG Schweiz	sales@wittenstein.ch	+41 81 300 10 30
台湾	威騰斯坦有限公司	info@wittenstein.tw	+886 3 287 0191
Türkiye	WITTENSTEIN Güç Aktarma Sistemleri Tic. Ltd. Şti.	info@wittenstein.com.tr	+90 216 709 21 23

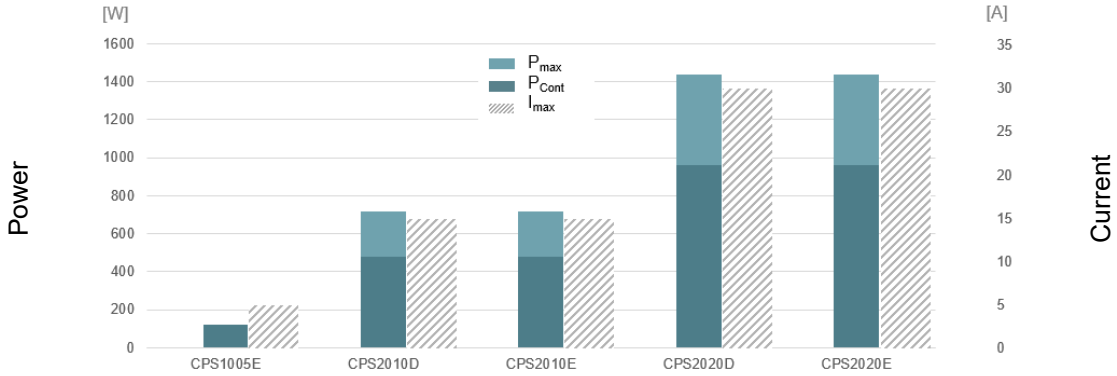
Table of Contents

1 Product introduction

The power supplies cyber® power supply are DIN rail power supplies in a power range from 100 W to 1500 W. The efficiencies of more than 95% enables the reduction of heat development in the overall system. The power supplies are designed for cabinet mounting.

In conjunction with servo drives from the cyber® simco® drive series intelligent drive solutions with high power density and functionality are created.

Picture 1-2 shows an overview of the power spectrum of the power supplies cyber® power supply from **WITTENSTEIN cyber motor**.



1.1 Nameplate

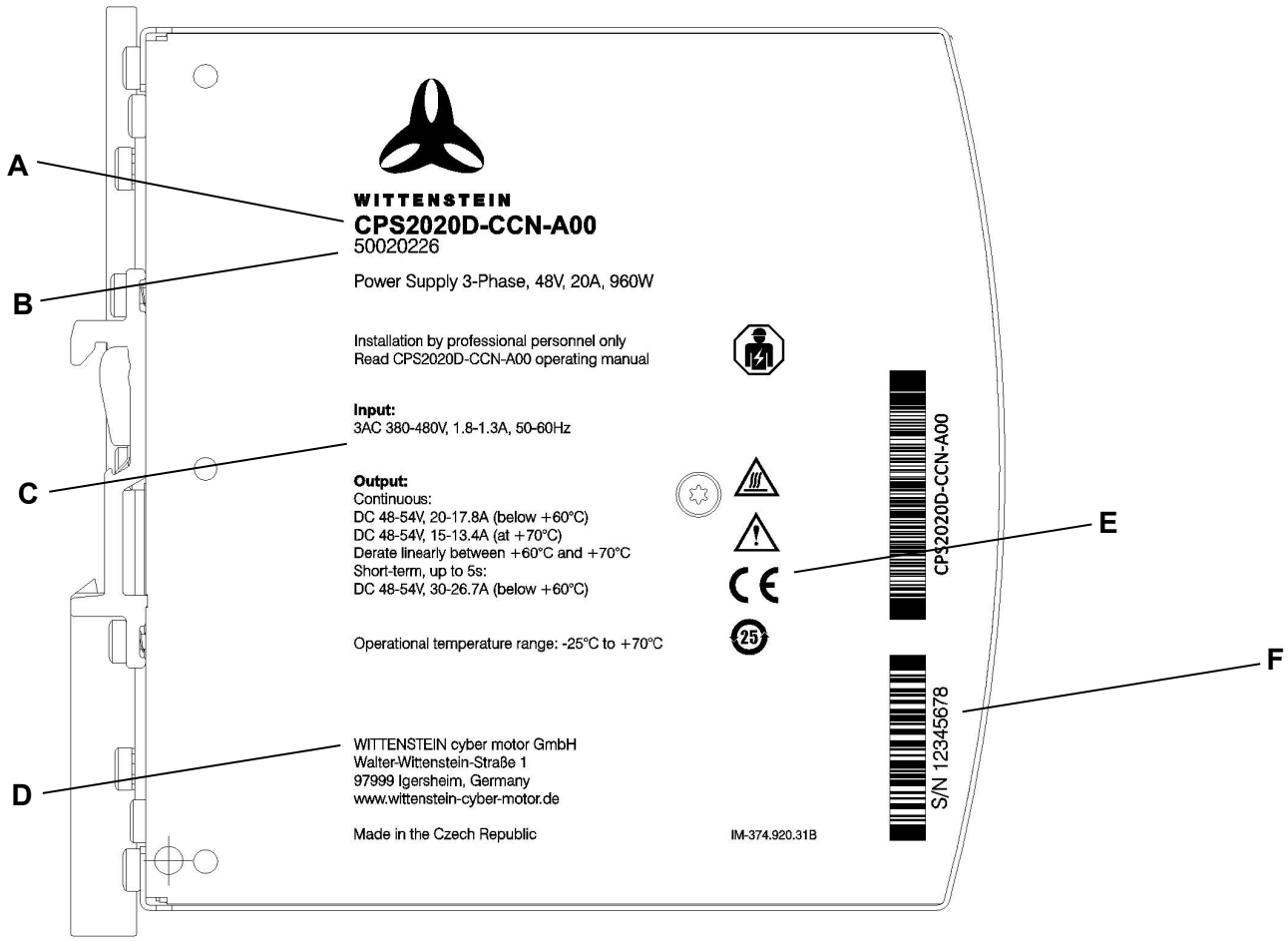
The nameplate is used to identify the product and contains essential information on the properties of the product. The nameplate is on the side of the product. The serial number is attached to the product for clear identification.

NOTICE

- Use the information on the nameplate in accordance with your company's regulations.

If the product conforms to standards and guidelines that require identification on the nameplate, the conformity is indicated in the corresponding field on the nameplate (see Picture 1 3). The conformity is valid with correct assembly.

The technical data given on the nameplate are valid in the event that the correct assembly of the products has been carried out and the specified type of cooling is ensured.



	Designation
A	Type Code
B	Material Number
C	Technical Data
D	Manufacturer Designation
E	Conformity
F	Serial Number

Tbl 1: Nameplate of cyber® power supply

2 Intended usage

The products from **WITTENSTEIN cyber motor** are developed and produced according to the latest standards. Before delivery, they are checked for their operationally safe state.

The products may only be used as intended. In the event of improper use, situations can arise that result in property damage and personal injury.

Before using the products, the following requirements must be observed to ensure use of the products are used as intended:

- Ensure that everybody working with one of the products has read and understood the applicable safety regulations and instructions on the intended use.
- Leave the products in their original condition. Do not change or manipulate the structure of the product.

ⓘ Software products may not be decompiled and source codes must not be changed.

- Do not subject the products to external force.
- Ensure that damaged or incorrect products are not installed or taken into operation.

2.1 Intended use

Only properly qualified and professionally trained personnel who are able to assess the safe condition of the product are allowed to work at the product. For example, this qualification is verified by the following points:

- Professional and/or technical training
- Knowledge of applicable standards and regulations
- Knowledge of accident prevention regulations and operating conditions
- Ability to recognize and assess potential danger

Electrical connection may only be realized by qualified personnel who are able to recognize, assess and prevent any potential electrical hazards.

All instructions in this project specifications, information on packaging and the product as well as the assembly instructions of your company must be observed at all times. If applicable, any local requirements must be observed.

WITTENSTEIN cyber motor GmbH is not informed about the installation conditions into your product. These project specifications highlight only the general conditions of use and limits of the building kit motor. It is the responsibility of your company to create and use the corresponding internal documents (e.g. assembly instructions, circuit diagrams etc.) on this basis.

The product may only be mounted with the intended attachment elements as described in the assembly instructions of your company.

In case of any differences between these project specifications, the instructions on the packaging, the instructions on the product, the local requirements and the assembly instructions of your company, clarify the correct approach with the responsible personnel at your company and notify the competent positions of the recognized differences.

	The products of the cyber® power supply are only intended for installation in a machine. Taking into operation is prohibited until the conformity of the machine with Directive 2006/42/EC or another comparable valid directive for your company's product has been established.

2.2 Application range

The products of the cyber® power supply are exclusively intended for use in industrial systems engineering in order to be used as a power supply in machines.

It may be necessary to connect additional sensors or components. The products may only be used with the accessories and add-on parts specified in this project specification. Components that are not expressly mentioned may not be attached or connected. Operation is only allowed in compliance with explicitly stated configurations and combinations of components.

The products may only be used with the ambient conditions specified in these project specifications (e.g. temperature, protection class, cooling, etc.) and in the applications specified by your company.

Applicable ambient conditions during operation of products:

- IEC 60721-3-3, Class 3K3 with uprating
  low ambient air temperature from +5 °C to -25 °C and
  high ambient air temperature from +40 °C to +70 °C and
  the relative humidity from 85 % auf 95 %.
- IEC 60721-3-3, Class 3B1
- IEC 60721-3-3, Class 3C1
- IEC 60721-3-3, Class 3S1
- IEC 60068-2-6, 2 – 17.8 Hz: ±1.6 mm; 17.8 – 500 Hz: 20 m/s²
- IEC60068-2-27, 150 m/s² 6 ms; 100 m/s² 11 ms (DIN rail mounting)
  300 m/s² 6 ms; 200 m/s² 11 ms (wall mounting bracket ZM2.WALL)

Tbl 2 contains an excerpt of the ambient conditions during operation of the products.

Ambient conditions during operation			
Property	**Value**	**Standard**	**Class**
Temperature Range	-25 °C ... +70 °C [a]	IEC 60721-3-3	3K3
Relative Humidity	5 % … 95 % [a]	IEC 60721-3-3	3K3
Absolute Humidity	1 g/m³ … 25 g/m³	IEC 60721-3-3	3K3
Rate of Temperature Change	0,5 °C/min	IEC 60721-3-3	3K3
Maximum Vibration (17.8 – 500 Hz)	20 m/s²	IEC 60068-2-6	-
Maximum Shock (6 ms) (DIN rail mounting)	150 m/s²	IEC 60068-2-27	-
Maximum Shock (6 ms) (wall mounting bracket)	300 m/s²	IEC 60068-2-27	-

a: Values adjusted compared to standard

Tbl 2: Excerpt of the ambient conditions during operation

The protection class is indicated by the abbreviation IP (International Protection) and two numbers stating the degree of protection. The first number describes the degree of protection against contact and ingress of foreign objects, the second number describes the degree of protection against water.

For the cyber® power supply the protection class is IP20 according to IEC 60529. Follow your company's installation instructions to protect the products with suitable covers or seals. Failure to observe the protection class can lead to irreparable damage to the product. It is your company's responsibility to define, review and implement suitable measures.

The power loss of the product, which is converted into heat, is dissipated to the environment directly and via the adjacent components. The products may therefore only be operated if sufficient dissipation of the power loss is guaranteed. The cooling system and the materials used must therefore be designed appropriately. Please note that add-on parts can both dissipate and introduce heat.

2.3 Standards and certificates

In these project specifications, German, European and international technical standards are mentioned. Standard documents and standard sheets are subject to copyright protection. If necessary, contact the authorized sales offices.

All cyber® power supply products comply with the following standards and approvals provided they apply to the product:

- IEC 61000 Standard on Electronic Discharge (ESD)
- IEC 60664 Insulation coordination for equipment within low-voltage supply systems
- 2011/65/EU RoHS Directive
- 1907/2006/EU REACH Directive
- 2014/30/EU EMC Directive
- 2014/35/EU Low Voltage Directive

The product conforms to the EU directives named in the respective EU declaration of conformity and therefore bears the CE mark.

WITTENSTEIN | cyber motor

EU-Konformitätserklärung
EU Declaration of Conformity

Wir / *We* **WITTENSTEIN cyber motor GmbH**

Anschrift / *Address*
Walter-Wittenstein-Straße 1
D-97999 Igersheim / Germany
Tel: +49 (0)7931 493 15800
Fax: +49 (0)7931 493 10905
E-Mail: info@wittenstein-cyber-motor.de

erklären hiermit in alleiniger Verantwortung, dass das Erzeugnis / *declare under our sole responsibility, that the product*

Bezeichnung / *Designation*: **Netzteil cyber® power supply**
Power supply cyber® power supply

Typen / *Types*: **CPS1005E-CCA-A00,**
CPS2010D-CCN-A00, CPS2010E-CCN-A00,
CPS2020D-CCN-A00, CPS2020E-CCN-A00

konform ist zu den EU-Richtlinien / *is conform with the EU directives*

2014/30/EU	**Elektromagnetische Verträglichkeit** *Electromagnetic compatibility Directive*
2014/35/EU	**Niederspannungsrichtlinie** *Low Voltage Directive*
2011/65/EU	**zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten (RoHS-Richtlinie)** *on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS directive)*

und die einschlägigen Bestimmungen dieser EU-Richtlinien erfüllt. / *and fulfills the relevant provisions of these EU directives.*

Das Erzeugnis erfüllt die den wesentlichen Anforderungen der oben genannten EU-Richtlinien entsprechenden Bestimmungen der harmonisierten Normen / *The product fulfills the essential requirements of the EU directives mentioned above by fulfilling the corresponding requirements of the harmonized standards*

EN 61000-6-1:2007	**Elektromagnetische Verträglichkeit (EMV) – Teil 6-1: Fachgrundnormen – Störfestigkeit für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe** *Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments*
EN 61000-6-2:2005 / AC:2005	**Elektromagnetische Verträglichkeit (EMV) – Teil 6-2: Fachgrundnormen - Störfestigkeit für Industriebereich** *Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments*

Picture 2-1 EU declaration of conformity of cyber® power supply (Page 1)

WITTENSTEIN | cyber motor

EN 61000-6-3:2007 + A1:2011 / AC:2012	**Elektromagnetische Verträglichkeit (EMV) - Teil 6-3: Fachgrundnormen – Störaussendung für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe** *Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments*
EN 61000-6-4:2007 + A1:2011	**Elektromagnetische Verträglichkeit (EMV) – Teil 6-4: Fachgrundnormen – Störaussendung für Industriebereiche** *Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments Generic emission standard for industrial environments*

und zusätzlich der Normen / *and additionally of the technical standards*

EN IEC 61010-2-201:2018	**Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte – Teil 1: Besondere Anforderungen für Steuer- und Regelgeräte** *Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: Particular requirements for control equipment*
EN IEC 63000:2018	**Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe** *Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances*

Das Erzeugnis trägt das CE-Zeichen. / *The product bears the CE-marking.*

Igersheim, den 31.03.2021
Ort und Datum der Ausstellung
Place and date of issue

Dr. Ingolf Gröning
Geschäftsführer / *General Manager*
WITTENSTEIN cyber motor GmbH

Picture 2-2 EU declaration of conformity of cyber® power supply (Page 2)

In addition, the product fulfils the EU-REACH regulation and the China RoHS regulation. The Environment Friendly Use Period (EFUP) for the products is 25 years. Furthermore, the product fulfils the European Persistent Organic Pollutants (POP) Regulation 2019/2021 and is free of paint wetting impairment substances (LABS) according to VDMA 24364. The product is classified as halogen-free product, as all plastic and chemical materials do not contain any halogens and all other material shall contain halogens according to IEC 61249-2-21 with a maximum of 1500 ppm halogens in total as far as possible within the state of the art and the economic viability.

WITTENSTEIN | cyber motor

Manufacturer's Declaration

EU-REACH Regulation

In June 2007, the European Union Regulation (EC) 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) came into force.

The WITTENSTEIN cyber motors GmbH ("WCM") supports actively the purpose of this Regulation to ensure a high level of protection of human health and the environment, and will meet all applicable REACH requirements.

Our REACH obligations
According to the REACH Article 33 WCM has to provide the information to you as we are informed by our suppliers a substance of very high concern (SVHC) is in a concentration above 0.1 % weight by weight (w/w) in one of our products.

To the best of our knowledge and based on the information of our suppliers, the WCM products and packaging

CPS1005E-CCA-A00
CPS2010D-CCN-A00
CPS2010E-CCN-A00
CPS2020D-CCN-A00
CPS2020E-CCN-A00

are in compliance with the requirements of the REACH Regulation.

Best Regards,

Igersheim, den 31.03.2021
Ort und Datum der Ausstellung
Place and date of issue

Dr. Ingolf Gröning
Geschäftsführer / *General Manager*
WITTENSTEIN cyber motor GmbH

05-STD-V08

WITTENSTEIN cyber motor GmbH

Walter-Wittenstein-Straße 1
97999 Igersheim · Germany
Tel. +49 7931 493-0
Fax +49 7931 493-10905
info@wittenstein-cyber-motor.de
www.wittenstein-cyber-motor.de

Managing Directors
Dr. Michael Geier
Dr. Ingolf Gröning
AG Ulm HRB 680693
USt-IdNr.: DE 198016351

Sparkasse Tauberfranken
SWIFT/BIC: SOLADES1TBB
IBAN EUR: DE61 6735 2565 0000 0660 27
IBAN USD: DE10 6735 2565 0070 7035 09

Deutsche Bank AG Würzburg
SWIFT/BIC: DEUTDEMM790
IBAN EUR: DE84 7907 0016 0840 8726 00
IBAN USD: DE84 7907 0016 0840 8726 00

Commerzbank AG
SWIFT/BIC: COBADEFFXXX
IBAN EUR: DE32 6004 0071 0554 0166 00

Picture 2-3 EU REACH declaration of cyber® power supply

WITTENSTEIN | cyber motor

Manufacturer's Declaration

China-RoHS

In July 2016, the Order 32 of the Chinese Ministry of Industry and Information Technology (MIIT) - Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products (China RoHS II) - came into force in China.

Herewith, WITTENSTEIN cyber motor GmbH ("WCM") declares that the products:

CPS2010D-CCN-A00
CPS2010E-CCN-A00
CPS2020D-CCN-A00
CPS2020E-CCN-A00

delivered to you comply with the Law as specified in the GB/T 26572-2011.

Attention: WCM products are not typically stand-alone products and are not sold as final products for end consumers.

The products are evaluated according to GB/T 26572-2011 and the next page shows the analysis of the Electrical and Electronic Products (EEPs):

05-STD-V07

WITTENSTEIN cyber motor GmbH

Walter-Wittenstein-Straße 1
97999 Igersheim · Germany
Tel. +49 7931 493-0
Fax +49 7931 493-10905
info@wittenstein-cyber-motor.de
www.wittenstein-cyber-motor.de

Managing Directors
Dr. Michael Geier
Dr. Ingolf Gröning
AG Ulm HRB 680693
USt-IdNr.: DE 198016351

Sparkasse Tauberfranken
SWIFT/BIC: SOLADES1TBB
IBAN EUR: DE61 6735 2565 0000 0660 27
IBAN USD: DE14 6735 2565 0070 6235 09

Deutsche Bank AG Würzburg
SWIFT/BIC: DEUTDEMM790
IBAN EUR: DE84 7907 0016 0840 8726 00
IBAN USD: DE84 7907 0016 0840 8726 00

Picture 2-4 China RoHS declaration of cyber® power supply (Page 1)

WITTENSTEIN | cyber motor

本表格依据SJ/T1164-2014的规定编制

This table is prepared according to the requirements of SJ/T 11364-2014.

部件名称 Part Name	有毒有害物质或元素 Toxic or hazardous Substances and Elements					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr (VI))	多溴联苯 Polybrominated biphenyls (PBB)	多溴二苯醚 Polybrominated diphenyl ethers (PBDE)
Printed Circuit Boards Assemblies	X	O	O	O	O	O

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下

O: Indicates the toxic or hazardous substance contained in all of the homogeneous materials for this part is within the limit requirement in GB/T 26572.

X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。

X: Indicates the toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is outside the limit requirement in GB/T 26572

环保期限（EFUP）的产品及其部件是每个列出的符号，除非另有标明。使用期限只适用于产品在产品手册中规定的条件下工作

The Environmentally Friendly Use Period (EFUP) for the product and its parts are per the symbol listed, unless otherwise marked. The Period of use is valid only when the product is operated within the conditions defined in the product manual.
The EFUP of the units listed in table 1 is 25 years. The units are marked with following EFUP symbol: 25

Best regards,

Igersheim, den 31.03.2021
Ort und Datum der Ausstellung
Place and date of issue

Dr. Ingolf Gröning
Geschäftsführer / *General Manager*
WITTENSTEIN cyber motor GmbH

05-STD-007

WITTENSTEIN cyber motor GmbH

Walter-Wittenstein-Straße 1
97999 Igersheim · Germany
Tel. +49 7931 493-0
Fax +49 7931 493-10905
info@wittenstein-cyber-motor.de
www.wittenstein-cyber-motor.de

Managing Directors
Dr. Michael Geier
Dr. Ingolf Gröning
AG Ulm HRB 680693
USt-IdNr.: DE 198016351

Sparkasse Tauberfranken
SWIFT/BIC: SOLADES1TBB
IBAN EUR: DE61 6735 2565 0000 0660 27
IBAN USD: DE14 6735 2565 0070 6235 09

Deutsche Bank AG Würzburg
SWIFT/BIC: DEUTDEMM790
IBAN EUR: DE84 7907 0016 0840 8726 00
IBAN USD: DE84 7907 0016 0840 8726 00

Picture 2-5 China RoHS declaration of cyber® power supply (Page 2)

The products of the cyber® power supply are certified according to

- GOST P Certificate of Conformity for Russia and other GUS countries

3 Safety instructions

3.1 Application and passing on of safety instructions

Do not install and commission the product before having thoroughly read all provided documents. These safety instructions and all user instructions must be read each time before working with the product. If the product is sold, borrowed and/or passed on in any other way, these safety instructions must also be passed on as part of the project specifications in the national language of the user.

⚠ WARNING

Incorrect handling of this product, non-compliance with the warnings in this document or unauthorized modification of safeguards can lead to damage, injury, electric shock or even death.

The safety instructions and any measures derived by your company must be included by your company into the assembly and installation instructions after carrying out a risk assessment. Inform yourself about the safety instructions already during project planning. Also observe any national regulations and include them into the assembly and installation instructions.

In addition to the safety instructions mentioned in these project specifications, generally applicable and local regulations on prevention of accidents and environmental protection must be observed. If necessary, use suitable personal protective equipment.

3.2 Warning symbols and hazard classes

Warning instructions are structured in the following hazard classes in compliance with ANSI Z535 and ISO 3864:

⚠ DANGER

This signal word indicates an imminent danger that will cause serious injuries or even death.

⚠ WARNING

This signal word indicates a potential hazard that could cause serious injuries and even death.

⚠ CAUTION

This signal word indicates a potential hazard that could cause minor or serious injuries.

NOTICE

This signal word indicates a potential hazard that could lead to property damage.

A note without a signal word indicates application hints or especially important information for working with the drive system.

The following warning symbols are used in these project specifications to indicate hazards in connection with the safety instructions. Observe the warnings and use them for preparation of the assembly and operating manual:

Warning symbol	Hazard	Warning symbol	Hazard
	General danger		Hot surface
	Suspended loads		Danger of being pulled in
	Magnetic field		Electric voltage
	Crushing hazard		Electrostatic discharge sensitive component
	Pacemaker ban		Information
	Explosion		

Tbl 3: Warning symbols of safety instructions

3.3 Hazard-related safety instructions

⚠ DANGER

Faulty electrical connections or not approved, current-carrying components can cause serious injuries and even death.

- Ensure that electrical connections are only established by qualified personnel.
- Observe valid standards and directives.
- Carry out connection work only with suitable tools.
- Immediately replace damaged cables or plugs.

⚠ DANGER

Electrically live parts may result in electric shocks if touched and can cause serious injuries and even death. Electrical work performed in damp areas may result in electric shocks and can cause serious injuries and even death.

- Ensure that electrical connections are only established by qualified personnel.
- Observe valid standards and directives.
- Carry out connection work only with suitable tools.
- Observe the general installation and safety regulations for work at electrical systems.
- **Before** accessing electrical parts with voltages exceeding 50V, disconnect the product from the voltage supply. Secure the product against reactivation.
- Do not make contact with electrical connections of the product while it is activated **under any circumstances**.

⚠ DANGER

Risk of electrical shock, fire, personal injury or death.

- Turn power off before working on the device.
- Protect against inadvertent re-powering.
- Do not use the product without proper grounding (Protective Earth).
- Do not use in wet locations or in areas where moisture or condensation can be expected.
- Do not open the product.
- Do not modify or repair the product.

⚠ WARNING

Connecting or disconnecting the power and signal supply lines *under voltage* can lead to machine damage, serious injury or even death.

- Make sure that the product and the connections of the electronics (power and signal) are in a voltage-free state before connecting.
- Observe any discharge time of your components.

⚠ CAUTION

During the mechanical assembly of the product onto the application, handling errors can lead to serious crushing injuries as well as to damage to the product or the application.

- Secure the machine against restarting and unintentional movements during assembly and maintenance work.
- Have all mechanical assembly and maintenance work carried out by qualified personnel only.
- Only use suitable tools for assembly and maintenance work.

⚠ CAUTION

Hot surfaces at the product (e.g. housing, motor housing) can cause severe injuries.
During and after operation, the temperatures of the products and surrounding components can exceed 60 °C (140 °F) depending on the operating conditions and the cooling.

- Let the product cool down for a sufficient period after switching it off.
- When working with hot surfaces, always wear protective gloves.
- For specific applications, plan suitable measures to prevent burning injuries.
- Check for your application whether safety measures and warnings are required.

NOTICE

If present, the temperature sensors and rotor position encoders, particularly Hall effect sensors and encoders, can be damaged by electrostatic discharge.

- Carry out the work in an ESD-protected work environment and suitable personal protective equipment.
- Do not remove ESD safeguards from the connections before they are established.

3.4 Minimizing risks

The building kit motor is developed and produced according to the latest standards.

The responsibility for the intended use of the building kit motor and minimizing risks on the overall product lies with the manufacturer of this overall product.

For minimizing risks on the overall product, we recommend the following approach to you:

- Prepare an application-specific risk assessment in the form of a FMEA, for example. If necessary, introduce measures for minimizing risks.

4 Transport and storage

The products of the cyber® power supply are packed in foil and/or cardboard boxes. Packing units on pallets are secured with straps.

⚠ CAUTION

Risk of injury when disengaging the straps due to uncontrolled movements when cutting open the cardboard boxes.

- Carefully disengage the straps and keep sufficient safety distance.
- Use suitable tools, e.g. safety cutter and personal protective equipment when cutting open the cardboard boxes.

Dispose of the packaging materials at the designated disposal points and observe the applicable national regulations.

The products of the cyber® power supply have been subjected to a standardized test procedure before delivery, so that a high-voltage test is not required by the customer. Repeated high-voltage tests can damage the products.

	**NOTICE** **Destruction of the products due to improperly carried out high-voltage tests.** • Observe the specifications for high-voltage testing in IEC 62477. • Avoid repeating the test.

The overall scope of delivery is described in the delivery or shipping note and the contents may be distributed on several packages. Every package can be identified by the shipping sticker on its outside.

- Check the completeness of the delivery using the delivery note. Compare the type ordered and delivered and report any discrepancies immediately. Missing parts or damage must be reported immediately in writing to the freight forwarder, the insurance company or **WITTENSTEIN cyber motor GmbH**.
- Note the mass of the product to be transported and choose an adequate transport device.

ⓘ The information on the mass of the product can be found within this project specification.

	**NOTICE** **Electronic components of the product can be damaged by electrostatic discharge, particularly by contact with electrical connections.** • Observe the directives concerning ESD protection. • Do not remove ESD protective devices from the connections until immediately before connecting them.

To protect the product, **WITTENSTEIN cyber motor** recommends transporting the product to the intended installation location and to the actual installation time in the machine in the packaging in which the product was delivered by **WITTENSTEIN cyber motor**.

	**NOTICE** **Damage due to incorrect handling.** • Have the product transported in its original packaging and by qualified personnel. • Observe the ambient conditions during transport and storage of the products.

The environmental conditions during the **transport** of the products in the **WITTENSTEIN cyber motor** packaging are:

- IEC 60721-3-3, Class 3K6
- IEC 60721-3-3, Class 3B1
- IEC 60721-3-3, Class 3C1
- IEC 60721-3-3, Class 3S2
- IEC 60721-3-3, Class 3M2

Only store the product in a horizontal position in the original, ESD-compliant packaging. The environment must be dry and clean. Store the product for a maximum of 2 years. We recommend the "first in - first out" principle for your warehouse logistics.

The ambient conditions during storage of the products in the **WITTENSTEIN cyber motor** packaging are:

- IEC 60721-3-3, Class 3K3
- IEC 60721-3-3, Class 3B1
- IEC 60721-3-3, Class 3C1
- IEC 60721-3-3, Class 3S1
- IEC 60721-3-3, Class 3M1

4.1 Delivery condition and scope of delivery

The cyber® power supply are delivered packed in foil and/or cardboard boxes, which contain an operation manual additionally.

	Check the received goods: • After receiving the goods, compare the ordered and delivered products. • Report any deviations immediately. • Check the scope of delivery for completeness.

5 Technical data

5.1 Definitions

The products of the cyber® power supply are documented according to the regulations of the IEC 62103. The reference value is the nominal output voltage U_{DC} specified in the technical data.

Description	Symbol	Unit	Explanation
Nominal output voltage	U_{DC}	V	Output voltage of the power supply
Voltage adjustment range	$U_{DC,adj}$	V	Adjustable range of the output voltage of the power supply
Continuous output current	I_{cont}	A	Current of the power supply, which is continuously available
Short term output current	I_{max}	A	Current of the power supply, which is for a short time available
Continuous output power	P_{cont}	W	Output power, which is continuously available
Short term output power	P_{max}	W	Output power, which is for a short time available
Output ripple	U_{rip}	V	Alternating voltage superimposed on the output voltage, specified as peak-peak-value
Input voltage	U_{AC}	V	Nominal voltage of the power supply to which the product may be connected
Mains frequency	f	Hz	Nominal frequency of the input voltage
Input current	I_{AC}	A	Current on the input for delivering the output power
Power factor	cos φ	-	Ratio between active power and apparent power
Input inrush current	I_{IC}	A	The inrush current is the power surge occurring after connecting to the input voltage.
Efficiency	η	-	Relationship between output and input power
Power losses	P_V	W	Power losses

Description	Symbol	Unit	Explanation
Temperature range	ϑ_{amb}	°C	Ambient temperature during operation
Temperature derating	$f_{d,\vartheta}$	W/°C	Reduction of output power in case of increased temperature
Hold up time	T_2	s	Period between input voltage dropping below the minimum permissible value and the output voltage dropping by 5%.
Dimensions	W · H · D	mm·mm·mm	Length of Width · Height · Depth
Mass	m	kg	Mass of the product.
Crest factor	CF	-	Parameter of a waveform, showing the ratio of peak values to the effective value.

Tbl 4: Explanation of the used technical data

The technical data are valid according to IEC 62103 for installation levels up to 2000 m above sea level. At installation heights between 2000 m and the maximum installation height (see Tbl 5) the performance data are reduced as shown in Tbl 5 and the over-voltage category is limited to category II. With regards to the installation height and the effects, consider not only the power supply but the entire drive system.

Model	Nominal Output Voltage / Current			CPS1005	CPS2010		CPS2020	
	Power Supply			E	D	E	D	E
Reduction by installation height		-	W / 1000 m	7.5	30.0		60.0	
Maximum installation height		-	m	6000	5000		4000	

Tbl 5: Installation conditions

NOTICE

Operation with a higher voltage U_{AC} than the voltage specified on the nameplate can lead to device damage.

- Operate the product at the maximum voltage indicated on the type plate.

5.2 Technical product data

Model	Nominal Output Voltage / Current		CPS1005	CPS2010		CPS2020	
	Power Supply		E	D	E	D	E
Nominal output voltage	U_{DC}	V	24	48		48	
Voltage adjustment range	$U_{DC,adj}$	V	24 – 48	48 – 55		48 – 54	
Continuous output current	I_{cont}	A	5.0 – 4.3	10 – 8.7	10 – 8.7	20 – 17.8	20 – 17.8
Short term output current	I_{max}	A	5.0 – 4.3	15 – 13	15 – 13.1	30 – 26.7	30 – 26.7
Short term output current	P_{cont}	W	120	480		960	
Continuous output power	P_{cont}	W	120	480		960	
Short term output power	P_{max}	W	120	720		1440	
Output ripple (20 Hz – 20 MHz)	U_{rip}	V	< 0.1	< 0.1		< 0,15	
Input voltage	U_{AC}	V	100 – 120 200 – 240	380 – 480	100 – 240	380 – 480	100 – 240
Mains frequency	f	Hz	50 – 60	50 – 60		50 – 60	
Input current	I_{AC}	A	1.72 at 120 V_{AC}	0.79 at 400 V_{AC}	4.56 at 120 V_{AC}	1.58 at 400 V_{AC}	8.6 at 120 V_{AC}
			1.05 at 230 V_{AC}	0.65 at 480 V_{AC}	2.48 at 230 V_{AC}	1.30 at 480 V_{AC}	4.5 at 230 V_{AC}
Power factor	cos φ	-	0.64 at 120 V_{AC}	0.94 at 400 V_{AC}	0.95 at 120 V_{AC}	0.92 at 400 V_{AC}	0.99 at 120 V_{AC}
			0.54 at 230 V_{AC}	0.95 at 480 V_{AC}	0.90 at 230 V_{AC}	0.93 at 480 V_{AC}	0.99 at 230 V_{AC}
Input inrush current	I_{IC}	A	22 at 120 V_{AC}	3 at 400 V_{AC}	9 at 120 V_{AC}	4.5 at 400 V_{AC}	17 at 120 V_{AC}
			33 at 230 V_{AC}	3 at 480 V_{AC}	7 at 230 V_{AC}	4.5 at 480 V_{AC}	11 at 230 V_{AC}
Efficiency	η	%	91.2 at 120 V_{AC}	95.4 at 400 V_{AC}	92.8 at 120 V_{AC}	95.4 at 400 V_{AC}	93.9 at 120 V_{AC}
			92.3 at 230 V_{AC}	95.0 at 480 V_{AC}	94.3 at 230 V_{AC}	95.2 at 480 V_{AC}	95.0 at 230 V_{AC}

Model		Nominal Output Voltage / Current		CPS1005	CPS2010		CPS2020	
		Power Supply		E	D	E	D	E
Power losses		P_V	W	11.6 at 120 V_{AC}	23.1 at 400 V_{AC}	37.2 at 120 V_{AC}	46.3 at 400 V_{AC}	62.4 at 120 V_{AC}
				10.0 at 230 V_{AC}	25.3 at 480 V_{AC}	29.0 at 230 V_{AC}	48.4 at 480 V_{AC}	50.5 at 230 V_{AC}
Temperature range	**min**	ϑ_{amb}	°C	-10 °C	-25 °C		-25 °C	
	max			+70 °C	+70 °C		+70 °C	
Temperature derating (60 – 70 °C)		$f_{d,\vartheta}$	W/°C	3	12		24	
Hold up time		T_2	s	51 x 10^{-3} at 120 V_{AC}	22 x 10^{-3} at 400 V_{AC}	32 x 10^{-3} at 120 V_{AC}	25 x 10^{-3} at 400 V_{AC}	27 x 10^{-3} at 120 V_{AC}
				50 x 10^{-3} at 230 V_{AC}	22 x 10^{-3} at 480 V_{AC}	51 x 10^{-3} at 230 V_{AC}	25 x 10^{-3} at 480 V_{AC}	27 x 10^{-3} at 230 V_{AC}
Dimensions		W	mm	39	65	82	110	125
		H	mm	124	124	124	124	124
		D	mm	124	127	127	127	127
Mass		m	kg	0,37	0,87	1,20	1,50	1,90

Tbl 6: Technical data of CPS

Tolerances			
Mains frequency		± 6 %	
Input voltage	3~, 380 V – 480 V	- 15 %	at CPS2010
		- 15 % + 10 %	at CPS2020
Input voltage	1~, 100 V – 240 V	- 15 %	at CPS2010
		- 15 % + 10 %	at CPS2020
Input voltage	1~, 100 V – 120 V	± 10 %	at CPS1005
	1~, 200 V – 240 V	± 10 %	at CPS1005
All other data		± 10 %	

Tbl 7: Tolerances

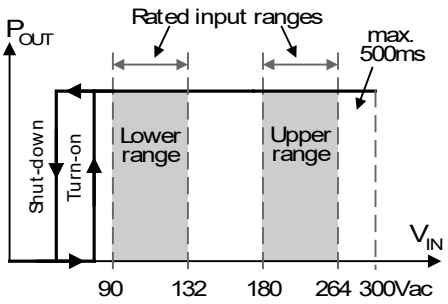
5.2.1 Operation with AC input

The cyber® power supply shall be connected to an AC input, where the products have the following technical values

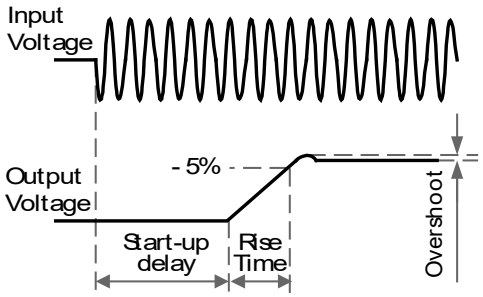
Model	Nominal Output Voltage / Current		CPS1005	Remark
	Power Supply		E	
AC input	V	nominal	100 – 120	Auto-select Suitable for TN, TT and IT mains
			200 - 240	
AC input range	V	minimum	90 – 132	Continuous operation
			180 – 264	
		maximum	264 – 300	< 500 ms
Voltage L or N to earth	V	maximum	300	Continuous, IEC 62103, AC value
External input protection	A	minimum	10 A, B-characteristic	Tested and approved for branch circuits up to 30 A (UL) and 32 A (IEC).
			6 A, C-characteristic	

Model	Nominal Output Voltage / Current		CPS1005E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Input current	A	typical	2.00	1.72	1.05	at 24 V, 5 A (see Picture 5-1)
Power factor	-	typical	0.66	0.64	0.54	at 24 V, 5 A (see Picture 5-1)
Crest factor	-	typical	2.7	2.8	3.4	at 24 V, 5 A
Turn-on voltage	V	typical	78	78	157	at 24 V, 0 A (see Picture 5-1)
Shut-down voltage	V	typical	68	68	68	at 24 V, 5 A (see Picture 5-1)
Start-up delay	ms	typical	400	400	100	(see Picture 5-1)
Rise time	ms	typical	30	30	30	at 24 V, 5 A constant current load, 0 mF load capacitance (see Picture 5-1)
			90	90	90	at 24 V, 5 A constant current load, 5 mF load capacitance (see Picture 5-1)
Turn-on overshoot	V	maximum	0.200	0.200	0.200	(see Picture 5-1)

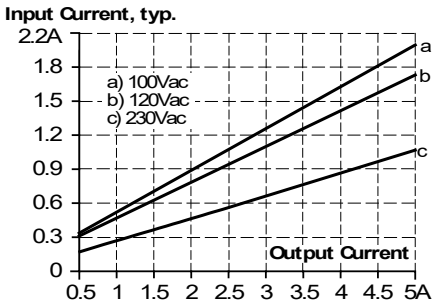
Tbl 8: Operation with AC Input CPS1005E



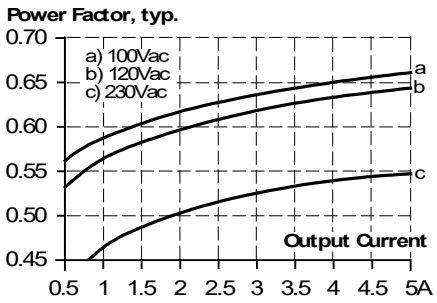
Input voltage range



Turn-on behavior



Input current at 24 V



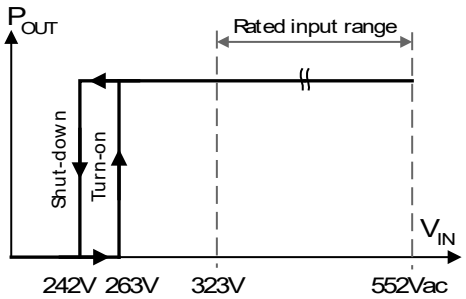
Power factor at 24 V

Picture 5-1: Operation with AC Input, behavior of CPS1005E

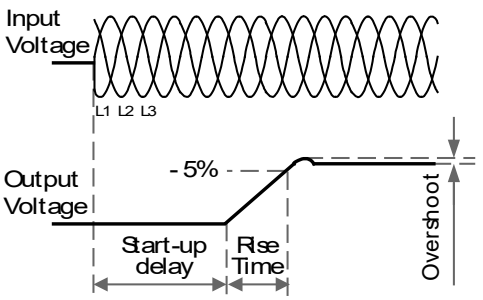
Model	Nominal Output Voltage / Current		CPS2010	Remark
	Power Supply		D	
AC input	V	nominal	380 – 480	wide range input, 3~
AC input range	V	minimum	323 – 552	Continuous operation, 3~
Voltage L or N to earth	V	maximum	400	Continuous, IEC 60664-1, AC value
Turn-on voltage	V	typical	263	Steady-state value, load independent, 3~ (see Picture 5-2)
Shut-down voltage	V	typical	242	Steady-state value, load independent, 3~ (see Picture 5-2)

Model	Nominal Output Voltage / Current		CPS2010D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Input current	A	typical	0.79	0.65	at 48 V, 10 A (see Picture 5-2)
Power factor	-	typical	0.94	0.95	at 48 V, 10 A (see Picture 5-2)
Start-up delay	ms	typical	350	290	(see Picture 5-2)
Rise time	ms	typical	30	30	at 48 V, 10 A resistive load, 0 mF load capacitance (see Picture 5-2)
			40	40	at 48 V, 10 A resistive load, 10 mF load capacitance (see Picture 5-2)
Turn-on overshoot	V	maximum	0.500	0.500	(see Picture 5-2)

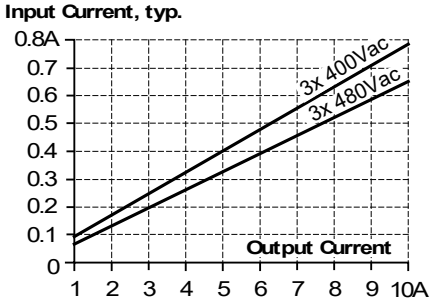
Tbl 9: Operation with AC Input CPS2010D



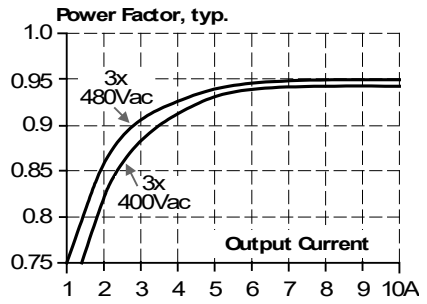
Input voltage range



Turn-on behavior



Input current at 48 V



Power factor at 48 V

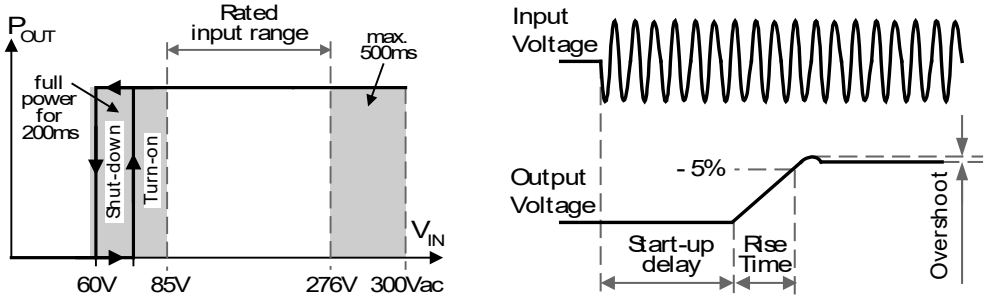
Picture 5-2: Operation with AC Input, behavior of CPS2010D

Model	Nominal Output Voltage / Current		CPS2010	Remark
	Power Supply		E	
AC input	V	nominal	100 – 240	Suitable for TN, TT and IT mains
AC input range	V	minimum	85 – 276	Continuous operation
		minimum	60 – 85	Full power for 200 ms,
		minimum	276 – 300	< 500 ms
Voltage L or N to earth	V	maximum	276	Continuous, IEC 60664-1, AC value
Turn-on voltage	V	typical	77	Steady-state value (see Picture 5-3)
Shut-down voltage	V	typical	73	Steady-state value, load independent, 3~ (see Picture 5-3)
			53	Dynamic value

Model	Nominal Output Voltage / Current		CPS2010E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Input current	A	typical	5.47	4.56	2.48	at 48 V, 10 A (see Picture 5-3)
Power factor	-	typical	0.96	0.95	0.90	at 48 V, 10 A (see Picture 5-3)
Crest factor	-	typical	1.60	1.70	2.05	at 48 V, 10 A
Start-up delay	ms	typical	640	610	660	(see Picture 5-3)
Rise time	ms	typical	80	80	80	at 48 V, 10 A constant current load, 0 mF load capacitance (see Picture 5-3)
			100	100	100	at 48 V, 10 A constant current load, 10 mF load capacitance (see Picture 5-3)

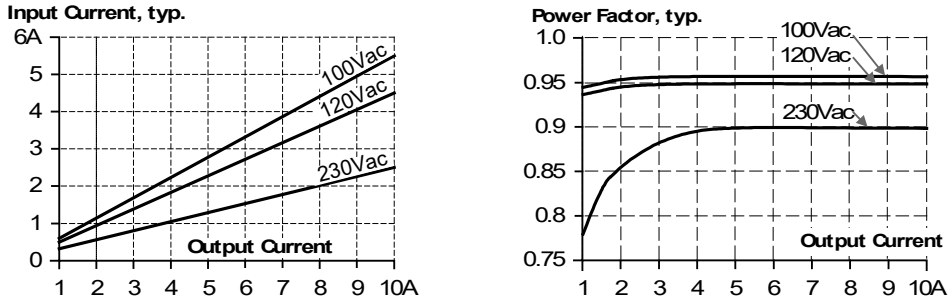
Turn-on overshoot	V	maximum	0.100	0.100	0.100	(see Picture 5-3)

Tbl 10: Operation with AC Input CPS2010E



Input voltage range

Turn-on behavior



Input current at 48 V

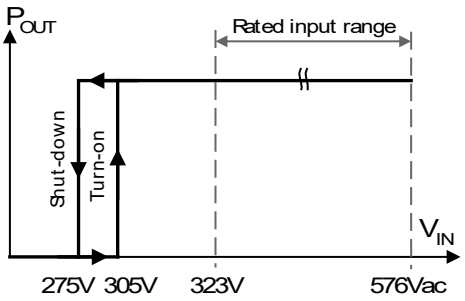
Power factor at 48 V

Picture 5-3: Operation with AC Input, behavior of CPS2010E

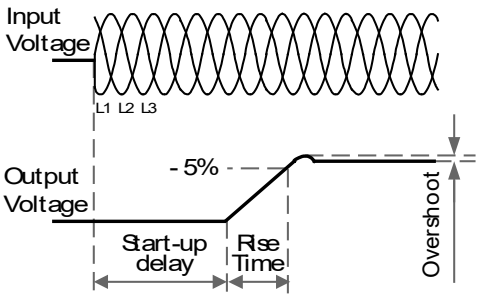
Model	**Nominal Output Voltage / Current**		**CPS2020**	**Remark**
	Power Supply		**D**	
AC input	V	nominal	380 – 480	wide range input, 3~ Suitable for TN, TT and IT mains Grounding of one phase is allowed except in UL 508 applications
AC input range	V	minimum	323 – 576	Continuous operation, 3~
Voltage L or N to earth	V	maximum	576	Continuous, IEC 60664-1, AC value
Turn-on voltage	V	typical	305	Steady-state value, load independent, 3~ (see Picture 5-4)
Shut-down voltage	V	typical	275	Steady-state value, load independent, 3~ (see Picture 5-4)

Model	Nominal Output Voltage / Current		CPS2020D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Input current	A	typical	1.58	1.30	at 48 V, 20 A (see Picture 5-4)
Power factor	-	typical	0.92	0.93	at 48 V, 20 A (see Picture 5-4)
Start-up delay	ms	typical	500	600	(see Picture 5-4)
Rise time	ms	typical	23	23	at 48 V, 20 A resistive load, 0 mF load capacitance (see Picture 5-4)
			47	47	at 48 V, 20 A resistive load, 20 mF load capacitance (see Picture 5-4)
Turn-on overshoot	V	maximum	1.000	1.000	(see Picture 5-4)

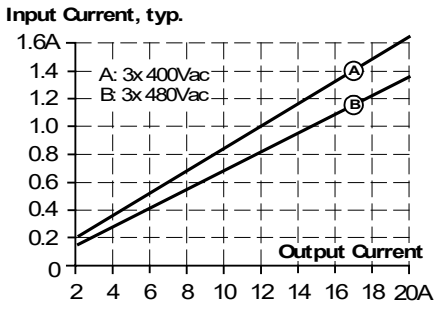
Tbl 11: Operation with AC Input CPS2020D



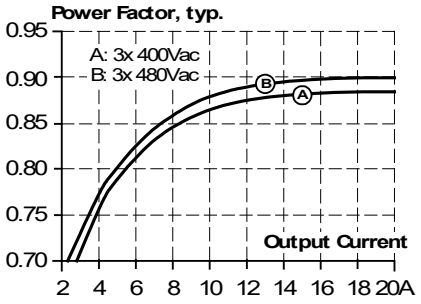
Input voltage range



Turn-on behavior



Input current at 48 V



Power factor at 48 V

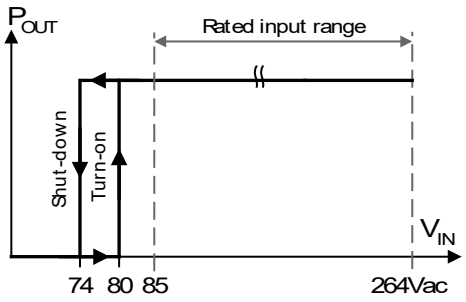
Picture 5-4: Operation with AC Input, behavior of CPS2020D

Model	Nominal Output Voltage / Current		CPS2020	Remark
	Power Supply		E	
AC input	V	nominal	100 – 240	Suitable for TN, TT and IT mains
AC input range	V	minimum	90 – 264	Continuous operation
		minimum	85 – 90	Continuous operation if ambient temperature < 55 °C with derating (see Picture 5-5) for ambient > 55 °C
		minimum	60 – 85	Full power for 200 ms,
		minimum	264 – 300	< 500 ms
Voltage L or N to earth	V	maximum	300	Continuous, IEC 60664-1, AC value
Turn-on voltage	V	typical	80	Steady-state value (see Picture 5-5)
Shut-down voltage	V	typical	74	Steady-state value (see Picture 5-5)

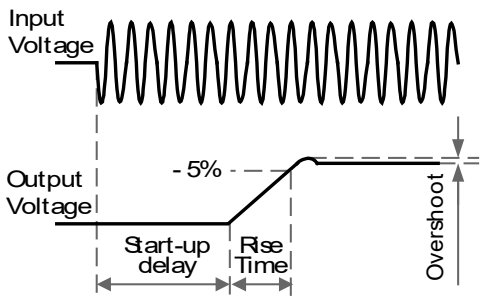
Model	Nominal Output Voltage / Current		CPS2020E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Input current	A	typical	10.5	8.6	4.5	at 48 V, 20 A (see Picture 5-5)
Power factor	-	typical	0.99	0.99	0.99	at 48 V, 20 A (see Picture 5-5)
Crest factor	-	typical	1.47	1.53	1.56	at 48 V, 20 A
Start-up delay	ms	typical	800	750	700	(see Picture 5-5)
Rise time	ms	typical	16	16	16	at 48 V, 20 A constant current load, 0 mF load capacitance (see Picture 5-5)

Model	Nominal Output Voltage / Current		CPS2020E			Remark
	AC Input Voltage		100 V	120 V	230 V	
			55	55	55	at 48 V, 20 A constant current load, 20 mF load capacitance (see Picture 5-5)
Turn-on overshoot	V	maximum	0.100	0.100	0.100	(see Picture 5-5)

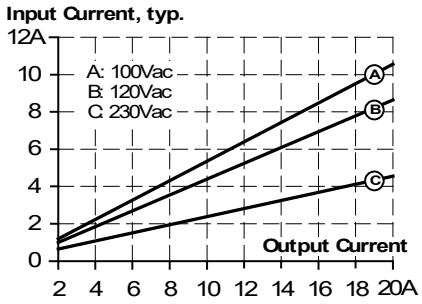
Tbl 12: Operation with AC Input CPS2020E



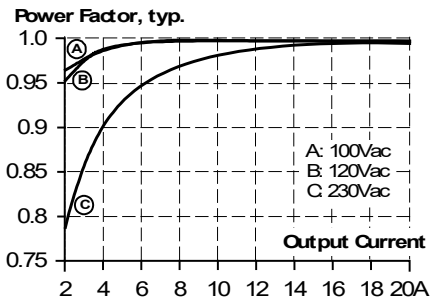
Input voltage range



Turn-on behavior



Input current at 48 V



Power factor at 48 V

Picture 5-5: Operation with AC Input, behavior of CPS2020E

An external input protection is only required if the supplying branch has an ampacity greater than this.

- Check also local codes and local requirements.
- Observe also local regulations.
- If an external fuse is necessary or utilized, minimum requirements need to be considered to avoid nuisance tripping of the circuit breaker.

5.2.2 Operation with DC input

The cyber® power supply CPS2010E-CCN-A00 may be connected to a DC input.

Model	Nominal Output Voltage / Current		CPS2010	Remark
	Power Supply		E	
DC input	V	nominal	100 – 150	Tolerances: -20% +25%
DC input range	V	minimum	88 – 187	
DC input current	A	typical	4.6	at 110 V input and 48 V, 10 A output
Voltage L or N to earth	V	maximum	375	Continuous, IEC 62103
Turn-on voltage	V	typical	74	Steady-state value
Shut-down voltage	V	typical	69	Steady-state value

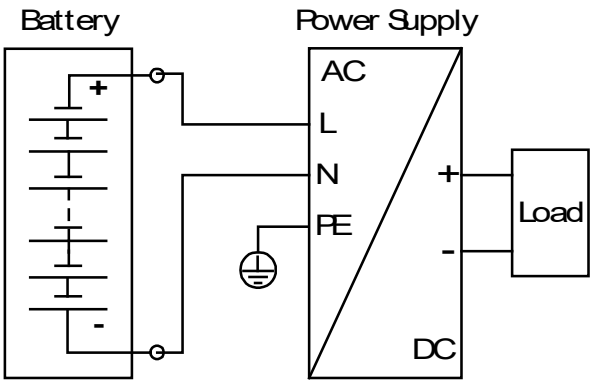
Tbl 13: Operation with DC Input CPS2010E

NOTICE

The operation of the CPS2020, the CPS2010D and the CPS1005 is only possible with AC input.

- Do not operate these power supplies on a DC input.

Observe the wiring diagram in Picture 5-6. Use a battery or a similar DC source. Connect the positive pole of the battery with L of the power supply and the negative pole of the battery with N of the power supply. Connect the PE of the power supply with an earth wire and / or the machine ground.



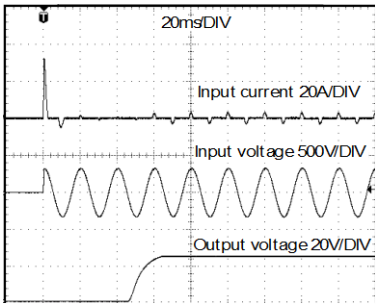
Picture 5-6: Wiring diagram with DC input of CPS2010E

5.2.3 Input inrush currents

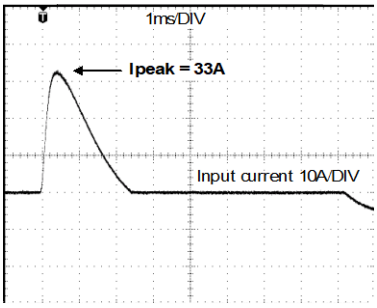
The CPS1005E uses a NTC inrush limiter to limits the input inrush current after turn-on of the input voltage. The charging current into electromagnetic interference suppression capacitors is disregarded in the first microseconds after switch-on.

Model	Nominal Output Voltage / Current		CPS1005E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Inrush current	A	maximum	23	27	40	at 40 °C ambient, cold start, peak values
		typical	18	22	33	at 40 °C ambient, cold start, peak values
		typical	13	16	30	at 25 °C ambient, cold start, peak values
Inrush energy	A^2s	maximum	0.4	0.5	1.5	at 40 °C ambient, cold start

Tbl 14: Input inrush currents of CPS1005E



Input inrush current



First peak of input inrush current

Picture 5-7: Input inrush currents behavior of CPS1005E

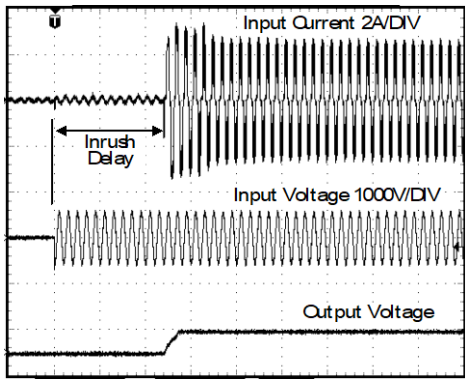
Picture 5-7 shows the typical behavior of the CPS1005E power supply at 230 V input and 24 V, 5 A output at 40 °C ambient temperature in a total view and a zoomed view of the first peak.

The power supply CPS2010D is equipped with an active inrush current limitation circuit, which limits the input inrush current after turn-on and after short input voltage interruptions to a very low value. The charging current into electromagnetic interference suppression capacitors is disregarded in the first microseconds after switch-on.

Model	Nominal Output Voltage / Current		CPS2010D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Inrush current	A	maximum	10	10	Over entire temperature range, peak value
		typical	3	3	
Inrush energy	A^2s	maximum	1	1	Over entire temperature range

Model	Nominal Output Voltage / Current		CPS2010D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Inrush delay	s	typical	0.270	0.220	

Tbl 15: Input inrush currents of CPS2010D



Input inrush current

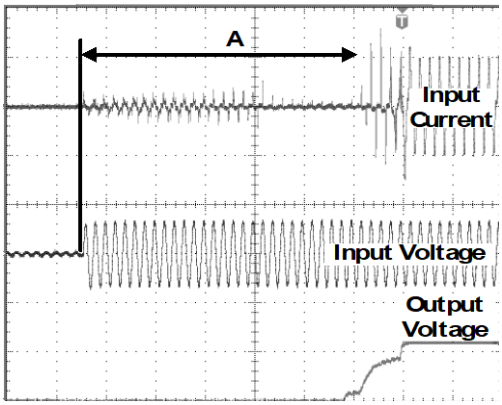
Picture 5-8: Input inrush currents behavior of CPS2010D

Picture 5-8 shows the typical behavior of the CPS2010D power supply at nominal output at 25 °C ambient temperature

The power supply CPS2010E has an active inrush limitation circuit which limits the input inrush current after turn-on of the input voltage and after short input voltage interruptions. The charging current into electromagnetic interference suppression capacitors is disregarded in the first microseconds after switch-on. The inrush current occur after an interruption of the mains for a longer period than 750 ms.

Model	Nominal Output Voltage / Current		CPS2010E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Inrush current	A	maximum	13	13	13	Over entire temperature range, peak value
		typical	11	9	7	
Inrush energy	A^2s	maximum	5	5	5	Over entire temperature range,
Inrush delay	s	typical	0.400	0.400	0.650	-

Tbl 16: Input inrush currents of CPS2010E



Input inrush current

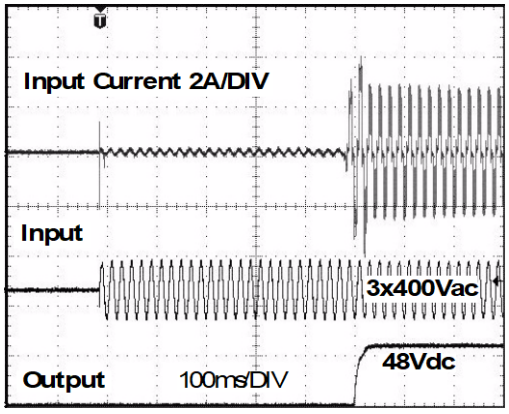
Picture 5-9: Input inrush currents behavior of CPS2010E

Picture 5-9 shows the typical behavior of the CPS2010E power supply at 48 V, 10 A output at 25 °C ambient temperature.

The power supply CPS2020D is equipped with an active inrush current limitation circuit, which limits the input inrush current after turn-on and after short input voltage interruptions to a very low value. The input current is usually smaller than the steady state input current. The charging current into electromagnetic interference suppression capacitors is disregarded in the first microseconds after switch-on.

Model	Nominal Output Voltage / Current		CPS2020D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Inrush current	A	maximum	6	6	Over entire temperature range, peak value
		typical	4.5	4.5	
Inrush energy	A²s	maximum	1.5	1.5	Over entire temperature range
Inrush delay	s	typical	0.500	0.600	

Tbl 17: Input inrush currents of CPS2020D



Input inrush current

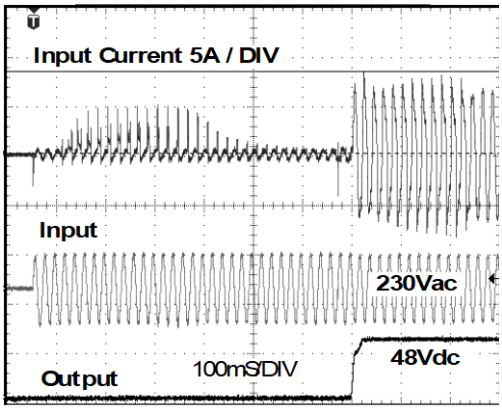
Picture 5-10: Input inrush currents behavior of CPS2020D

Picture 5-10 shows the typical behavior of the CPS2020D power supply at nominal output at 25 °C ambient temperature.

The power supply CPS2020E has an active inrush limitation circuit which limits the input inrush current after turn-on of the input voltage and after short input voltage interruptions. The input current is usually smaller than the steady state input current. The charging current into electromagnetic interference suppression capacitors is disregarded in the first microseconds after switch-on. The inrush current occur after an interruption of the mains for a longer period than 1000 ms.

Model	Nominal Output Voltage / Current		CPS2020E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Inrush current	A	maximum	25	22	16	Over entire temperature range, peak value
		typical	20	17	11	
Inrush energy	A^2s	maximum	5	5	5	Over entire temperature range,
Inrush delay	s	typical	0.400	0.400	0.650	-

Tbl 18: Input inrush currents of CPS2020E



Input inrush current

Picture 5-11: Input inrush currents behavior of CPS2020E

Picture 5-11 shows the typical behavior of the CPS2020E power supply at nominal output at 25 °C ambient temperature.

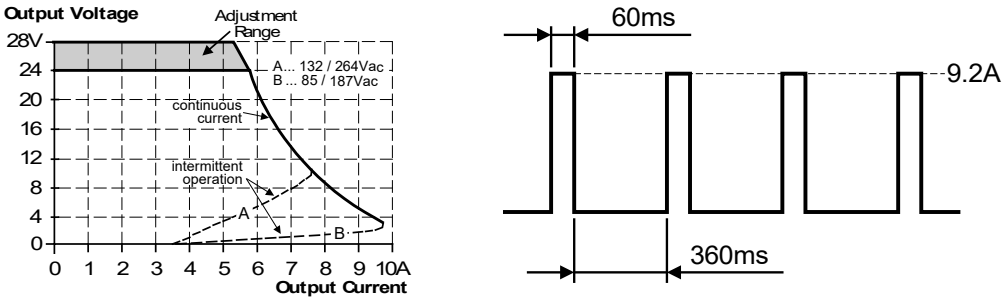
5.2.4 Output data

All cyber® power supply have an adjustable output voltage. In addition, the CPS2010 and CPS2020 have a short term power capability, called “Bonus Power”. This short term power is available as soon as power comes on and immediately after the end of an output short circuit or output overload.

Model	Nominal Output Voltage / Current		CPS1005	Remark
	Power Supply		E	
Output voltage	V	nominal	24	-
Adjustment range	V	minimum	24 – 28	guaranteed
		maximum	30	Maximum output voltage at end position of potentiometer. Value not guaranteed. Typical value 28.5 V
Factory setting	V	typical	24.1	± 0.2 %, at full load, cold unit
Line regulation	mV	maximum	10	at 90 – 132 V / 180 – 264 V

Model	Nominal Output Voltage / Current		CPS1005	Remark
	Power Supply		E	
Load regulation	mV	maximum	150	Static value
Ripple and noise voltage	mV	maximum	100	20 Hz – 20 MHz, 50 Ω, peak value
Output current (at nominal AC input)	A	nominal	5.0	at 24 V, < 55 °C ambient temperature
		nominal	4.3	at 28 V, < 55 °C ambient temperature
		nominal	3.1	at 24 V, at 70 °C ambient temperature
		nominal	2.7	at 28 V, at 70 °C ambient temperature
Output current (at 100 V~ / 200 V~ input)	A	nominal	5.0	at 24 V, < 55 °C ambient temperature
		nominal	4.3	at 28 V, < 55 °C ambient temperature
		nominal	2.5	at 24 V, at 70 °C ambient temperature
		nominal	2.1	at 28 V, at 70 °C ambient temperature
Short-circuit current	A	typical	3.5	at load impedance 50 mΩ, rms-value, no discharge current
Output capacitance	µF	typical	2050	inside power supply

Tbl 19: Output data of CPS1005E



Output voltage over output current

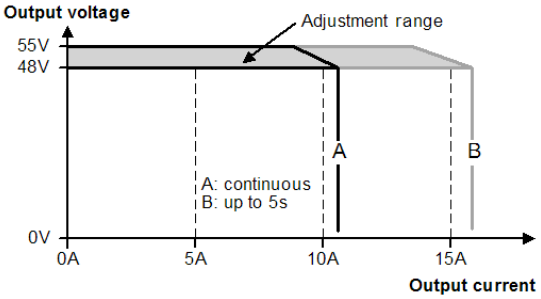
Intermittent operation

Picture 5-12: Output behavior of CPS1005E

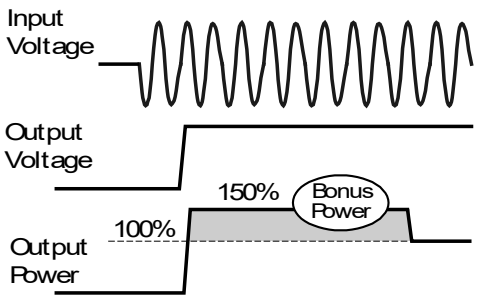
With its overload behavior the CPS1005E delivers continuous current at output voltages > 10 V and intermittent operation at output voltages < 10 V as shown in Picture 5-12.

Model	Nominal Output Voltage / Current		CPS2010	Remark
	Power Supply		D	
Output voltage	V	nominal	48	-
Adjustment range	V	minimum	48 – 55	guaranteed
		maximum	59	Maximum output voltage at end position of potentiometer. Value not guaranteed. Typical value 56 V
Factory setting	V	typical	48.0	± 0.2 %, at full load, cold unit
Line regulation	mV	maximum	10	at 3~ 323 – 552 V
Load regulation	mV	maximum	100	Static value
Ripple and noise voltage	mV	maximum	100	20 Hz – 20 MHz, 50 Ω, peak value
Output current	A	nominal	10.0	at 48 V, < 60°C ambient temperature
		nominal	8.7	at 55 V, < 60°C ambient temperature
		nominal	7.5	at 48 V, at 70°C ambient temperature
		nominal	6.5	at 55 V, at 70°C ambient temperature
		nominal	15.0	at 48 V, < 60°C ambient temperature, short term power capability ≤ 5 s
		nominal	13.0	at 55 V, < 60°C ambient temperature, short term power capability ≤ 5 s
		nominal	13.5	at 48 V, < 60°C ambient temperature, short term power capability > 5 s – 34 s
		nominal	11.8	at 55 V, < 60°C ambient temperature, short term power capability > 5 s – 34 s
Output power	W	nominal	480	at 48 V – 55 V
		nominal	720	at 48 V – 55 V, short term power capability
Short-circuit current	A	minimum	10.0	Continuous, at load impedance 50 mΩ, rms-value, no discharge current
		maximum	11.5	
		minimum	15.0	Short term (5 s), at load impedance 50 mΩ, rms-value, no discharge current
		maximum	17.0	
Output capacitance	µF	typical	250	inside power supply

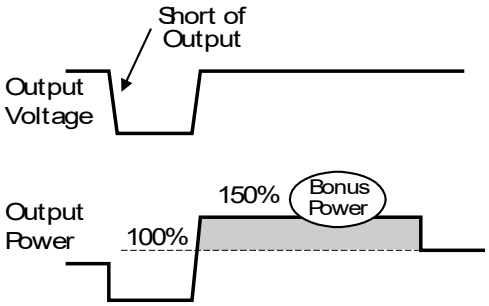
Tbl 20: Output data of CPS2010D



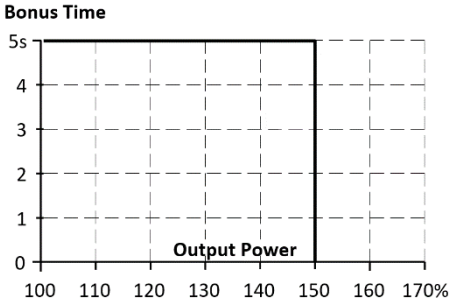
Output voltage over output current



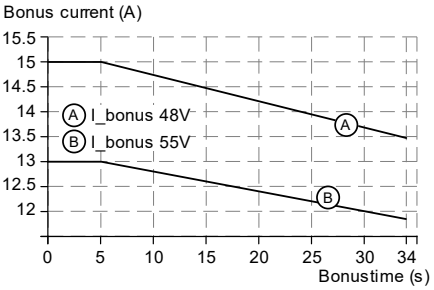
Short term power after input turn-on



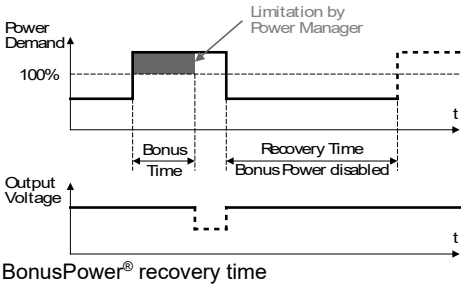
Short term power after output short



Bonus time vs. output power



Allowed bonus current for >5s to 34s

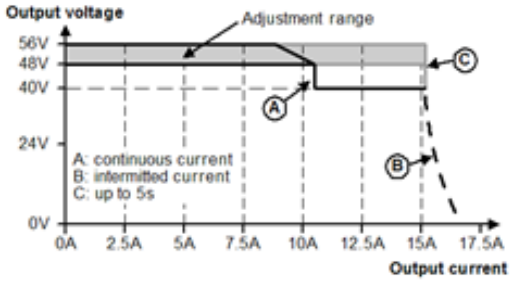


BonusPower® recovery time

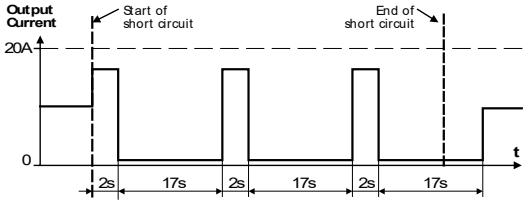
Picture 5-13: Output behavior of CPS2010D

Model	Nominal Output Voltage / Current		CPS2010	Remark
	Power Supply		E	
Output voltage	V	nominal	48	-
Adjustment range	V	minimum	48 – 55	guaranteed
		maximum	59	Maximum output voltage at end position of potentiometer. Value not guaranteed. Typical value 56.5 V
Factory setting	V	typical	48.0	± 0.2 %, at full load, cold unit
Line regulation	mV	maximum	10	at 60 – 300 V
Load regulation	mV	maximum	100	Static value
Ripple and noise voltage	mV	maximum	100	20 Hz – 20 MHz, 50 Ω, peak value
Output current (at nominal AC input)	A	nominal	10.0	at 48 V, < 60°C ambient temperature
		nominal	8.7	at 55 V, < 60°C ambient temperature
		nominal	7.5	at 48 V, at 70°C ambient temperature
		nominal	6.5	at 55 V, at 70°C ambient temperature
		nominal	15.0	at 48 V, short term power capability (up to max. 60 s)
		nominal	13	at 55 V, short term power capability (up to max. 60 s)
Output power	W	nominal	480	Continuously available
		nominal	720	Short term available
Short-circuit current	A	minimum	15.0	at load impedance 100 mΩ, rms-value, no discharge current
		maximum	20.0	
		maximum	7.0	at load impedance < 10 mΩ, rms-value, no discharge current
Output capacitance	µF	typical	3100	inside power supply

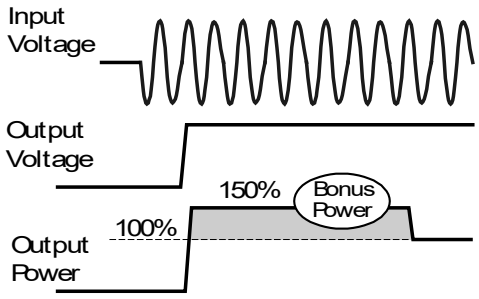
Tbl 21: Output data of CPS2010E



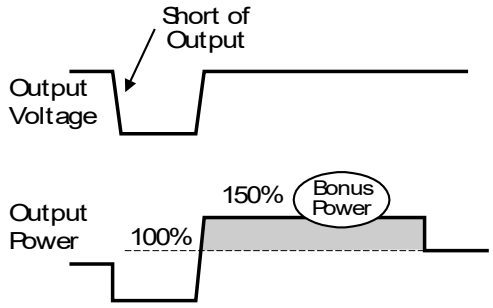
Output voltage over output current



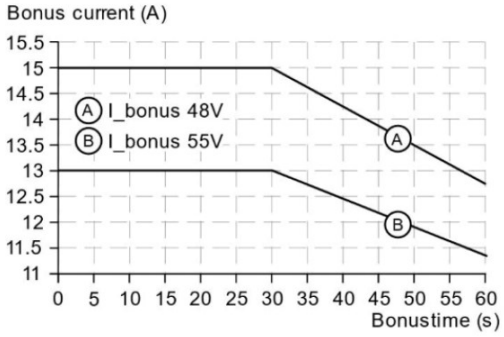
Hiccup mode



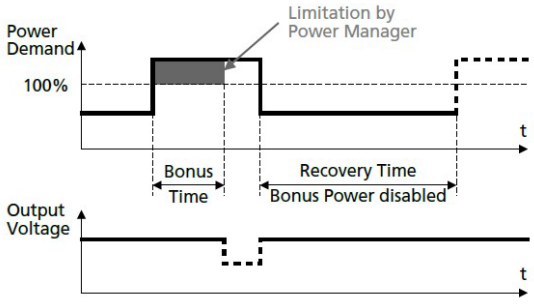
Short term power after input turn-on



Short term power after output short



Bonus time vs. output power



Bonus current vs. output power

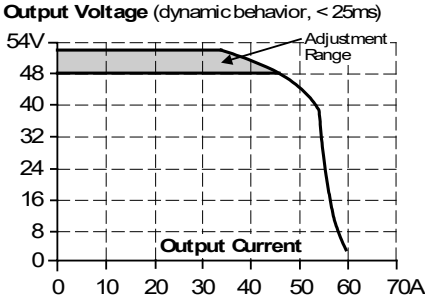
Picture 5-14: Output behavior of CPS2010E

With its overload behavior the CPS2010E delivers continuous current at output voltages > 40 V. At heavy overloads, when the output voltage drops below 40 V, the power supply delivers continuous output current for 2 s. After this, the output is switched off for approximately 17 s before a new start attempt is automatically performed (“hiccup mode”, see Picture 5-16). This cycle is repeated as long as the overload exists. If the overload has been cleared, the device will operate normally.

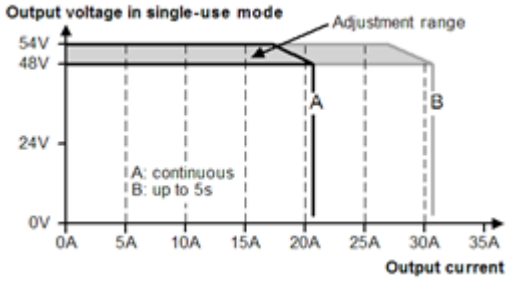
Model	Nominal Output Voltage / Current		CPS2020	Remark
	Power Supply		D	
Output voltage	V	nominal	48	-
Adjustment range	V	minimum	48 – 54	guaranteed
		maximum	56	Maximum output voltage at end position of potentiometer. Value not guaranteed. Typical value 55 V
Factory setting	V	typical	48.0	± 0.2 %, at full load, cold unit, single mode at no load, cold unit, parallel mode
			46.0	± 0.2 %, at full load, cold unit, parallel mode
Line regulation	mV	maximum	10	at 3~ 323 – 576 V
Load regulation	mV	maximum	50	Static value, single mode

Model	Nominal Output Voltage / Current		CPS2020	Remark
	Power Supply		D	
		typical	2000	Static value, parallel mode
Ripple and noise voltage	mV	maximum	150	20 Hz – 20 MHz, 50 Ω, peak value
Output current	A	nominal	20.0	at 48 V, < 60°C ambient temperature
		nominal	17.8	at 54 V, < 60°C ambient temperature
		nominal	15.0	at 48 V, at 70°C ambient temperature
		nominal	13.4	at 54 V, at 70°C ambient temperature
		nominal	30.0	at 48 V, < 60°C ambient temperature, short term power capability ≤ 5 s
		nominal	26.7	at 54 V, < 60°C ambient temperature, short term power capability ≤ 5 s
		nominal	27.0	at 48 V, < 60°C ambient temperature, short term power capability > 5 s – 60 s
		nominal	24.0	at 54 V, < 60°C ambient temperature, short term power capability > 5 s – 60 s
		typical	50.0	up to 10 ms with output voltage > 40 V available one every second
Output power	W	nominal	960	at 48 V – 54 V
		nominal	1440	at 48 V – 54 V, short term power capability
Short-circuit current	A	minimum	20.0	Continuous, at load impedance 50 mΩ, rms-value, no discharge current
		maximum	22.0	
		minimum	30.0	Short term (5s), at load impedance 50 mΩ, rms-value, no discharge current
		maximum	34.0	
		typical	26.0	Continuous, at load impedance < 10 mΩ, rms-value, no discharge current
		maximum	29.0	
Output capacitance	µF	typical	3700	inside power supply

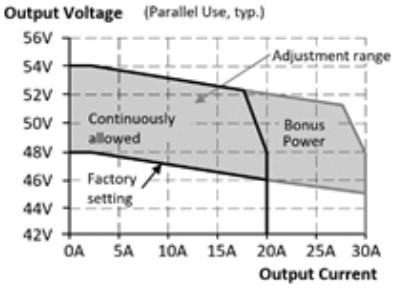
Tbl 22: Output data of CPS2020D



Dynamic overcurrent capability

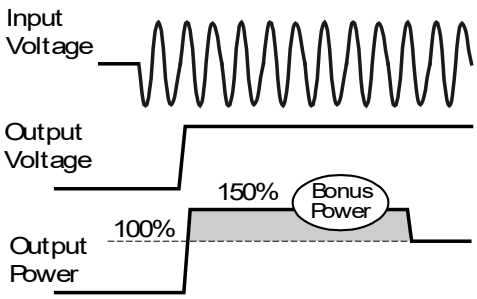


Single Mode: Output voltage over current

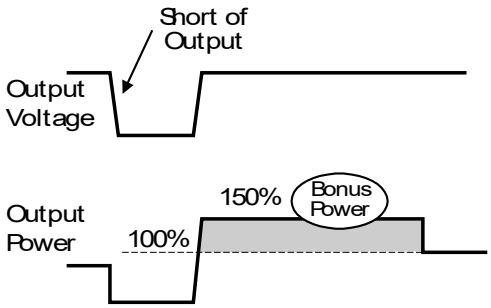


Parallel Mode: Output voltage over current

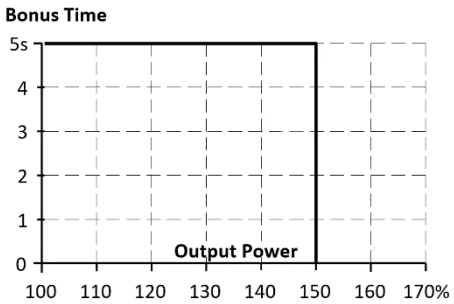
Picture 5-15: Output behavior of CPS2020D



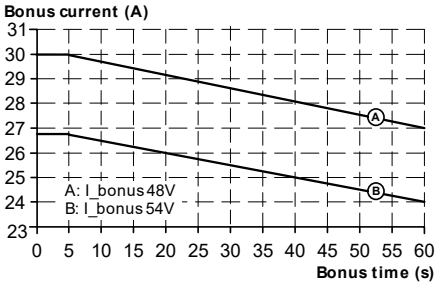
Short term power after input turn-on



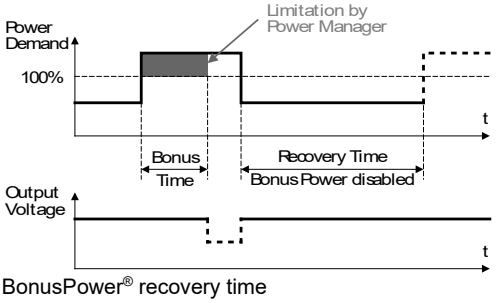
Short term power after output short



Bonus time vs. output power



Allowed bonus current for >5s to 60s



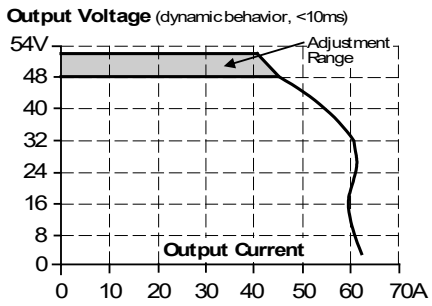
BonusPower® recovery time

Picture 5-16: Short term power output behavior of CPS2020D

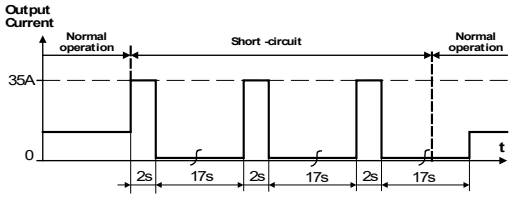
Model	Nominal Output Voltage / Current		CPS2020	Remark
	Power Supply		E	
Output voltage	V	nominal	48	-
Adjustment range	V	minimum	48 – 54	guaranteed
		maximum	56	Maximum output voltage at end position of potentiometer. Value not guaranteed. Typical value 55 V
Factory setting	V	typical	48.0	± 0.2 %, at full load, cold unit, single mode at no load, cold unit, parallel mode
			46.0	± 0.2 %, at full load, cold unit, parallel mode
Line regulation	mV	maximum	10	at 85 – 300 V
Load regulation	mV	maximum	50	Static value, single mode
		typical	2000	Static value, parallel mode
Ripple and noise voltage	mV	maximum	150	20 Hz – 20 MHz, 50 Ω, peak value
Output current	A	nominal	20.0	at 48 V, < 60°C ambient temperature
		nominal	17.8	at 54 V, < 60°C ambient temperature
		nominal	15.0	at 48 V, at 70°C ambient temperature
		nominal	13.4	at 54 V, at 70°C ambient temperature
		nominal	30.0	at 48 V, short term power capability (up to max. 60 s)
		nominal	26.7	at 54 V, short term power capability (up to max. 60 s)
		typical	55.0	up to 10 ms with output voltage > 40 V available one every second
Output power	W	nominal	960	at 48 V – 54 V
		nominal	1440	at 48 V – 54 V, short term power capability
Short-circuit current	A	minimum	30.0	Continuous, at load impedance 50 mΩ, rms-value, no discharge current
		maximum	35.0	
		maximum	11.5	Average current, at load impedance 50 mΩ, rms-value, no discharge current
		typical	62.0	up to 10 ms, at load impedance < 10 mΩ, rms-value, no discharge current
Output capacitance	µF	typical	3700	inside power supply

Tbl 23: Output data of CPS2020E

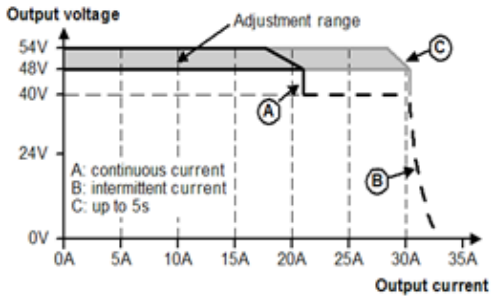
With its overload behavior the CPS2020E delivers continuous current at output voltages > 40 V. At heavy overloads, when the output voltage drops below 40 V, the power supply delivers continuous output current for 5 s. After this, the output is reduced to nearly zero for approximately 17 s before a new start attempt is automatically performed (“hiccup mode”, see Picture 5-21). During this new start attempt, the output current will be delivered for 2 s to 5 s depending on the overload, and reduced to nearly zero for approximately 17 s. This cycle is repeated as long as the overload exists. If the overload has been cleared, the device will operate normally. During the off-period a small rest voltage and rest current is present on the output.



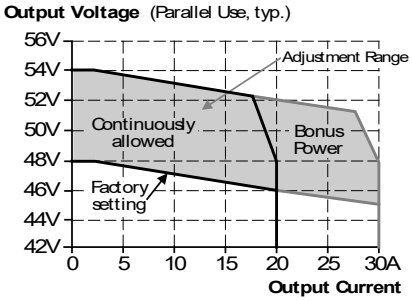
Dynamic overcurrent capability



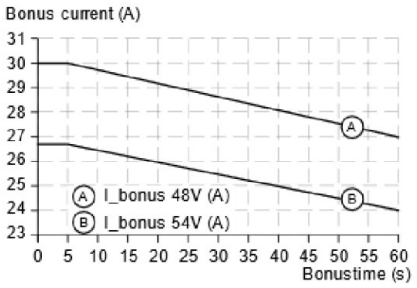
Hiccup mode



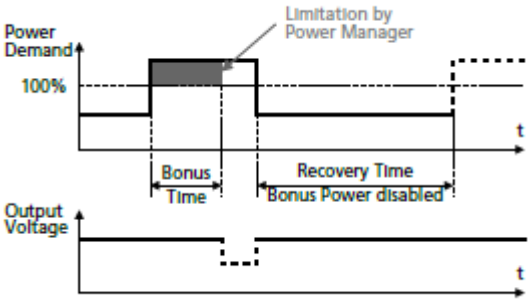
Single Mode: Output voltage over current



Parallel Mode: Output voltage over current

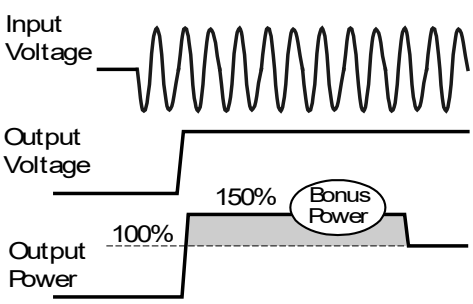


Output current vs. bonus time

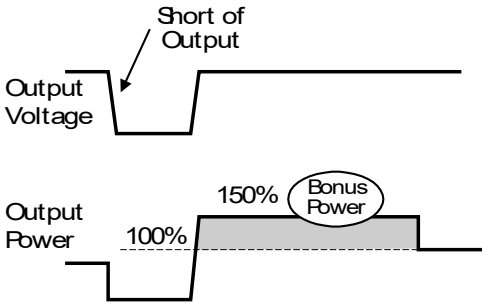


BonusPower® recovery time

Picture 5-17: Output behavior of CPS2020E



Short term power after input turn-on

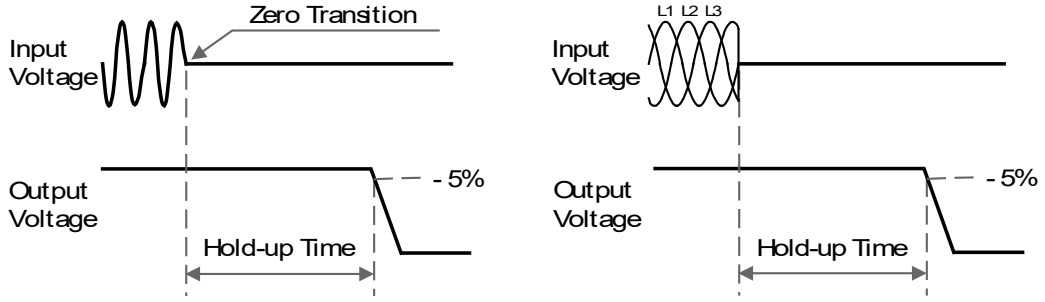


Short term power after output short

Picture 5-18: Short term power output behavior of CPS2020E

5.2.5 Hold-up time

The hold-up time is the time between the collapse of the input voltage below the minimum permitted value and the fall in output voltage by 5% of the power supply.



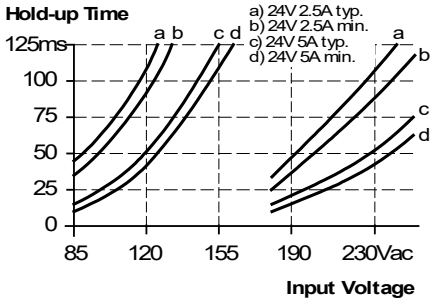
1~ shut down behavior

3~ shut down behavior

Picture 5-19: Definitions of shut-down behavior

Model	Nominal Output Voltage / Current		CPS1005E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Hold-up time	s	typical	0.064	0.108	0.105	at 24 V, 2.5 A
		minimum	0.054	0.091	0.088	
		typical	0.026	0.051	0.050	at 24 V, 5.0 A
		minimum	0.022	0.043	0.042	

Tbl 24: Hold-up time of CPS1005E

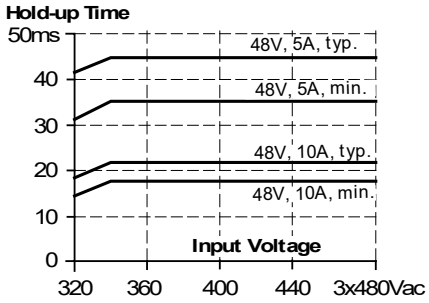


Hold-up time over input voltage

Picture 5-20: Hold-up behavior of CPS1005E

Model	Nominal Output Voltage / Current		CPS2010D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Hold-up time	s	typical	0.044	0.044	at 48 V, 5.0 A
		minimum	0.036	0.036	
		typical	0.022	0.022	at 48 V, 10.0 A
		minimum	0.018	0.018	

Tbl 25: Hold-up time of CPS2010D

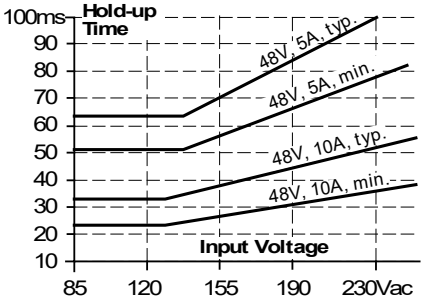


Hold-up time over input voltage

Picture 5-21: Hold-up behavior of CPS2010D

Model	Nominal Output Voltage / Current		CPS2010E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Hold-up time	s	typical	0.064	0.064	0.099	at 48 V, 5.0 A
		typical	0.032	0.032	0.051	at 48 V, 10.0 A

Tbl 26: Hold-up time of CPS2010E

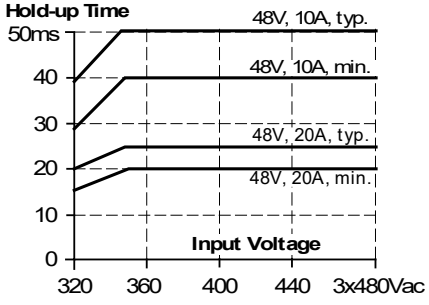


Hold-up time over input voltage

Picture 5-22: Hold-up behavior of CPS2010E

Model	Nominal Output Voltage / Current		CPS2020D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Hold-up time	s	typical	0.050	0.050	at 48 V, 10.0 A
		minimum	0.040	0.040	
		typical	0.025	0.025	at 48 V, 20.0 A
		minimum	0.020	0.020	

Tbl 27: Hold-up time of CPS2020D

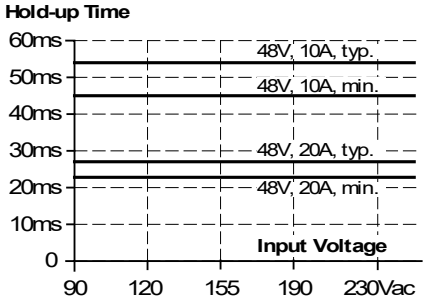


Hold-up time over input voltage

Picture 5-23: Hold-up behavior of CPS2020D

Model	Nominal Output Voltage / Current		CPS2020E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Hold-up time	s	typical	0.054	0.054	0.054	at 48 V, 10.0 A
		minimum	0.045	0.045	0.045	
		typical	0.027	0.027	0.027	at 48 V, 20.0 A
		minimum	0.023	0.023	0.023	

Tbl 28: Hold-up time of CPS2020E



Hold-up time over input voltage

Picture 5-24: Hold-up behavior of CPS2020E

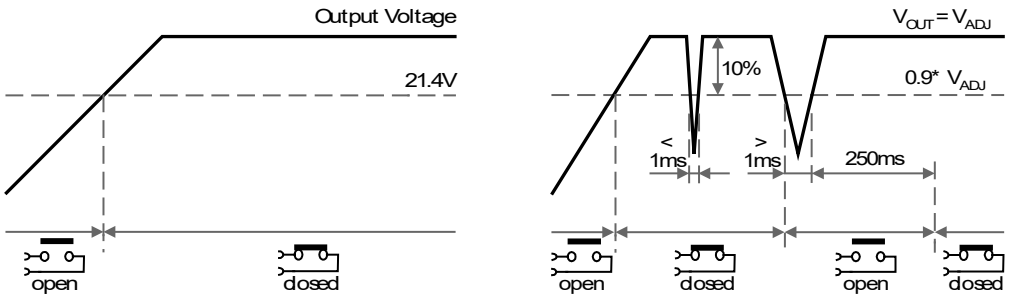
5.2.6 DC-OK relay contact

The output voltage, which is produced by the power supply itself, is monitored. This is independent of a back-fed voltage from a unit connected in parallel to the power supply output.

The DC-OK relay contact opens as soon as the output voltage dips below the voltage displayed in Tbl 29. Voltage dips shorter than 1 ms will be ignored. Short voltage dips will be extended to a signal length of 250 ms (see Picture 5-29). The DC-OK relay contact re-closes after the output voltage exceeds the voltage displayed in Tbl 29The DC-OK feature requires that the output voltage reaches the nominal level, respectively the adjusted level (U_{adj}), after turn-on. If this level cannot be achieved, the overload lamp will be on and the DC-ok contact will be open. The overload signal will only shut off as soon as the adjusted voltage is reached. Especially note this behavior as a condition if the load is a battery, the power supply is used in parallel or the power supply is used for N+1 redundant systems.

Model	Nominal Output Voltage / Current		CPS1005		CPS20x0	
			open	close	open	close
DC-OK relay contact	V	typical	< 21.4 V	≥ 21.4 V	< 0.9 x U_{adj}	≥ 0.9 x U_{adj}
Contact rating with resistive load		maximum	60 V_{DC} 0.3 A; 30 V_{DC} 1.0 A; 30 V_{AC} 0.5 A			
		minimum	1 mA at 5 V_{DC}			

Tbl 29: DC-OK relay contact



DC-OK relay contact behavior of CPS1005

DC-OK relay contact behavior (all versions)

Picture 5-25: DC-OK relay contact behavior

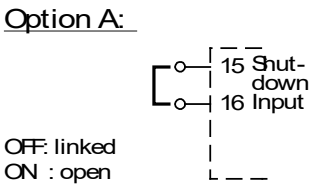
5.2.7 Shut-down input and remote control of output voltage

A switch-off of the output of the power supply with a signal switch or an external voltage is allowed with the shut-down feature at the CPS2020. The shut-down occurs immediately while the turn-on is delayed up to 350 ms. In a shut-down condition, the output voltage is < 4 V and the output power is < 0.5 W.

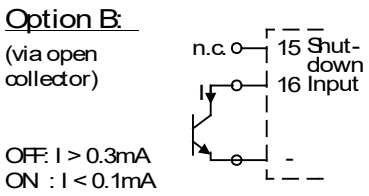
NOTICE

The shut-down function has no safety feature included.

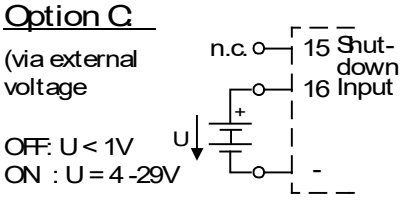
- Do not use the shut-down function as a safety feature.



Shut-down input, Option A



Shut-down input, Option B



Shut-down input, Option C

Picture 5-26: Shut-down input options

NOTICE

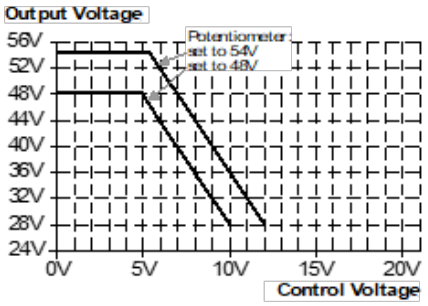
The use of option C requires a current sink capability of the voltage source.

- Do not use a blocking diode.

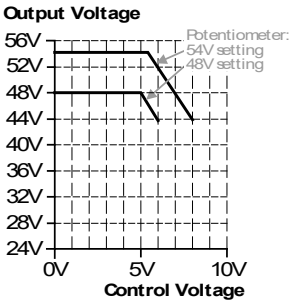
The shut-down input of the CPS2020 can also be used to remotely adjust the output voltage between typically 28 V and 54 V (CPS2020D) respectively 44 V and 54 V (CPS2020E). The control voltage is referenced to the main ground (negative output voltage). All other functions of shut-down input remain the same. To use the feature of remote control perform the following steps:

- Set the unit into single mode.
- Set the output voltage adjustment to the maximum desired voltage.

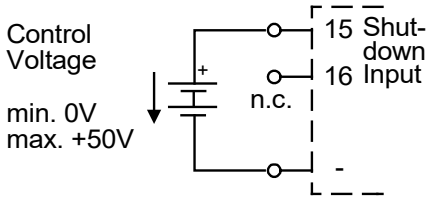
- Apply a control voltage to reduce the output voltage.



Output voltage over control voltage (CPS2020D)



Output voltage over control voltage (CPS2020E)



Connection of the control voltage

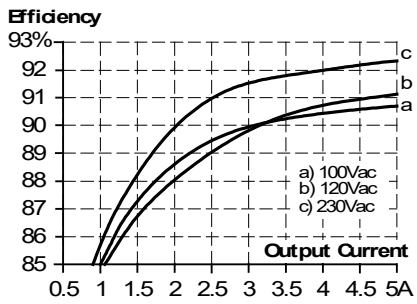
Picture 5-27: Remote control of output voltage

5.2.8 Efficiency and power losses

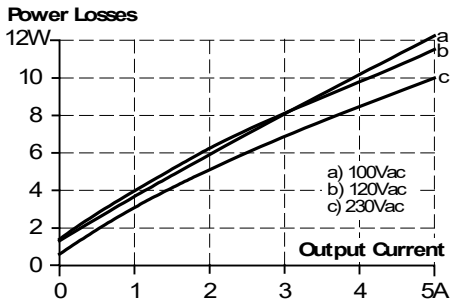
The efficiency of the cyber® power supply are displayed as typical values. The shown average efficiency is an assumption for a typical application, where the power supply is loaded with 25% of the nominal load for 25% of the time, 50% of the nominal load for another 25% of the time, 75% of the nominal load for another 25% of the time and with 100% of the nominal load for the rest of the time.

Model	Nominal Output Voltage / Current		CPS1005E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Efficiency	%	typical	90.7	91.2	92.3	at 24 V, 5.0 A
Average Efficiency	%	typical	89.2	89.4	90.6	at 24 V
Power Losses	W	typical	1.4	1.5	0.7	at 24 V, 0.0 A
			7.0	7.4	6.0	at 24 V, 2.5 A
			12.3	11.6	10.0	at 24 V, 5.0 A

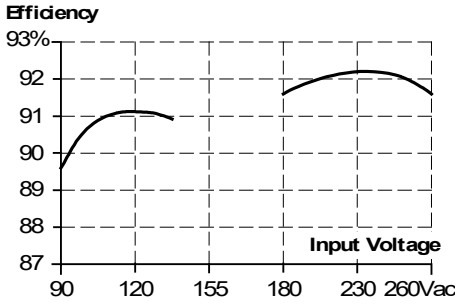
Tbl 30: Efficiency and power losses of CPS1005E



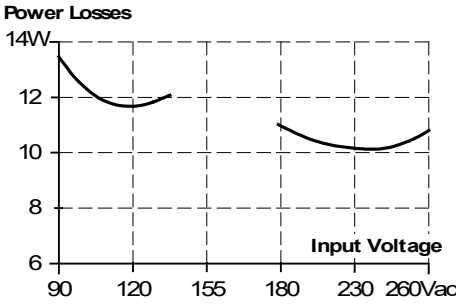
Efficiency over output current



Losses over output current



Efficiency over input voltage

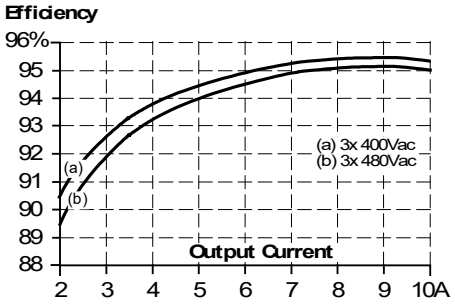


Losses over input voltage

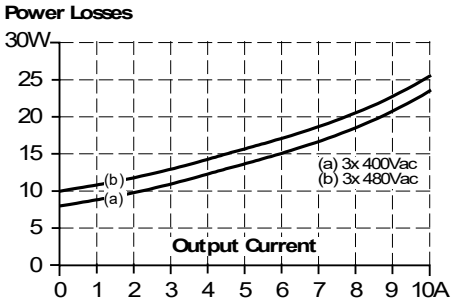
Picture 5-28: Graphs of efficiency and power losses of CPS1005E at 24 V

Model	Nominal Output Voltage / Current		CPS2010D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Efficiency	%	typical	95.4	95.0	at 48 V, 10.0 A
Average Efficiency	%	typical	94.4	93.8	at 48 V
Power Losses	W	typical	8.2	10.0	at 48 V, 0.0 A
			14.1	15.8	at 48 V, 5.0 A
			23.1	25.3	at 48 V, 10.0 A

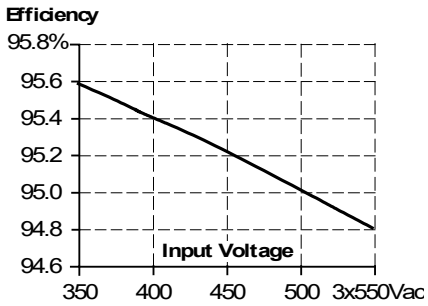
Tbl 31: Efficiency and power losses of CPS2010D



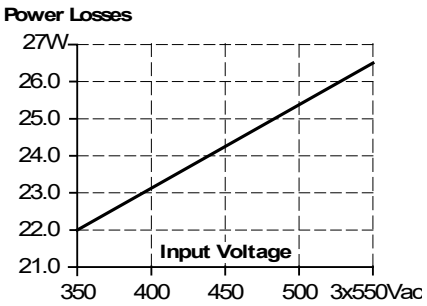
Efficiency over output current



Losses over output current



Efficiency over input voltage

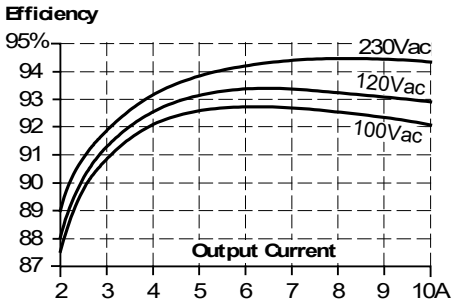


Losses over input voltage

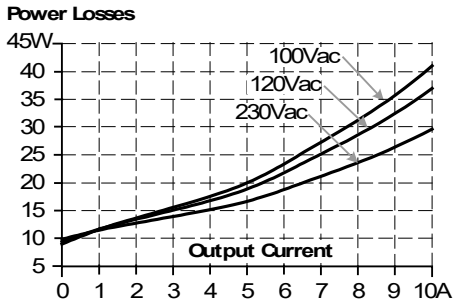
Picture 5-29: Graphs of efficiency and power losses of CPS2010D at 48 V

Model	Nominal Output Voltage / Current		CPS2010E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Efficiency	%	typical	92.0	92.8	94.3	at 48 V, 10.0 A
Average Efficiency	%	typical	91.7	92.4	93.4	at 48 V
Power Losses	W	typical	9.0	9.2	10.0	at 48 V, 0.0 A
			20.0	18.1	16.2	at 48 V, 5.0 A
			41.7	37.2	29.0	at 48 V, 10.0 A

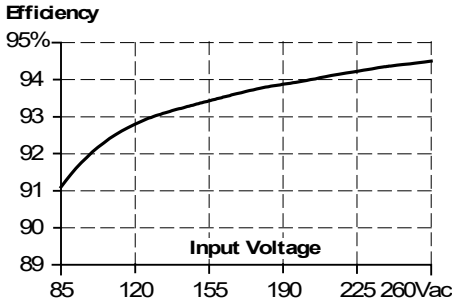
Tbl 32: Efficiency and power losses of CPS2010E



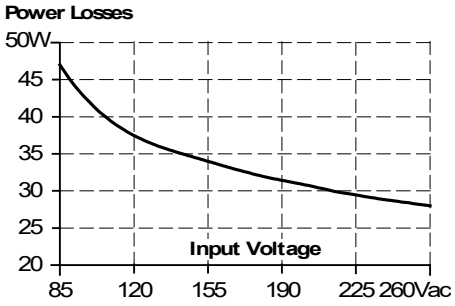
Efficiency over output current



Losses over output current



Efficiency over input voltage

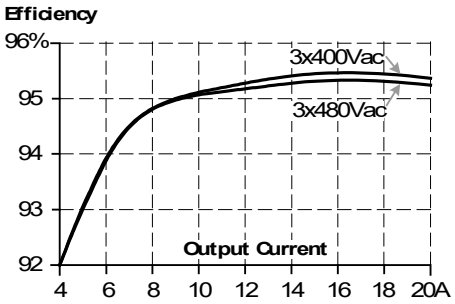


Losses over input voltage

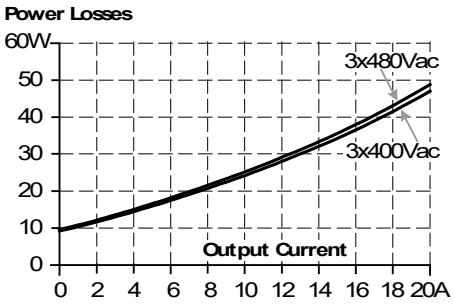
Picture 5-30: Graphs of efficiency and power losses of CPS2010E at 48 V

Model	Nominal Output Voltage / Current		CPS2020D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Efficiency	%	typical	95.4	95.2	at 48 V, 20.0 A
			94.4	94.7	at 48 V, 20.0 A using only 2 legs of a 3~ system
Average Efficiency	%	typical	94.7	94.6	at 48 V
Power Losses	W	typical	1.5	1.5	with activated shut-down
			9.5	9.8	at 48 V, 0.0 A
			24.1	25.0	at 48 V, 10.0 A
			46.3	48.4	at 48 V, 20.0 A
			56.9	53.7	at 48 V, 20.0 A using only 2 legs of a 3~ system

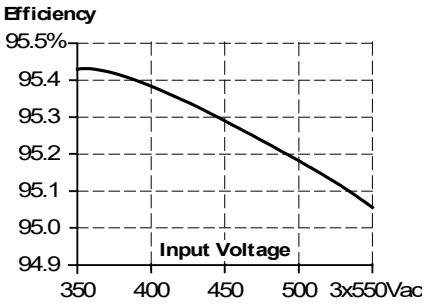
Tbl 33: Efficiency and power losses of CPS2020D



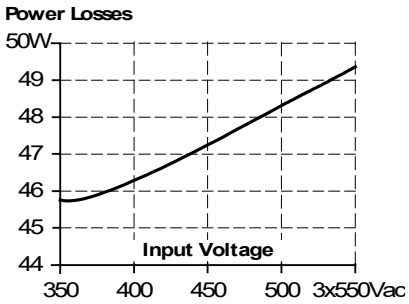
Efficiency over output current



Losses over output current



Efficiency over input voltage

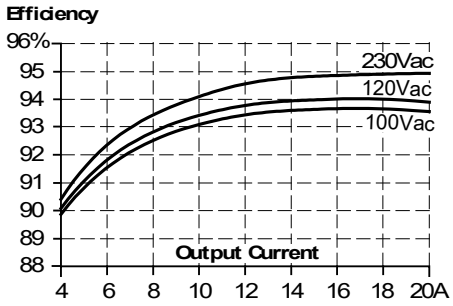


Losses over input voltage

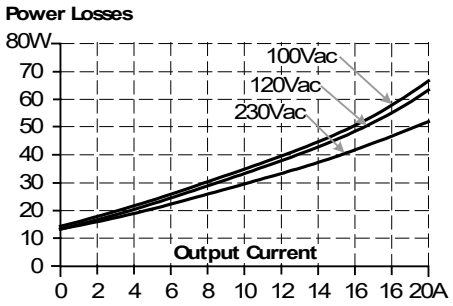
Picture 5-31: Graphs of efficiency and power losses of CPS2020D at 48 V

Model	Nominal Output Voltage / Current		CPS2020E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Efficiency	%	typical	93.5	93.9	95.0	at 48 V, 20.0 A
Average Efficiency	%	typical	92.9	93.3	93.9	at 48 V
Power Losses	W	typical	3.6	3.5	3.3	with activated shut-down
			13.5	12.8	12.8	at 48 V, 0.0 A
			35.6	34.0	30.1	at 48 V, 10.0 A
			66.7	62.4	50.5	at 48 V, 20.0 A

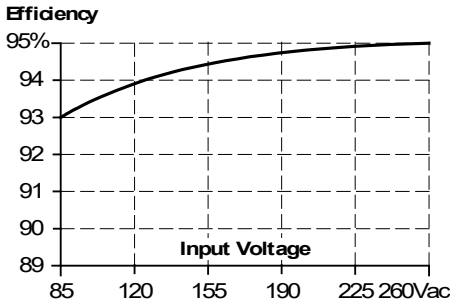
Tbl 34: Efficiency and power losses of CPS2020E



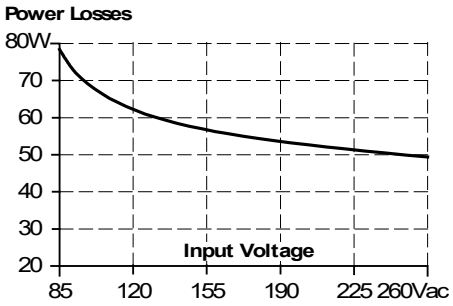
Efficiency over output current



Losses over output current



Efficiency over input voltage



Losses over input voltage

Picture 5-32: Graphs of efficiency and power losses of CPS2020E at 48 V

5.2.9 Lifetime expectancy and MTBF

The lifetime expectancy indicates the minimum operating hours and is determined by the lifetime expectancy of the built-in electrolytic capacitors. Lifetime expectancy is specified in operational hours and is calculated according to the capacitor's manufacturer specification. Values, which exceed the lifetime of the capacitors of 131 400 h (15 years), are calculated theoretical values and should be used for comparison of products.

MTBF stands for Mean Time Between Failure, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of a unit to fail and does not necessarily represent the life of a product. The MTBF figure is a statistical representation of the likelihood of a device to fail. A MTBF figure of 1 000 000 h means that statistically one unit will fail every 100 hours if 10 000 units are installed in the field. However, it cannot directly be determined if the failed unit has been running for 50 000 h or only for 100 h.

Model	Nominal Output Voltage / Current		CPS1005E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Lifetime Expectancy	h	-	511 000	548 000	621 000	at 24 V, 2.5 A, 25 °C
			181 000	194 000	219 000	at 24 V, 2.5 A, 40 °C
			188 000	193 000	234 000	at 24 V, 5.0 A, 25 °C
			66 000	68 000	83 000	at 24 V, 5.0 A, 40 °C
MTBF (SN 29500, IEC 61709)	h	-	2 038 000	2 166 000	2 519 000	at 24 V, 5.0 A, 25 °C
			1 065 000	1 147 000	1 379 000	at 24 V, 5.0 A, 40 °C
MTBF (MIL HDBK 217F)	h	-	872 000	842 000	839 000	at 24 V, 5.0 A, 25 °C Ground Benign GB25
			681 000	651 000	645 000	at 24 V, 5.0 A, 40 °C, Ground Benign GB40
			206 000	205 000	211 000	at 24 V, 5.0 A, 25 °C Ground Fixed GF25
			165 000	164 000	168 000	at 24 V, 5.0 A, 40 °C, Ground Fixed GF40

Tbl 35: Lifetime expectancy and MTBF of CPS1005E

Model	Nominal Output Voltage / Current		CPS2010D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Lifetime Expectancy	h	-	250 000	242 000	at 48 V, 5.0 A, 25 °C
			89 000	86 000	at 48 V, 5.0 A, 40 °C
			144 000	135 000	at 48 V, 10.0 A, 25 °C
			51 000	48 000	at 48 V, 10.0 A, 40 °C
MTBF (SN 29500, IEC 61709)	h	-	1 194 000	1 159 000	at 48 V, 10.0 A, 25 °C
			690 000	670 000	at 48 V, 10.0 A, 40 °C
MTBF (MIL HDBK 217F)	h	-	389 000	371 000	at 48 V, 10.0 A, 25 °C Ground Benign GB25

Model	Nominal Output Voltage / Current		CPS2010D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
			284 000	271 000	at 48 V, 10.0 A, 40 °C, Ground Benign GB40

Tbl 36: Lifetime expectancy and MTBF of CPS2010D

Model	Nominal Output Voltage / Current		CPS2010E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Lifetime Expectancy	h	-				at 48 V, 5.0 A, 25 °C
			119 000	178 000	147 000	at 48 V, 5.0 A, 40 °C
			138 000	165 000	259 000	at 48 V, 10.0 A, 25 °C
			49 000	63 000	92 000	at 48 V, 10.0 A, 40 °C
MTBF (SN 29500, IEC 61709)	h	-	749 000	799 000	840 000	at 48 V, 10.0 A, 25 °C
			407 000	441 000	469 000	at 48 V, 10.0 A, 40 °C
MTBF (MIL HDBK 217F)	h	-	273 000	288 000	308 000	at 48 V, 5.0 A, 25 °C Ground Benign GB25
			204 000	215 000	229 000	at 48 V, 5.0 A, 40 °C, Ground Benign GB40

Tbl 37: Lifetime expectancy and MTBF of CPS2010E

Model	Nominal Output Voltage / Current		CPS2020D		Remark
	AC Input Voltage		3~ 400 V	3~ 480 V	
Lifetime Expectancy	h	-	324 000	316 000	at 48 V, 10.0 A, 25 °C
			128 000	127 000	at 48 V,10.0 A, 40 °C
			193 000	192 000	at 48 V, 20.0 A, 25 °C
			69 000	68 000	at 48 V, 20.0 A, 40 °C
MTBF (SN 29500, IEC 61709)	h	-	685 000	678 000	at 48 V, 20.0 A, 25 °C
			375 000	369 000	at 48 V, 20.0 A, 40 °C
MTBF (MIL HDBK 217F)	h	-	211 000	210 000	at 48 V, 20.0 A, 25 °C Ground Benign GB25
			158 000	157 000	at 48 V, 20.0 A, 40 °C, Ground Benign GB40

Tbl 38: Lifetime expectancy and MTBF of CPS2020D

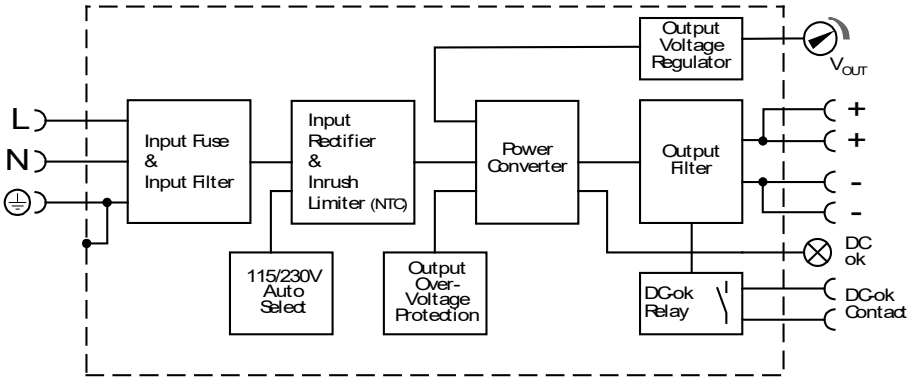
Model	Nominal Output Voltage / Current		CPS2020E			Remark
	AC Input Voltage		100 V	120 V	230 V	
Lifetime Expectancy	h	-	299 000	305 000	327 000	at 48 V, 10.0 A, 25 °C
			106 000	108 000	116 000	at 48 V, 10.0 A, 40 °C
			180 000	193 000	253 000	at 48 V, 20.0 A, 25 °C

Model	Nominal Output Voltage / Current		CPS2020E			Remark
	AC Input Voltage		100 V	120 V	230 V	
			64 000	68 000	90 000	at 48 V, 20.0 A, 40 °C
MTBF (SN 29500, IEC 61709)	h	-	491 000	481 000	537 000	at 48 V, 20.0 A, 25 °C
			274 000	269 000	300 000	at 48 V, 20.0 A, 40 °C
MTBF (MIL HDBK 217F)	h	-	170 000	171 000	183 000	at 48 V, 20.0 A, 25 °C Ground Benign GB25
			126 000	127 000	137 000	at 48 V, 20.0 A, 40 °C, Ground Benign GB40
			36 000	36 000	39 000	at 48 V, 20.0 A, 25 °C Ground Fixed GF25
			27 000	27 000	30 000	at 48 V, 20.0 A, 40 °C, Ground Fixed GF40

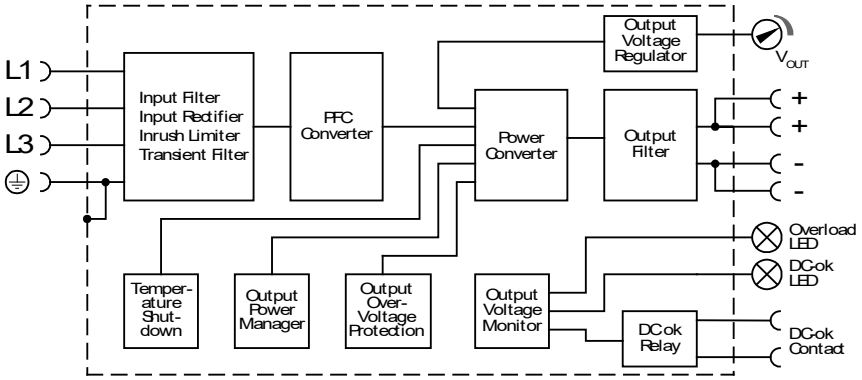
Tbl 39: Lifetime expectancy and MTBF of CPS2020E

5.2.10 Functional diagram

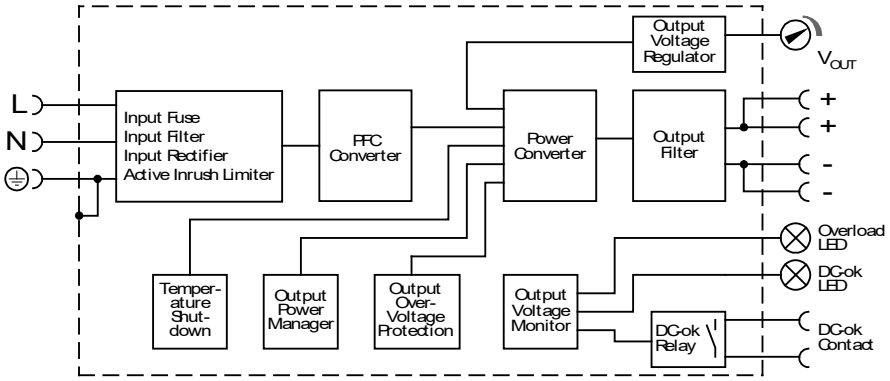
The functional diagrams of the cyber® power supply are displayed within the following pictures.



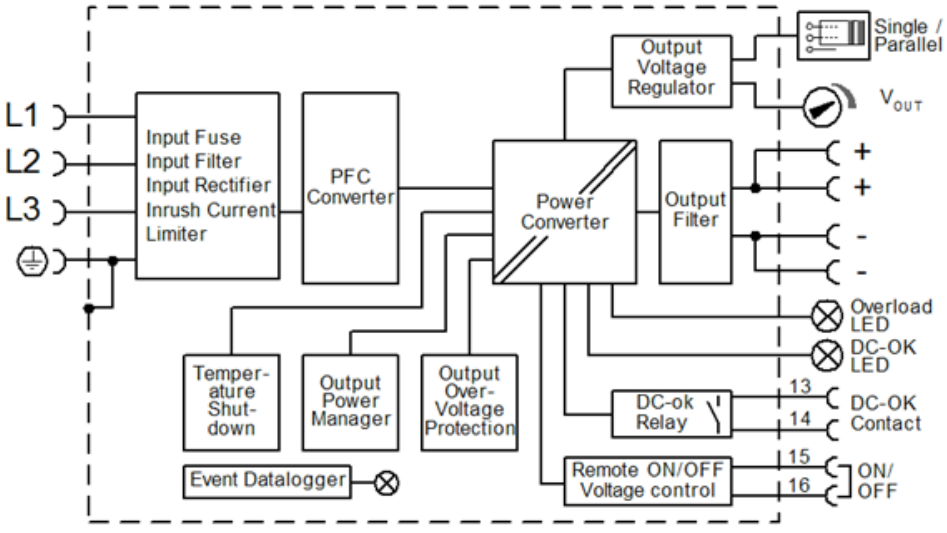
Picture 5-33: Functional diagram of CPS1005E



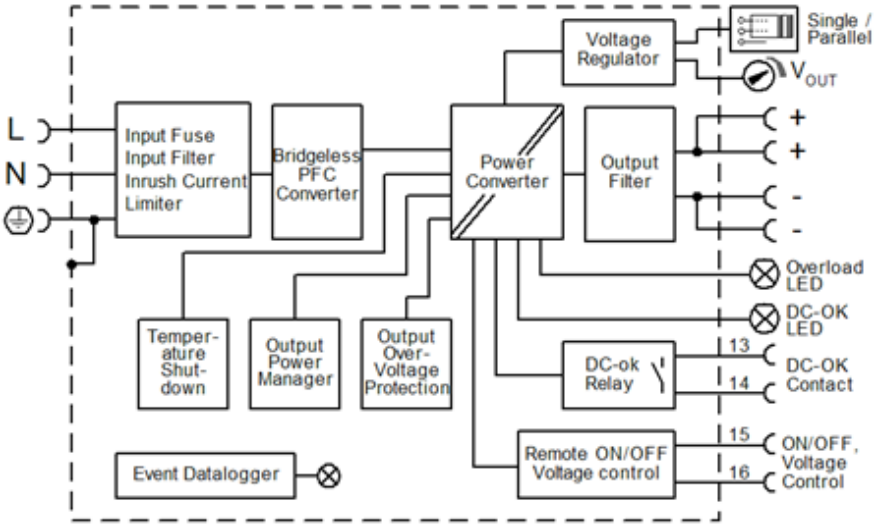
Picture 5-34: Functional diagram of CPS2010D



Picture 5-35: Functional diagram of CPS2010E



Picture 5-36: Functional diagram of CPS2020D



Picture 5-37: Functional diagram of CPS2020E

5.2.11 Terminals and wiring

The cyber® power supply are equipped screw terminations, push-in terminations or spring-clamp terminations according to Tbl 40. All spring-clamp terminals are bi-stable, quick-connect spring clamped, IP20 finger sage and suitable for field and factory installation, which are shipped in open position.

cyber® power supply	Input terminals	Output terminals	DC-OK terminal
CPS1005E	Screw terminal A	Screw terminal A	Push-in terminal
CPS2010D	Spring-clamp 6	Spring-clamp 6	Spring-clamp 6
CPS2010E	Spring-clamp 6	Spring-clamp 6	Spring-clamp 4
CPS2020D	Screw terminal A	Screw terminal B	Spring-clamp 2
CPS 2020E	Screw terminal A	Screw terminal B	Spring-clamp 2

Type of terminal		Screw terminal		Spring Clamp			Push-in
		A	**B**	**2**	**4**	**6**	
Solid wire	mm²	0.5 – 6.0	0.5 – 16.0	0.15 – 1.5	0.3 – 4.0	0.5 – 6.0	0.15 – 1.5
Stranded wire	mm²	0.5 – 4.0	0.5 – 10.0	0.15 – 1.5	0.3 – 2.5	0.5 – 4.0	0.15 – 1.5
American wire gauge	AWG	20 – 10	22 – 8	26 – 14	26 – 12	20 – 10	26 – 16
Maximum wire diameter (including ferrules)	mm	2.8	5.2	1.5	2.25	2.8	1.6
Wire stripping length	mm	7.0	12.0	7.0	6.0	10.0	7.0
Recommended Screwdriver	-	3.5 mm slotted or cross-head No. 2	3.5 mm or 5.0 mm slotted or cross-head No. 2	3.0 mm slotted to open spring	-	-	-

Type of terminal		Screw terminal		Spring Clamp			Push-in
		A	B	2	4	6	
Recommended tightening torque	Nm	1.0	2.3	-	-	-	-

Tbl 40: Terminals and wire types

ⓘ Use appropriate copper cables with a designed for minimum temperatures according to Tbl 41.

Ambient Temperature	Temperature Rating of Cable
45 °C	60 °C
60 °C	75 °C
70 °C	90 °C

Tbl 41: Temperature Rating of Cables

NOTICE

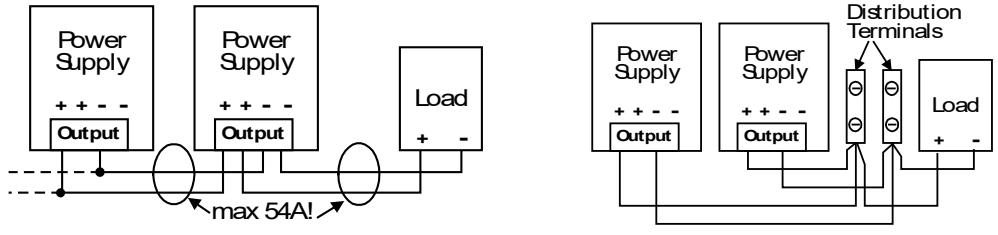
Observe safety regulations for installation.

- Follow national installation codes and regulations.
- Ensure that all strands of a stranded wire enter the terminal connection.
- Do not use the product without PE connection.
- Tighten unused terminal compartments securely.
- Use fitting ferrules.

Daisy chaining is allowed as long as the average output current through one terminal pin does not exceed the value given in Tbl 42. If the current is higher, use a separate distribution terminal block.

cyber® power supply	Maximum current if daisy chaining
CPS1005E	not allowed
CPS2010D	27 A
CPS2010E	25 A
CPS2020D	54 A
CPS 2020E	54 A

Tbl 42: Maximum current with daisy chaining

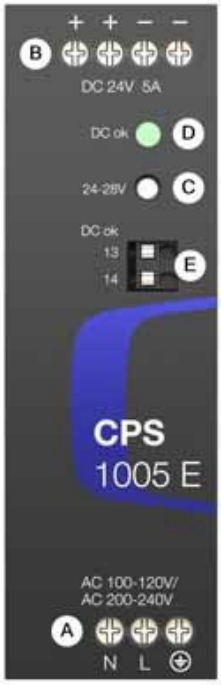


Daisy chaining of outputs

Connection with distribution terminals

Picture 5-38: Connection of multiple power supplies

5.2.12 Front side and user elements



Picture 5-39: Front Side of CPS1005

Letter	Characters	Description
A	**Input Terminals**	Screw Terminals
	N, L	Line input
	⏚	PE
B	**Output Terminals**	Screw Terminals
	+	Positive Output
	-	Negative Output
C	**Output Voltage Potentiometer**	
	Factory Set 24.1 V	
D	**DC-OK LED**	Green LED
	On, when output voltage is > 18 V	
E	**DC-OK Relay Contact**	Push-In Terminals
	See chapter 5.2.6	

Picture 5-40: Front Side of CPS2010D

Letter	Characters	Description
A	**Input Terminals**	Spring-clamp
	L1, L2, L3	Line input
	⏚	PE
B	**Output Terminals**	Spring-clamp
	+	Positive Output
	-	Negative Output
C	**Output Voltage Potentiometer**	
	Factory Set 48.0 V	
D	**DC-OK LED**	Green LED
	On, when output voltage is > 90% of U_{adj}	
E	**Overload LED**	Red LED
	On, when the voltage on the output terminals is < 90% of the adjusted output voltage, or in case of a short circuit in the output. On, when the unit has switched off due to over- temperature. Input voltage is always required	
F	**DC-OK Relay Contact**	Spring-clamp
	See chapter 5.2.6	

Picture 5-41: Front Side of CPS2010E

Letter	Characters	Description
A	**Input Terminals**	Spring-clamp
	N, L	Line input
	⏚	PE
B	**Output Terminals**	Spring-clamp
	+	Positive Output
	-	Negative Output
C	**DC-OK Relay Contact**	
	See chapter 5.2.6	
D	**Output Voltage Potentiometer**	
	Factory Set 48.0 V	
E	**DC-OK LED**	Green LED
	On, when output voltage is > 90% of U_{adj}	
F	**Overload LED**	Spring-clamp
	On, when the voltage on the output terminals is < 90% of the adjusted output voltage, or in case of a short circuit in the output. Input voltage is required.	

Picture 5-42: Front Side of CPS2020D

Letter	Characters	Description
A	**Input Terminals**	Screw Terminals
	N, L	Line input
	⏚	PE
B	**Output Terminals**	Screw Terminals
	+	Positive Output
	-	Negative Output
C	**Mode Selector**	Jumper
	Set jumper to "Parallel Use" when power supplies are connected in parallel to increase the output power (“parallel mode”). A missing jumper is equal to a "Single Use" mode (“single mode”).	
D	**Output Voltage Potentiometer**	
	Factory Set 48.0 V	
E	**DC-OK LED**	*Green LED*
	On, when output voltage is > 90% of U_{adj}	
F	**Overload LED**	*Red LED*
	On, when the voltage on the output terminals is < 90% of the adjusted output voltage, or in case of a short circuit in the output. Flashing, when the shut-down has been activated or the unit has switched off due to over- temperature. Input voltage is required.	
G	**DC-OK Relay Contact**	*Push-In Terminals*
	See chapter 5.2.6	

Letter	Characters	Description
H	**Shut-Down and Remote Control Input**	*Push-In Terminals*
	Allows the power supply to be shut down. Can be activated with a switch contact or an external voltage. The remote control input allows adjusting the output voltage. See chapter 5.2.7	

Picture 5-43: Front Side of CPS2020E

Letter	Characters	Description
A	**Input Terminals**	Screw Terminals
	N, L	Line input
	⏚	PE
B	**Output Terminals**	Screw Terminals
	+	Positive Output
	-	Negative Output
C	**Mode Selector**	Jumper
	Set jumper to "Parallel Use" when power supplies are connected in parallel to increase the output power (“parallel mode”). A missing jumper is equal to a "Single Use" mode (“single mode”).	
D	**Output Voltage Potentiometer**	
	Factory Set 48.0 V	
E	**DC-OK LED**	Green LED
	On, when output voltage is > 90% of U_{adj}	
F	**Overload LED**	Red LED
	On, when the voltage on the output terminals is < 90% of the adjusted output voltage, or in case of a short circuit in the output. Flashing, when the shut-down has been activated or the unit has switched off due to over- temperature. Input voltage is required	
G	**DC-OK Relay Contact**	*Push-In Terminals*
	See chapter 5.2.6	

Letter	Characters	Description
H	**Shut-Down and Remote Control Input**	*Push-In Terminals*
	Allows the power supply to be shut down. Can be activated with a switch contact or an external voltage. The remote control input allows adjusting the output voltage. See chapter 5.2.7	

5.2.13 Electromagnetic compatibility

The power supply is suitable for applications in industrial environment as well as in residential, commercial and light industry environment without any restrictions. . All results of CPSxxxxD assume a three phase operation of the power supply.

The referenced criterions are:

A The power supply shows normal operation behavior within the defined limits.
B Output voltage will dip from 48 V to 42 V for 5 ms.
C Temporary loss of function is possible. The power supply may shut-down and restarts by itself. No damage or hazards for the power supply will occur.

Model					CPS1005	CPS2010		CPS2020	
	Standard	Detail	Unit	Crit.	E	D	E	D	E
Electrostatic discharge	EN 6100-4-2	Contact discharge	kV	A	8	8		8	
		Air discharge		A	8	15		15	
Electromagnetic RF field	EN 6100-4-3	80 MHz – 2.7 GHz	V/m	A	20	20	10	10	20
Fast transients (burst)	EN 6100-4-4	Input lines	kV	A	4	4		4	
		Output lines	kV	A	2	2		2	
		DC-OK signal	kV	A	2	2	1	2	
Surge voltage on input	EN 6100-4-5	L → N	kV	A	2	-	2	-	2
		L → PE, N → PE	kV	A	4	-	4	-	4
		$L_x \rightarrow L_y$	kV	A	-	2	-	2	-
		$L_x \rightarrow$ PE	kV	A	-	4	-	4	-
Surge voltage on output	EN 6100-4-5	+ → -	kV	A	0.5	0.5	1	1	
		+ / - → PE	kV	A	1	1		1	
Surge voltage on DC-OK	EN 6100-4-5	DC-OK → PE	kV	A	1	1		1	
Conducted disturbance	EN 6100-4-6	150 kHz – 80 MHz	V	A	20	20	10	10	20
Mains voltage dips	EN 6100-4-11	0% of 100 V_{AC}	ms	A	20	-	20	-	20
		40% of 100 V_{AC}	ms	C	200	-	200	-	200
		70% of 100 V_{AC}	ms	A	500[2)]	-	500	-	500
		0% of 200 V_{AC}	ms	A	20	-	20	-	20
		40% of 200 V_{AC}	ms	A	200[3)]	-	200	-	200

Model					CPS1005	CPS2010		CPS2020	
	Standard	Detail	Unit	Crit.	E	D	E	D	E
		70% of 200 V_{AC}	ms	A	500	-	500	-	500
		0% of 380 V_{AC}	ms	A	-	20	-	20	-
		0% of 480 V_{AC}	ms	A	-	20	-	20	-
Voltage interruptions	EN 6100-4-11	0 V_{AC}	ms	C	5000	5000		5000	
Voltage sags	SEMI F 47 0706	80% of 120 V_{AC}	ms	A	1000	-	1000	-	1000
		70% of 120 V_{AC}	ms	A	500	-	500	-	500
		50% of 120 V_{AC}	ms	A	200[3)]	-	200	-	200
		80% of 380 V_{AC}	ms	A	1000	1000	-	1000	
		70% of 380 V_{AC}	ms	A	500	500	-	500	
		50% of 380 V_{AC}	ms	A	200	200	-	200	
Powerfull transients	VDE 0160	750 V	ms	C	1.3	-	1.3	-	1.3[1)]
		1550 V	ms	A	-	1.3	-	1.3	-

1: Criterion B is fulfilled for output current up to 15 A, Criterion B for higher currents.

2: Criterion A is fulfilled for currents below 4.5 A, Criterion C for currents bigger than 5 A.

3: Criterion C is fulfilled.

Tbl 43: EMC Immunity of CPS

The EMC emissions of the cyber® power supply fulfill the following standards according to the generic standards EN 61000-6-3 and EN 61000-6-4:

- Conducted emission input lines:
  EN 55011, EN 55032, FCC Part 15, CISPR 11, CISPR 32
  Class B
- Conducted emission output lines:
  IEC/CISPR 16-1-2, IEC/CISPR 16-2-1
  - CPS1005E: limits for DC power port according EN 61000-6-3 not fulfilled; for information only, not mandatory for EN 61000-6-3.
  - CPS2010D: 12 dB higher than average limits for DC power port according to EN 61000-6-3[4)].
  - CPS2010E: limits for DC power port according EN 61000-6-3 are not fulfilled.
  - CPS2020D: 5 dB higher than average limits for DC power port according to EN 61000-6-3[4)].
  - CPS2020E: 10 dB higher than average limits for DC power port according to EN 61000-6-3[4)].
- Radiated emission:
  EN 55011, EN 55032
  Class B

- Harmonic input current:
  EN 61000-3-2
  fulfilled for class A equipment
- Voltage fluctuations, flicker
  EN 6100-3-3
  fulfilled (tested with constant current loads, non pulsing)

Remark 4): Restrictions apply for applications in residential, commercial and light-industrial environments, where local DC power networks according to EN 61000-6-3 are involved. No restrictions for all kinds of industrial applications.

All products comply with FCC Part 15 rules. Operation is subjected to the conditions that (1) this product may not cause harmful interference, and that (2) this product must accept any interference received, including interference that may cause undesired operation.

The switching frequencies of the product may be different depending on the input voltage and the load. One switching frequency is nearly constant:

- CPS1005E:
  40 kHz – 120 kHz for load current range between 1 A – 5 A
- CPS2010D:
  100 kHz resonant converter, nearly constant
  30 kHz – 90 kHz boost converter, load dependent
  40 kHz – 220 kHz power factor correction (PFC) converter, input voltage and load dependent
- CPS2010E:
  100 kHz resonant converter, nearly constant
  110 kHz – 500 kHz boost converter, input voltage and load dependent
  73 kHz – 114 kHz power factor correction (PFC) converter, input voltage and load dependent
  35 kHz – 45 kHz auxiliary converter, input voltage and load dependent
- CPS2020D:
  105 kHz resonant converter, nearly constant
  1 kHz – 140 kHz boost converter, load dependent
  40 kHz – 210 kHz power factor correction (PFC) converter, input voltage and load dependent

CPS2020E:
105 kHz resonant converter, nearly constant
1 kHz – 150 kHz boost converter, input voltage and load dependent
1 kHz – 100 kHz power factor correction (PFC) converter, input voltage and load dependent
25 kHz – 45 kHz auxiliary converter, input voltage and load dependent

5.2.14 Environmental conditions

Model				CPS1005	CPS2010		CPS2020	
	Detail		Unit	E	D	E	D	E
Storage temperature	For storage and transportation		°C	-40 to +85				
Humidity	IEC 60068-2-30		r. H.	5 % to 95 %				
Condensation	IEC 60068-2-30		-	Do not energize while condensation is present				
Over-voltage category	IEC 62103, altitudes up to 2000 m		-	III				
	EN 50178[1)], altitudes up to 2000 m		-	III				
	IEC 62103, altitudes 2000 m – 6000 m		-	II				
	EN 50178[1)], altitudes 2000 m – 6000 m		-	II				
Deegree pf pollution	IEC 6213m EN 50178[1)], not conductive		-	2				
LABS compability			-	Yes[2)]				
Operational temperature[7)]	Reduce output current as in Picture 5-48		°C	-10 °C to +70 °C	-25 °C to +70 °C			
Output de-rating	60 °C to 70 °C[3)]		W/°C	3	12		24	
Vibration sinusoidal	IEC 60068-2-6 2 hours / axis	2 Hz – 17.8 Hz	mm	±1.6	±1.6		±1.6	
		17.8 Hz – 500 Hz	m/s²	20[4)]	20		20	20
Shock	IEC 60068-2-27[6)4)]	DIN rail mounting	m/s²	300 / 200		150 / 100[5)]		
Altitude	No restrictions of output		m	0 to 2000				
	Reduce output current as in Picture 5-49		m	2000 to 6000				
Altitude de-rating	Reduce output current as in Picture 5-49		W/m	0.0075	0.03		0.06	
			°C/m	0.005	0.005		0.005	

1: EN 62477-1 instead of EN 50178 for CPS2010D.

2: The product does not release any silicone or other LABS-critical substances and is suitable for use in paint shops.

3: At CPS1005E: 55 °C to 70 °C for 110 – 120 VAC and 220 – 240 Vac; 50 °C to 70 °C for 100 VAC and 200 Vac;

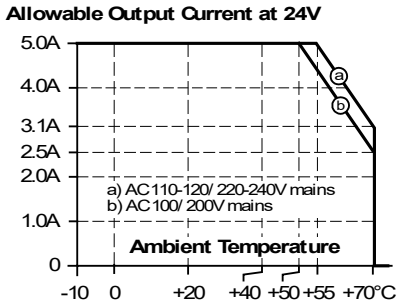
4: CPS1005E tested on a DIN rail with a thickness of 1.3 mm.

5: Higher levels allowed with wall mounting bracket.

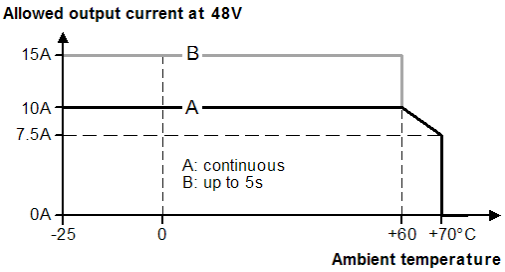
6: 3 bumps / direction, 18 bumps in total; Values are given for 6 ms / 11 ms.

7: Operational temperature is the same as the ambient temperature and is defined as the air temperature 20 mm below the unit.

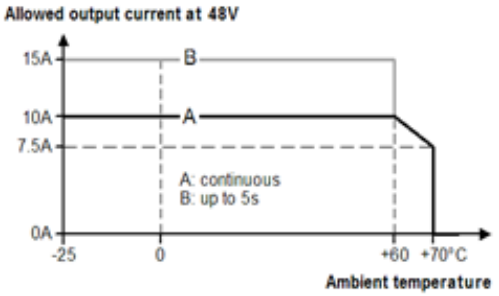
Tbl 44: Environmental data of CPS



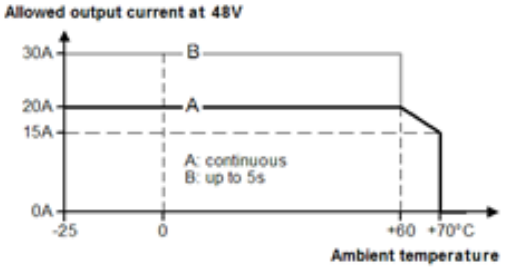
CPS1005E



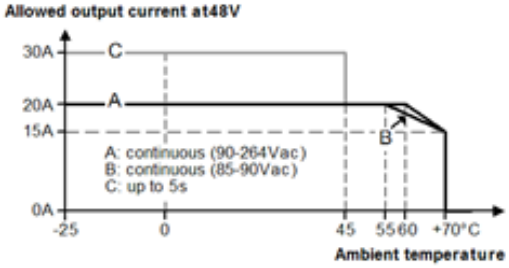
CPS2010D



CPS2010E

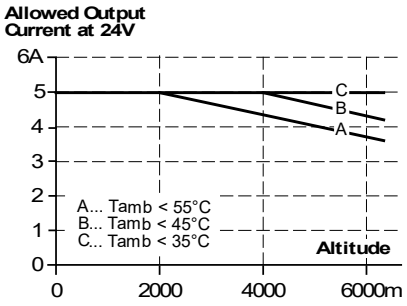


CPS2020D

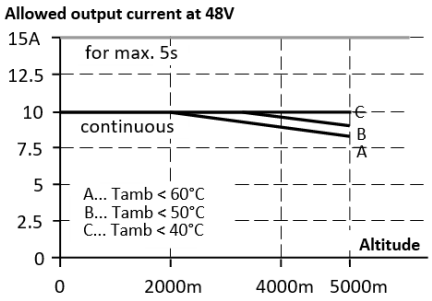


CPS2020E

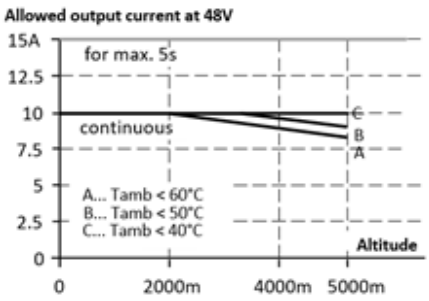
Picture 5-44: Ouptut current over ambient temperature



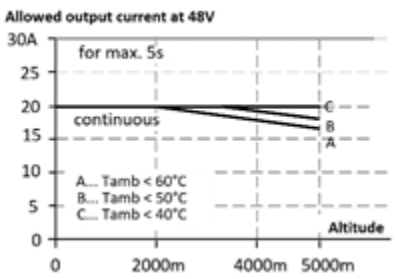
CPS1005E



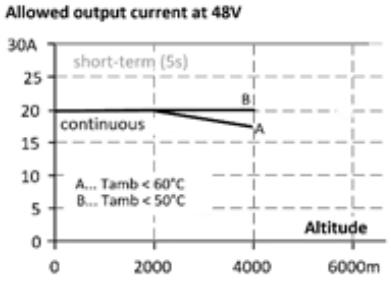
CPS2010D



CPS2010E



CPS2020D



CPS2020E

Picture 5-45: Ouptut current over altitude

5.2.15 Protection features

The cyber® power supply has an electronically output protection, which protects against overload, no-load and short-circuits. In case of a protection event or in a low-load condition of the CPS1005E only, audible noise may occur. Note that the CPS1005E has no over-temperature protection.

In case of an internal power supply defect, a redundant circuit limits the maximum output voltage. The output shuts down and automatically attempts to restart at the CPS20x0. At the CPS1005 the output shuts down and stays down until the input voltage is turned off and on again for at least one minute or until the green LED went off.

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Degree of protection	IEC 60259	-	IP20				
Over temperature protection	Output shut-down with restart	-	no	yes			
Input transient protection	Metal Oxide Varistor (MOV)	-	yes				
Internal input fuse	not replaceable by user	-	Included	-[1)]	Included		
Output over-voltage protection	typical	V	31.0	57.0	58.0	58.5	58.0
	maximum	V	34.0	60.0	60.0	60.0	60.0
Penetration protection	against small parts	mm	> 4.0 mm				

1: Internal input fuse is not included at CPS2010D.

Tbl 45: Protection features of CPS

5.2.16 Safety features and dielectric strength

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Input / output separation SELV	IEC 60950-1	-	Double or reinforced insulation				
Input / output separation PELV	IEC 60204-1, EN 50178, IEC 62103, IEC 60364-4-41	-	Double or reinforced insulation				
Class of protection	PE connection required	-	I				
Isolation resistance	Input to output, 500 V_{DC}	MΩ	> 5				
PE resistance	-	Ω		< 0.1			
Touch current typical value (leakage current)	100 V_{AC}, 50 Hz, TN-, TT-mains	mA	0.21	-	0.23	-	0.39
	100 V_{AC}, 50 Hz, IT-mains	mA	0.46	-	0.63	-	1.00
	120 V_{AC}, 60 Hz, TN-, TT-mains	mA	0.30	-	0.34	-	0.56
	120 V_{AC}, 60 Hz, IT-mains	mA	0.65	-	0.93	-	1.43
	230 V_{AC}, 50 Hz, TN-, TT-mains	mA	0.33	-	0.58	-	0.90
	230 V_{AC}, 50 Hz, IT-mains	mA	0.72	-	1.56	-	2.25
	3~ 400 V_{AC}, 50 Hz, TN-, TT-mains	mA	-	0.44	-	0.35	-
	3~ 400 V_{AC}, 50 Hz, IT-mains	mA	-	0.94	-	0.64	-
	3~ 480 V_{AC}, 60 Hz, TN-, TT-mains	mA	-	0.62	-	0.45	-
	3~ 480 V_{AC}, 60 Hz, IT-mains	mA	-	1.31	-	0.91	-
Touch current maximuml value (leakage current)	110 V_{AC}, 50 Hz, TN-, TT-mains	mA	0.27	-	0.31	-	0.50
	110 V_{AC}, 50 Hz, IT-mains	mA	0.56	-	0.77	-	2.21
	132 V_{AC}, 60 Hz, TN-, TT-mains	mA	0.38	-	0.45	-	0.71
	132 V_{AC}, 60 Hz, IT-mains	mA	0.78	-	1.13	-	1.73
	264 V_{AC}, 50 Hz, TN-, TT-mains	mA	0.43	-	0.80	-	1.18
	264 V_{AC}, 50 Hz, IT-mains	mA	0.90	-	2.00	-	2.82

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
	3~ 440 V_{AC}, 50 Hz, TN-, TT-mains	mA	-	0.54	-	0.45	-
	3~ 440 V_{AC}, 50 Hz, IT-mains	mA	-	1.12	-	0.78	-
	3~ 528 V_{AC}, 60 Hz, TN-, TT-mains	mA	-	0.78	-	0.60	-
	3~ 528 V_{AC}, 60 Hz, IT-mains	mA	-	1.62	-	1.20	-

Tbl 46: Safety features of CPS

The output voltage is floating and has no ohmic connection to the ground. Type and factory tests are conducted by the manufacturer. Field tests may be conducted in the field using the appropriate test equipment, which applies the voltage with a slow ramp (2 s up and 2 s down).

To fulfil the PELV requirements according to EN60204-1 §6.4.1, we recommend that either the + pole, the - pole or any other part of the output circuit shall be connected to the protective earth system. This helps to avoid situations in which a load starts unexpectedly or cannot be switched off when unnoticed earth faults occur.

When testing, set the cut-off current settings to the values in the tables below. When testing input to DC-OK ensure that the maximum voltage between DC-OK and the output is not exceeded (see Tbl 47: Output vs. DC-OK). It is recommend connecting DC-OK pins and the output pins together when performing the test.

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Input vs. PE	Type test (60s)	V_{AC}	2500	2500		2500	
	Factory test (5s)	V_{AC}	2500	2500		2500	
	Field test (5s)	V_{AC}	2000	2000		2000	
	Cut-off current setting	mA	10	10	15	10	20
Input vs. Output	Type test (60s)	V_{AC}	3000	3000		3000	
	Factory test (5s)	V_{AC}	2500	2500		2500	
	Field test (5s)	V_{AC}	2000	2000		2000	
	Cut-off current setting	mA	10	10	15	10	20
Output vs. PE	Type test (60s)	V_{AC}	1000	500		500	
	Factory test (5s)	V_{AC}	500	500		500	
	Field test (5s)	V_{AC}	500	500		500	
	Cut-off current setting	mA	15	30	40	40	40
Output vs. DC-OK	Type test (60s)	V_{AC}	500	500		500	
	Factory test (5s)	V_{AC}	500	500		500	
	Field test (5s)	V_{AC}	500	500		500	
	Cut-off current setting	mA	1	1	1	1	1

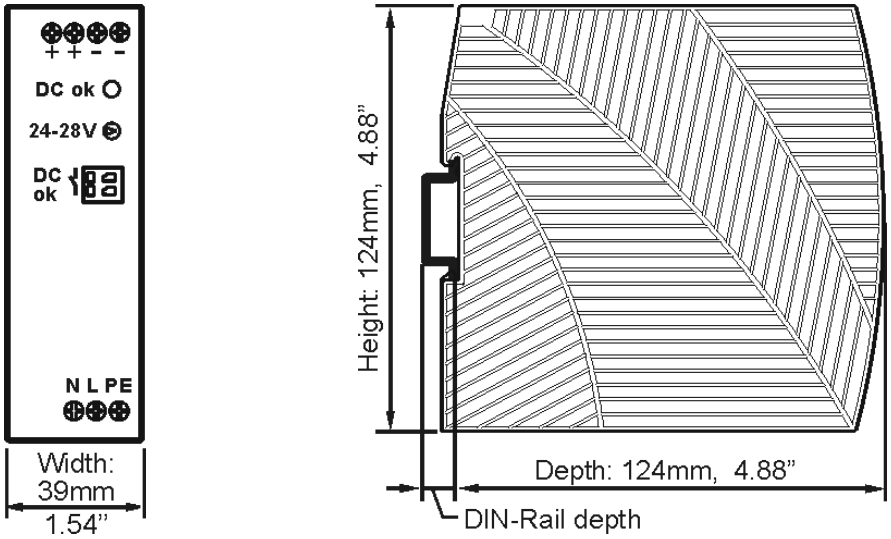
Tbl 47: Testing voltages of CPS

5.3 Physical dimensions and weight

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Weight		g	370	870	1200	1500	1900
		lb	0.81	1.92	2.65	3.30	4.20
Width		mm	39	65	82	110	125
		“	1.54	2.56	3.23	4.33	4.92
Height		mm	124	124		124	
		“	4.88	4.88		4.88	
Depth	Add DIN rail height to calculate the required installation depth.	mm	124	127		127	
		“	4.88	5.00		5.00	

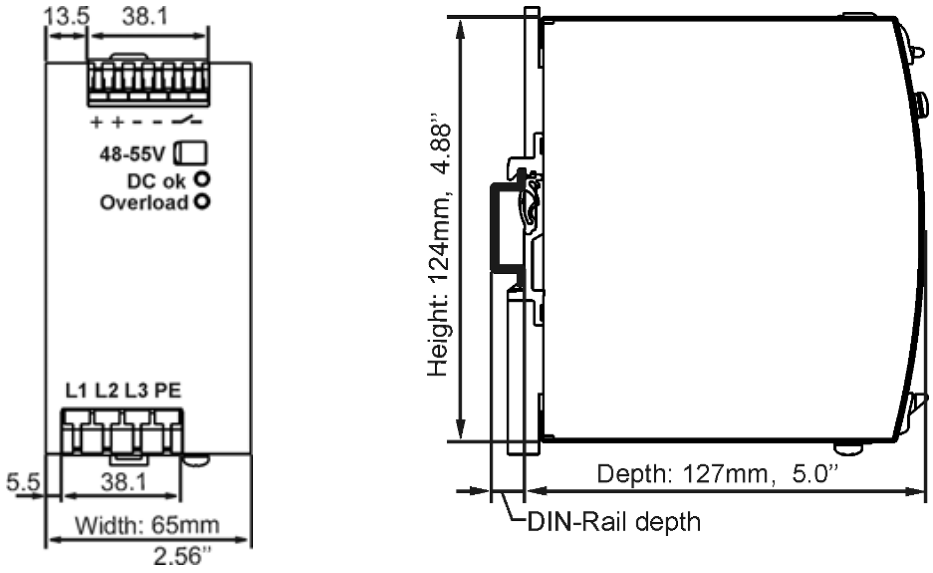
Tbl 48: Weight and dimensions of CPS

- Use 35 mm DIN rails according to EN 60715 or EN 50022 with a height of 7.5 mm or 15.0 mm.



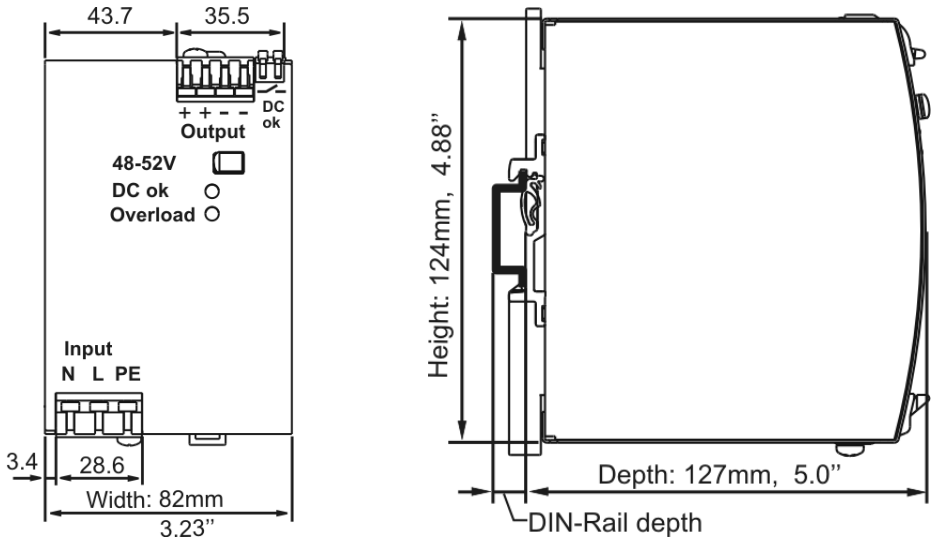
Front view Side view

Picture 5-46: Dimensions of CPS1005E



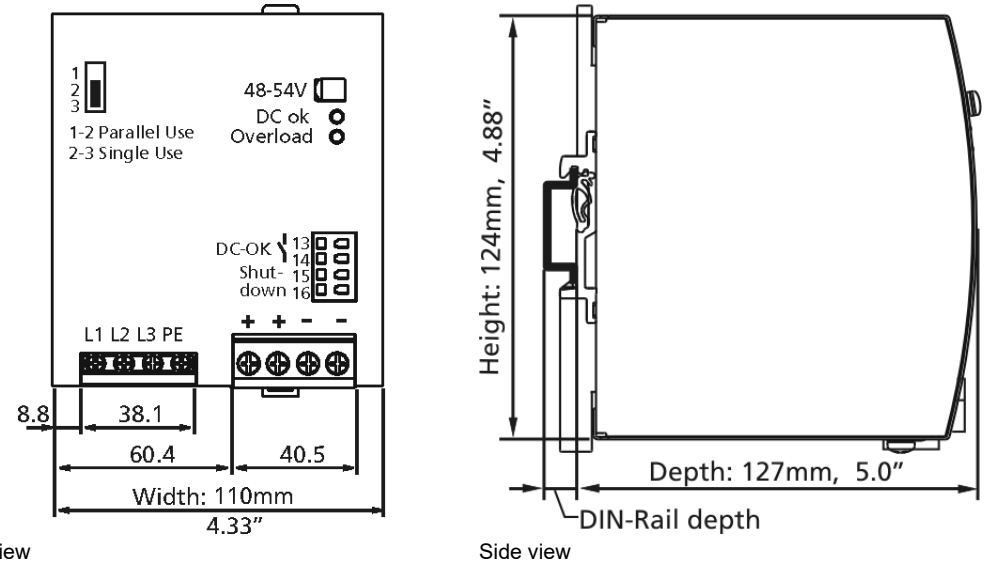
Front view Side view

Picture 5-47: Dimensions of CPS2010D



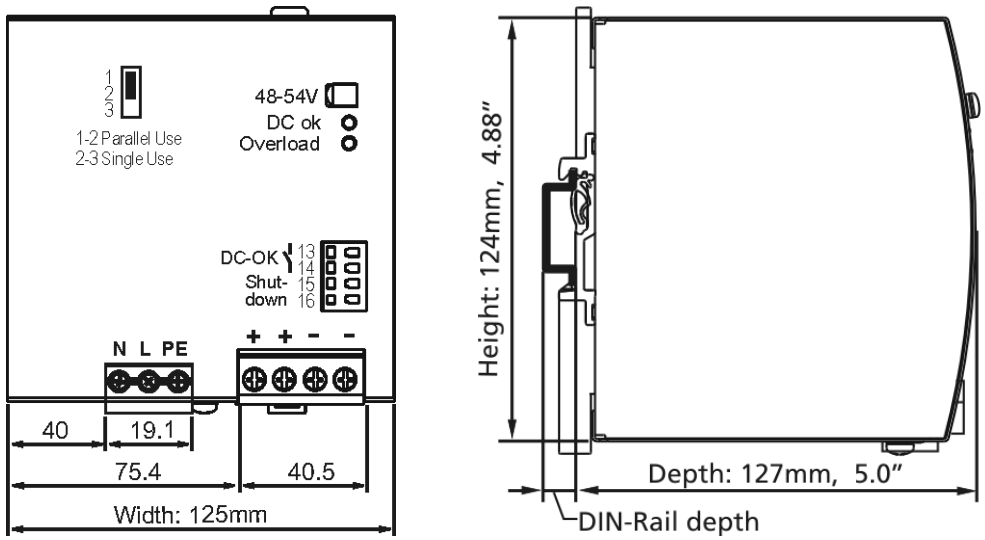
Front view Side view

Picture 5-48: Dimensions of CPS2010E



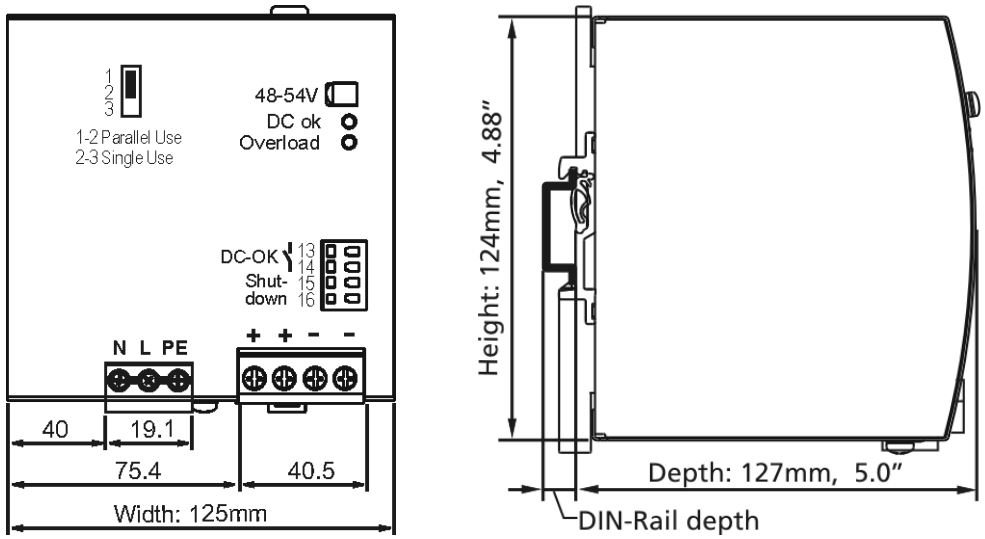
Front view Side view

Picture 5-49: Dimensions of CPS2020D



Front view Side view

Picture 5-50: Dimensions of CPS2020D



Front view Side view

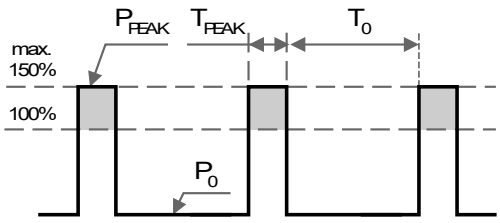
Picture 5-51: Dimensions of CPS2020E

5.4 Application notes

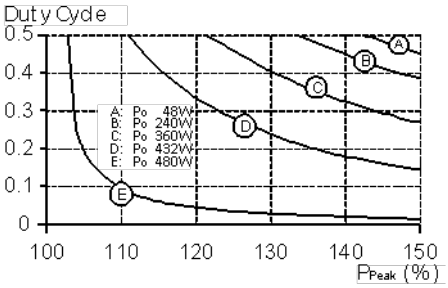
Typically, a load current is not constant and varies over time. The power supply is designed to support loads with a higher short-term power demand. The short-term duration is not firmware controlled. If the short-term power load lasts longer than the hardware controller allows it, the unit will respond with a thermal shut-down after a period of time.

To avoid this, the following rules must be met:

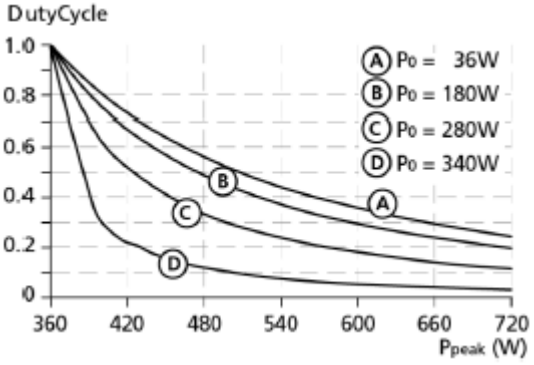
- The power demand of the pulse must be below 150% of the nominal output power.
- The root-mean-square output current must be below the specified continuous output current. If the R.M.S. current is higher, the product will respond with a thermal shut-down after a period of time. Use the maximum duty cycle curve (see Picture 5-52) to check if the average output current is below the nominal current.
- The duty cycle must be below 0.75.



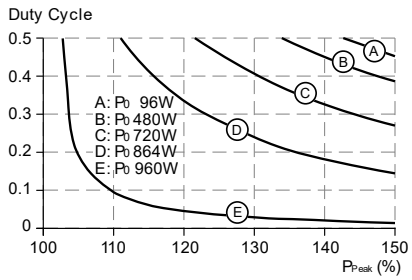
Definition of repetitive pulse loads



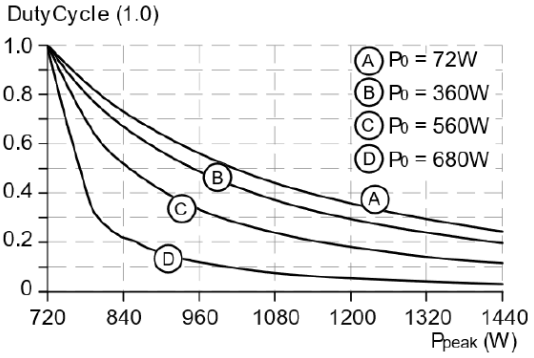
Maximum duty cycle curve 2010D



Maximum duty cycle curve 2010E



Maximum duty cycle curve 2020D



Maximum duty cycle curve 2020E

Picture 5-53: Duty cycle calculation

The following abbreviations and formulas are used:

- P_0 Base load [W]
- P_{PEAK} Pulse load above 100% [W]
- T_0 Duration between pulses [s]
- T_{PEAK} Pulse duration [s]
- DutyCycle Percentage of Pulse duration $DutyCycle = \frac{T_{PEAK}}{T_{PEAL}+T_0}$

As a calculation example: A load, connected to a CPS2020, is powered continuously with 480 W, which is 50 % of the rated output load. From time to time a peak power of 1440 W, which is 150 % of the rated output load, is needed for 1 s (T_{PEAK}). Using a vertical line in the maximum duty cycle curve (Picture 5-57) at P_{PEAK} equal 150 % and a horizontal line where the vertical line crosses the P_0 = 50 % curve, the maximum duty cycle from the axis reads to 0.37. With the given formula for the duty cycle the duration between pulses calculates to

$T_0 = \frac{T_{PEAK} \cdot (1 - DutyCycle)}{DutyCycle} = 1.7s.$

5.4.1 Peak current capability

The power supply can deliver peak currents (up to several milliseconds) which are higher than the specified short term currents. Solenoids, contactors and pneumatic modules often have a steady state coil and a pick-up coil. The inrush current demand of the pick-up coil is several times higher than the steady-state current and usually exceeds the nominal output current. The same situation applies when starting a capacitive load.

The peak current capability also ensures the safe operation of subsequent circuit breakers of load circuits. The load branches are often individually protected with circuit breakers or fuses. In case of a short or an overload in one branch circuit, the fuse or circuit breaker need a certain amount of over-current to open in a timely manner. This avoids voltage loss in adjacent circuits.

The peak current is supplied by the power converter and the built-in large sized output capacitors of the power supply. The capacitors get discharged during such an event, which causes a voltage dip on the output.

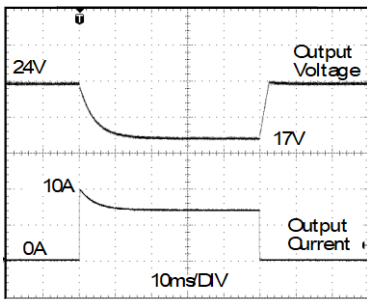
	The DC-OK relay triggers at the CPS20x0 when the voltage dips more than 10% for longer than 1ms.

The voltage dips from nominal value typically to the values given in Tbl 49 for the given time on resistive load.

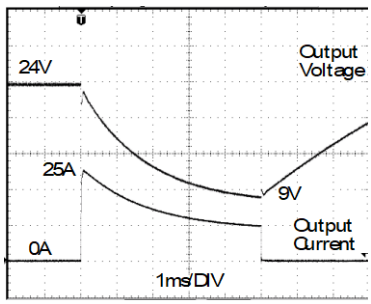
Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Peak current voltage dips from nominal voltage to	at 200% of nominal current 50 ms, resistive load	V	17.0	30.6	39.0	38.0	37.9
	at 500% of nominal current 5 ms, resistive load	V	9.0	34.2	32.0	34.0	28.9
	at 500% of nominal current 2 ms, resistive load	V	13.0	39.0	34.0	37.0	34.9

Tbl 49: Peak current voltage drips of CPS

The following examples show typical voltage dips of the cyber® power supplies:

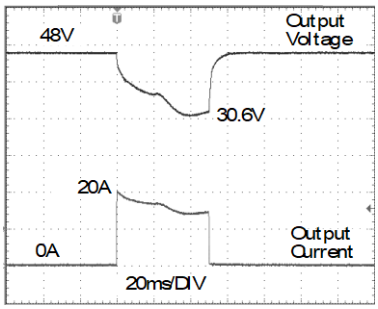


200 % nominal current, 50 ms

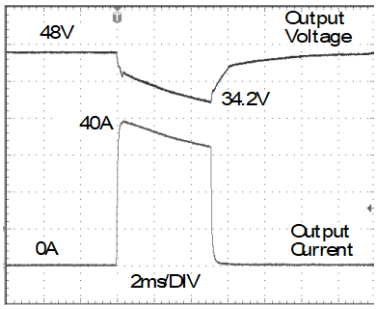


500 % nominal current, 5 ms

Picture 5-54: Peak current voltage drips of CPS1005E

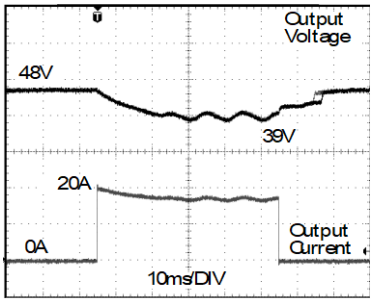


200 % nominal current, 50 ms

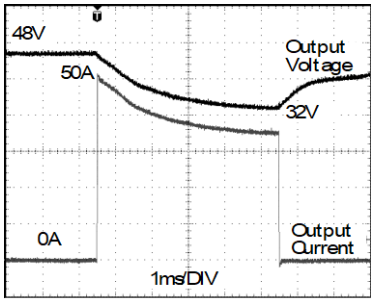


400 % nominal current, 5 ms

Picture 5-55: Peak current voltage drips of CPS2010D

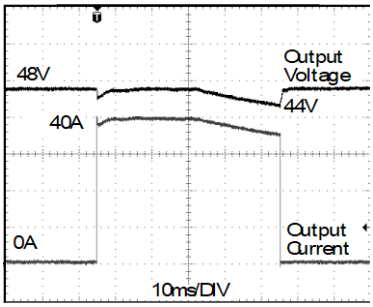


200 % nominal current, 50 ms

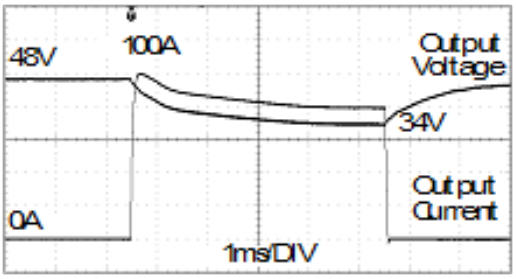


500 % nominal current, 5 ms

Picture 5-56: Peak current voltage drips of CPS2010E

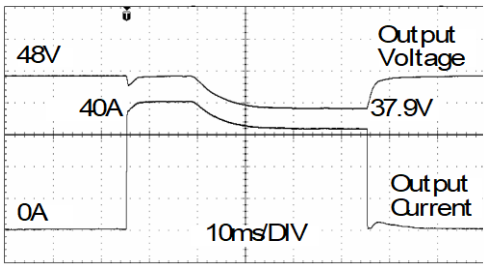


200 % nominal current, 50 ms

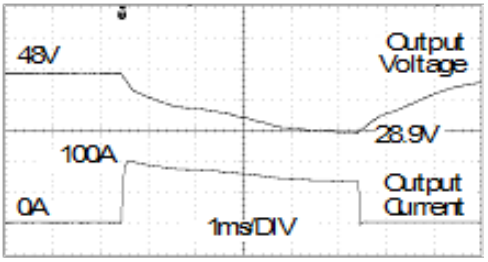


500 % nominal current, 5 ms

Picture 5-57: Peak current voltage drips of CPS2020D



200 % nominal current, 50 ms



500 % nominal current, 5 ms

Picture 5-58: Peak current voltage drips of CPS2020E

5.4.2 Back-feeding loads

Loads such as decelerating motors and inductors can feed voltage back to the power supply. This feature is also called return voltage immunity or resistance against Back- E.M.F. (Electro Magnetic Force).

The power supply is resistant and does not show malfunctioning when a load feeds back voltage to the power supply. It does not matter whether the power supply is on or off. The absorbing energy can be calculated according to the built-in large sized output capacitor.

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Maximum allowed back-feeding voltage		V_{DC}	35	58		63	

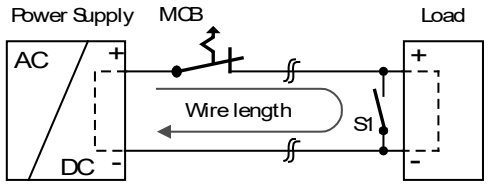
Tbl 50: Maximum back-feeding voltage of CPS

5.4.3 Output circuit breakers

Standard miniature circuit breakers (MCB's or UL1077 circuit breakers) may also be used on DC branches. MCB's are designed to protect wires and circuits. If the ampere value and the characteristics of the MCB are adapted to the wire size that is used, the wiring is considered as thermally safe regardless of whether the MCB opens or not.

To avoid voltage dips and under-voltage situations in adjacent 48V branches which are supplied by the same source, a fast (magnetic) tripping of the MCB is desired. A quick shutdown within 10 ms is necessary corresponding roughly to the ride-through time of PLC's. This requires power supplies with high current reserves and large output capacitors. Furthermore, the impedance of the faulty branch must be sufficiently small in order for the current to actually flow. The best current reserve in the power supply does not help if Ohm's law does not permit current flow. The following tables have typical test results showing which B- and C-characteristic MCBs magnetically trip depending on the wire cross section and wire length.

	Consider the outward and return wires when calculating.



S1... Fault simulation switch

Test circuit

Picture 5-59: Test setup of output circuit breakers

Model	Unit	CPS2010D				CPS2010E			
characteristic - current	mm²	**0.75**	**1.0**	**1.5**	**2.5**	**0.75**	**1.0**	**1.5**	**2.5**
C-2A	m	56	69	104	163	67	86	129	185
C-3A	m	34	44	64	84	48	63	92	157
C-4A	m	13	15	24	35	32	44	63	93
C-6A	m	2	4	4	9	12	18	23	38
C-8A	m					5	6	9	14
C-10A	m					4	5	7	11
C-13A	m					2	2	3	5
B-6A	m	16	19	28	42	30	39	52	87

Model	Unit	CPS2010D				CPS2010E			
B-10A	m	4	7	9	15	11	16	22	29
B-13A	m	3	4	7	10	9	12	17	24
B-16A	m					-	2	2	4

Tbl 51: Maximum back-feeding voltage of CPS2010

Model	Unit	CPS2020D				CPS2020E			
characteristic - current	mm²	**0.75**	**1.0**	**1.5**	**2.5**	**0.75**	**1.0**	**1.5**	**2.5**
C-2A	m	85	100	100	100	68	89	100	100
C-3A	m	59	75	100	100	53	75	100	100
C-4A	m	44	58	83	100	44	57	88	100
C-6A	m	19	26	38	63	18	25	38	58
C-8A	m	16	21	29	46	9	12	18	24
C-10A	m	14	18	26	43	8	11	16	23
C-13A	m	6	6	11	16	4	5	8	12
B-6A	m	45	60	89	100	39	50	74	100
B-10A	m	23	29	41	66	21	29	44	68
B-13A	m	17	25	36	56	13	21	34	52
B-16A	m	14	14	19	33	7	9	13	17
B-20A	m	4	4	7	10	2	3	4	5

Tbl 52: Maximum back-feeding voltage of CPS2020

5.4.4 Inductive and capacitive loads

The unit is designed to supply any kind of loads, including capacitive and inductive loads. If extreme large capacitors, such as EDLCs (electric double layer capacitors or "UltraCaps") with a capacitance > 1 F are connected to the output, a power supply with hiccup mode might charge the capacitor in this hiccup mode.

The CPS1005E must be limited, if capacitive loads in combination with constant current type of loads are used, to maximum 20 mF with an additional 2.5 A constant current load and to maximum 10 mF with an additional 5.0 A constant current load.

5.4.5 Operation on two phases

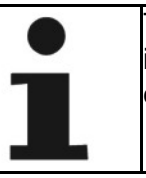
The power supply CPSxxxxE can also be used on two-phases of a three-phase-system. Such a phase to phase connection is allowed as long as the supplying voltage is below 240 V with tolerances of +10 % for CPS1005E and CPS2020E respectively of +15 % for CPS2010E. Connect L to L_1 and N to L_2. Use a fuse or a circuit breaker to protect the N input. The N input is internally not protected and is in this case connected to a hot wire.

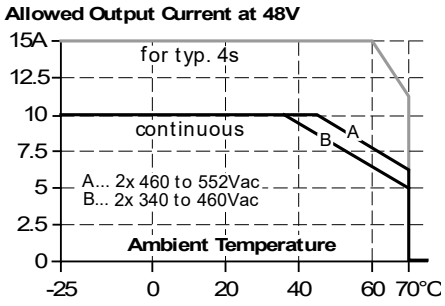
5.4.6 Using only two legs of a three phase system

The power supply CPSxxxxD can be used on only two legs of a 3-phase system. The third connection stays open and the screw of the terminal, which remains unused, must be securely tightened. No external protection devices are required to protect against a phase-loss failure. The power supply can also be permanently operated on two legs of a 3-phase system. However, it is

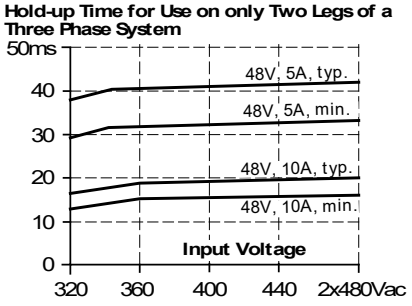
not recommended for this power class since the supplying 3-phase network can become unbalanced.

The output power must be reduced according to the curves in Picture 5-64 to Picture 5-66 when operation on only two legs of a 3-phase system. A long-term exceeding of these limits will result in a thermal shut-down of the unit. EMC performance, hold-up time, losses and output ripple differ from a three phase operation. Therefore, check suitability of your individual application.

	The use of the CPSxxxxD on only two legs of a 3-phase system is not included in the UL approval. Additional tests might be necessary when the complete system has to be approved according to UL 508 or UL 60950-1.

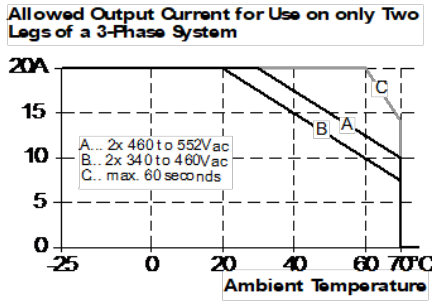


Output current over temperature

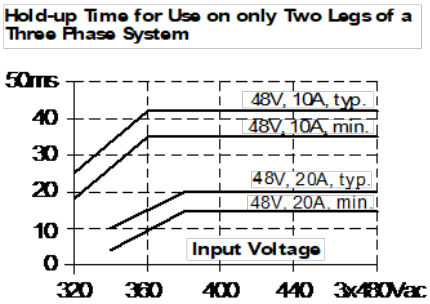


Hold-up time

Picture 5-60: Two legs operation of CPS2010D

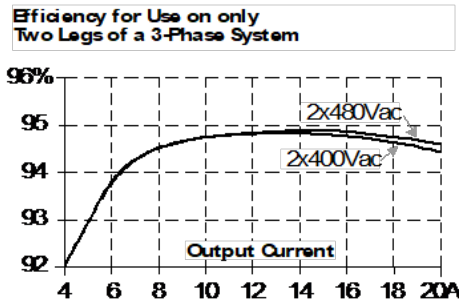


Output current over temperature

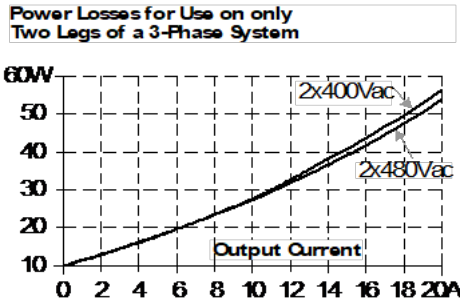


Hold-up time

Picture 5-61: Two legs operation of CPS2020D



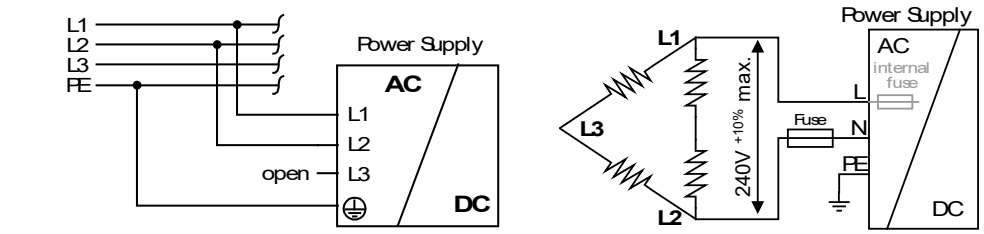
Efficiency over output current



Losses over output current

Picture 5-62: Two legs operation of CPS2020D at 48 V

The power supply CPSxxxxE can also be used on two-phases of a three-phase-system. Such a phase-to-phase connection is allowed as long as the supplying voltage is below 240 $V^{+10\%}$.



CPSxxxxD CPSxxxxE

Picture 5-63: Two-leg connection

5.5 Type code

The type code describes the product variants and supports you in product selection and ordering from **WITTENSTEIN cyber motor**.

Configuration	Column	Description
Product Type	1-2-3	**CPS** is the abbreviation of the product type cyber® power supply.
Nominal Output Voltage	4	„1“ = 24 V nominal output voltage „2“ = 48 V nominal output voltage
Nominal Output Current	5-6-7	„005“ = 5 A nominal output current „010“ = 10 A nominal output current „020“ = 20 A nominal output current
Power Supply	8	„D“ = 3-phase power supply „E“ = 1-phase power supply
Housing	10	„C“ = IP20 housing
Cooling	11	„C“ = Natural convection
Overload Factor	12	„A“ = no overload factor (0 times) „N“ = 1.5 times overload factor

Tbl 53: Description of the type code

Spalte	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Beispiel:	C	P	S	2	0	1	0	D	-	C	C	N	-	A	0	0																

Produkt Type
CPS = CPS

Nominal Output Voltage ①
24 V = 1
48 V = 2

Nominal Output Current
5 A = 005
10 A = 010
20 A = 020

Power Supply
3-phase = D
1-phase = E

Housing
IP20 = C

Cooling
Natural Convection = C

Overload Factor ②
no overload = A
1.5 times = N

Remarks:
① Nominal output voltage "1" is only available with nominal output current "005" and power supply "E".
Nominal output voltage "2" is not available with nominal output current "005".
② Overload factor "A" is only available with nominal output voltage "1".
Overload factor "N" is only available with nominal output voltage "2".

Picture 5-64: Type Code of the cyber® power supply

5.6 Built-in components

The products of the cyber® power supply do not contain any selectable built-in components.

5.7 Accessories

No accessories are available for the products of the cyber® power supply.

6 Installation

6.1 General instructions

The type, scope and sequence of the assembly steps are influenced by the special features of your machine design and may differ from the schematically described procedure.

⚠ DANGER

Faulty electrical connections or unapproved, current-carrying components can cause serious injuries and even death.

- Only qualified persons may carry out electrical connection work.
- Applicable standards and guidelines must be observed.
- Electrical connection work may only be carried out with suitable tools.
- Damaged cables or plugs must be replaced immediately.

⚠ DANGER

Electrically live parts may result in electric shocks if touched and can cause serious injuries and even death. Electrical work performed in damp areas may result in electric shocks and can cause serious injuries and even death.

- Only qualified persons may carry out electrical connection work.
- Applicable standards and guidelines must be observed.
- Electrical connection work may only be carried out with suitable tools.
- The general installation and safety regulations for working on electrical systems must be observed.
- Before accessing electrical parts with voltages greater than 50 V, the product must be disconnected from the mains or from the voltage source. The product must be secured against being switched on again.
- Do not touch the electrical connection points of the product when it is switched on.

⚠ DANGER

Risk of electrical shock, fire, personal injury or death.

- Turn power off before working on the device.
- Protect against inadvertent re-powering.
- Do not use the product without proper grounding (Protective Earth).
- Do not use in wet locations or in areas where moisture or condensation can be expected.
- Do not open the product.
- Do not modify or repair the product.

Mount the product on a DIN rail so that the input terminals are located on the bottom of the unit. In case of other mounting orientations, observe the de-rating at higher ambient temperatures (see Tbl 6: Technical data of CPS). This product is designed for convection cooling and does not require an external fan. Do not obstruct airflow and do not cover ventilation grid (e.g. cable conduits) by more than 15%. Keep the following installation clearances: 40 mm on top, 20 mm on the bottom, 5mm on the left and right sides. Increase the clearance on the left and right side to 15 mm in case the adjacent part is a heat source (e.g. another power supply). The installation clearances are especially necessary to be kept if the device is loaded permanently with more than 50% of the rated power.

An external protection is only required if the supplying branch has an ampacity greater than this. Check also local codes and local requirements. In some countries local regulations might apply. If an external fuse is necessary or utilized, minimum requirements need to be considered to avoid nuisance tripping of the circuit breaker.

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Minimum value	B- or C-characteristic	A	10	6	10	6	-
	B- or C-characteristic (100 V – 120 V)	A	-	-	-	-	16
	B- or C-characteristic (230 V)	A	-	-	-	-	10
Tested and approved value	B- or C-characteristic (U.S.A.)	A	30	15	20	30	30
	B- or C-characteristic (IEC)	A	32	16		32	32

Tbl 54: Recommended circuit breakers

6.2 Use in a sealed enclosure

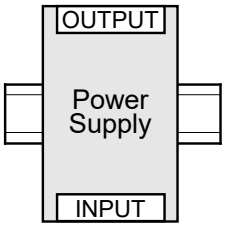
When the power supply is installed in a tightly sealed enclosure, the temperature inside the enclosure will be higher than outside. In such situations, the inside temperature defines the ambient temperature for the power supply. The following measurement results can be used as a reference to estimate the temperature rise inside the enclosure. The power supply is placed in the middle of the box, no other heat producing items are inside the box. The inside box temperature is measured in the middle of the right side of the power supply with distance as in Tbl 55.

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Enclosure	Rittal Type IP66 Box, plastic, PK	-	9516100	9519100	9522100		
Load	80 %, load is placed outside box	V	24	48		48	
		A	4	8		16	
Temperature	Inside box	°C	38,9	55,1	48,2	51,0	65,6
	Measurement distance	mm	1,0	2,0		2,0	
	Outside box	°C	24,2	24,9	24,2	21,8	24,1
	Rise	K	14,5	30,2	24,0	29,2	41,5

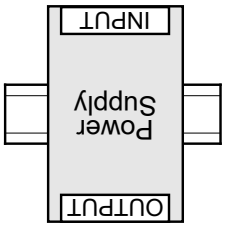
Tbl 55: Temperatures with use in a sealed enclosure

6.3 Mounting orientations

Mounting orientations other than input terminals on the bottom and output on the top respectively all terminals on the bottom require a reduction in continuous output power or a limitation in the maximum allowed ambient temperature. The amount of reduction influences the lifetime expectancy of the power supply. In Picture 6-1 to Picture 6-6 the de-rating curves are displayed for the recommended output current (A1) and the maximum allowed output current (A2), which results in a reduction of the lifetime expectancy of approximately half of A1. The CPS1005E may only be operated in standard orientation.



Standard Orientation



Upside-Down Orientation

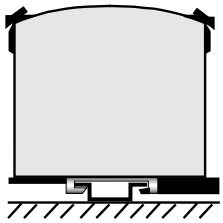
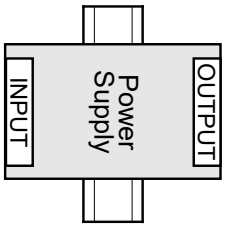
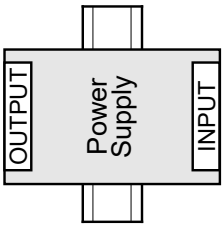


Table-Top Mounting

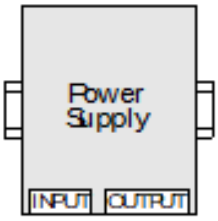


Horizontal Clockwise Orientation



Horizontal Counter-Clockwise Orientation

Picture 6-1: Mounting Orientations CPS2010



Standard Orientation

Upside-Down Orientation

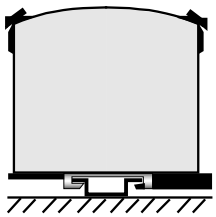
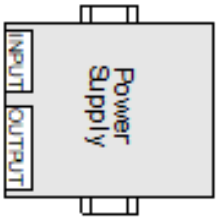
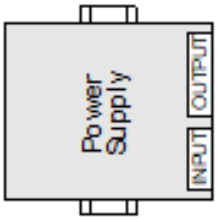


Table-Top Mounting

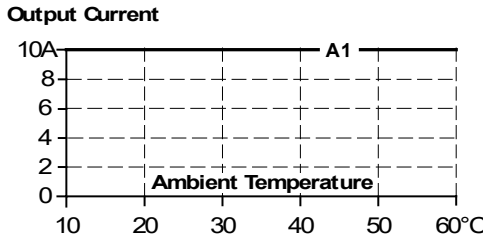


Horizontal Clockwise Orientation

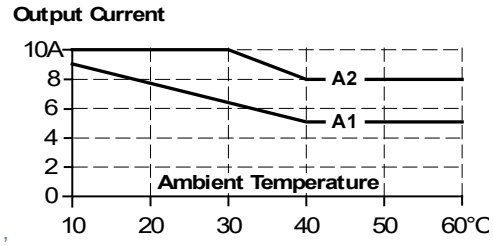


Horizontal Counter-Clockwise Orientation

Picture 6-2: Mounting Orientations CPS2020



Standard Orientation



Upside-Down Orientation

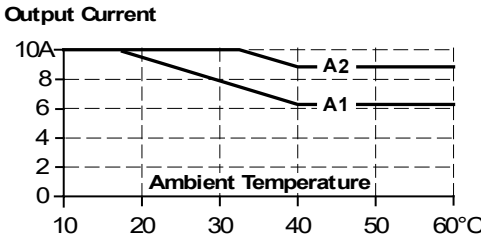
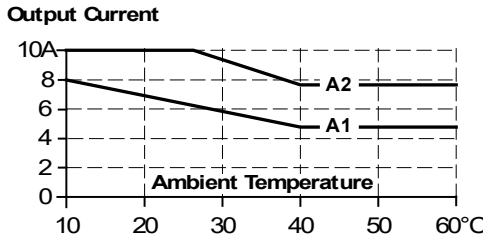
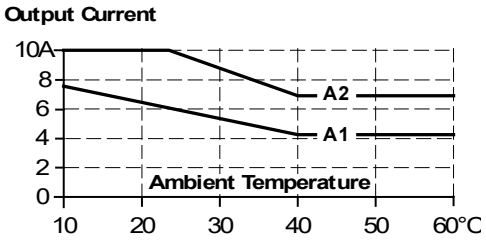


Table-Top Mounting

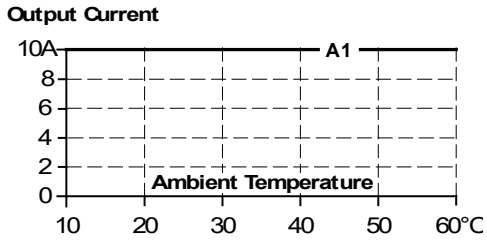


Horizontal Clockwise Orientation

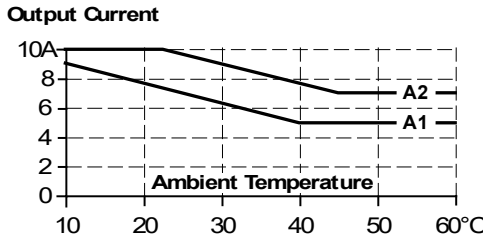


Horizontal Counter-Clockwise Orientation

Picture 6-3: De-Rating of CPS2010D depending on Mounting Orientations



Standard Orientation



Upside-Down Orientation

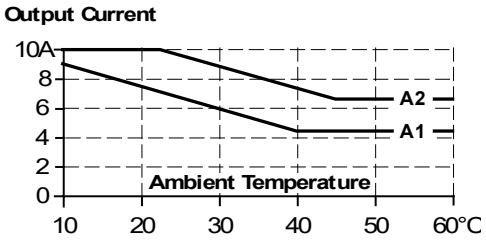
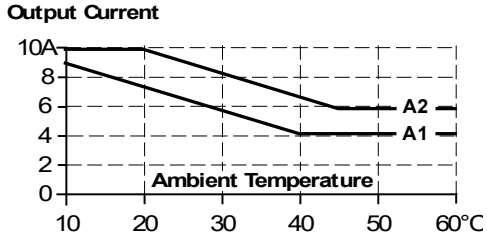
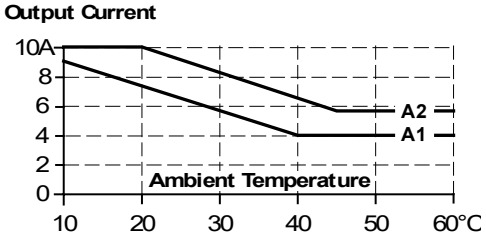


Table-Top Mounting

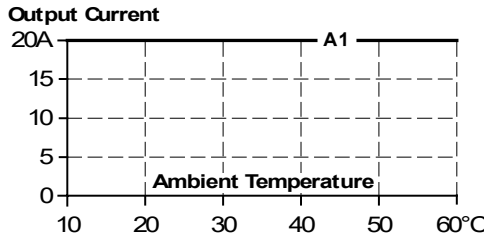


Horizontal Clockwise Orientation

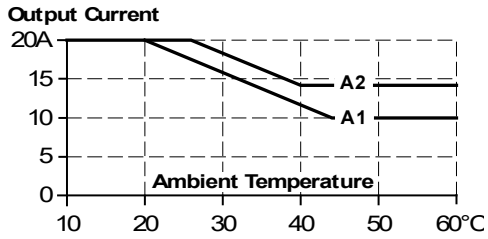


Horizontal Counter-Clockwise Orientation

Picture 6-4: De-Rating of CPS2010E depending on Mounting Orientations



Standard Orientation



Upside-Down Orientation

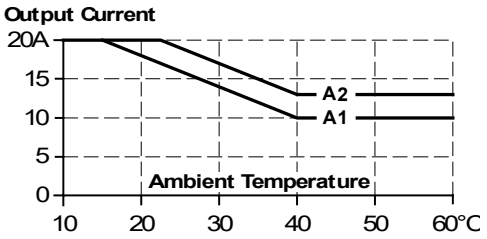
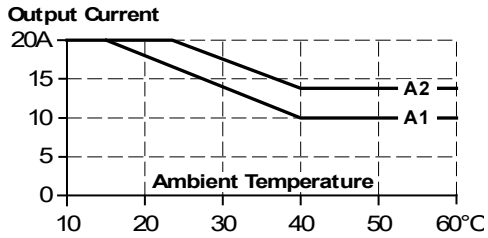
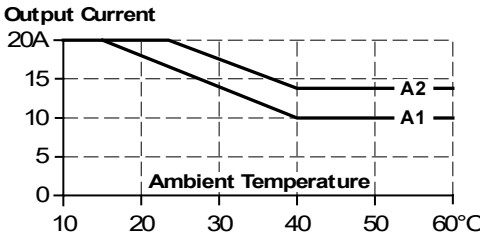


Table-Top Mounting

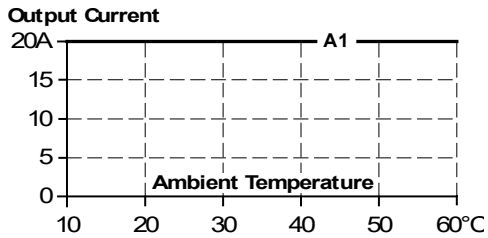


Horizontal Clockwise Orientation

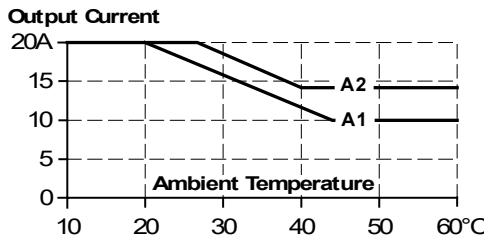


Horizontal Counter-Clockwise Orientation

Picture 6-5: De-Rating of CPS2020D depending on Mounting Orientations



Standard Orientation



Upside-Down Orientation

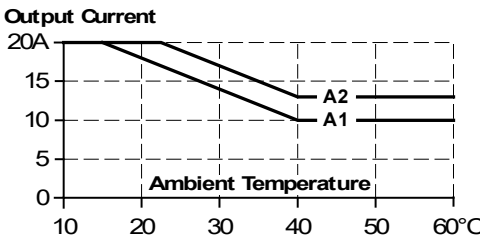
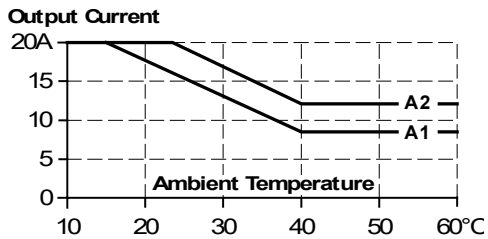
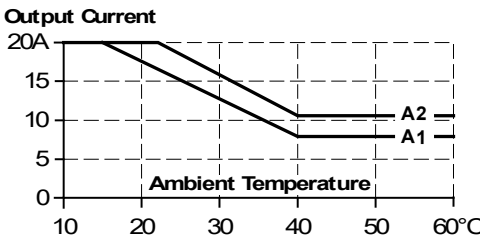


Table-Top Mounting



Horizontal Clockwise Orientation



Horizontal Counter-Clockwise Orientation

Picture 6-6: De-Rating of CPS2020E depending on Mounting Orientations

7 Connection technology

7.1 General information

- Use the corresponding internal documents (e.g. assembly instructions, circuit diagrams etc.) of your company.

- For preparation and execution of the connections, always observe applicable standards and any local requirements.
- Check the electromagnetic compatibility (EMC).
- Prepare a risk assessment of the residual risks.
- Carry out any additionally required measures.

7.2 Safety instructions

⚠ DANGER

Faulty electrical connections or unapproved, current-carrying components can cause serious injuries and even death.

- Ensure that electrical connections are only established by qualified personnel.
- Observe valid standards and directives.
- Carry out connection work only with suitable tools.
- Immediately replace damaged cables or plugs.

⚠ DANGER

Electrically live parts may result in electric shocks if touched and can cause serious injuries and even death. Electrical work performed in damp areas may result in electric shocks and can cause serious injuries and even death.

- Ensure that electrical connections are only established by qualified personnel.
- Observe valid standards and directives.
- Carry out connection work only with suitable tools.
- Observe the general installation and safety regulations for work at electrical systems.
- **Before** accessing electrical parts with voltages exceeding 50V, disconnect the product from the voltage supply. Secure the product against reactivation.
- Do not make contact with electrical connections of the product while it is activated **under any circumstances**.

⚠ DANGER

Risk of electrical shock, fire, personal injury or death.

- Turn power off before working on the device.
- Protect against inadvertent re-powering.
- Do not use the product without proper grounding (Protective Earth).
- Do not use in wet locations or in areas where moisture or condensation can be expected.
- Do not open the product.
- Do not modify or repair the product.

⚠ WARNING

Connecting or disconnecting the power and signal supply lines *under voltage* can lead to machine damage, serious injury or even death.

- Make sure that the product and the connections of the electronics (power and signal) are in a voltage-free state before connecting.
- Observe any discharge time of your components.

NOTICE

Electronic components of the product can be damaged by electrostatic discharge, particularly by contact with electrical connections.

- Carry out the work in an ESD-protected work environment and suitable personal protective equipment.
- Do not remove ESD safeguards from the connections before they are established.

8 Operation

8.1 Charging of batteries

The power supply CPS2010 can be used to charge lead-acid or maintenance free batteries.

The power supply CPS2020 is **not** recommended to charge lead-acid or maintenance free batteries.

- Do **not** use the CPS1005E to charge batteries.

In case of the usage of the CPS2010 to charge the above batteries, proceed as follow:

- Set output voltage (measured at no load and at the battery end of the cable) very precisely to the end-of-charge voltage.
- Use a suitable circuit breaker (or blocking diode) between the power supply and the battery.
- Ensure that the output current of the power supply is below the allowed charging current of the battery.
- Use only matched batteries when putting 12 V types in series.
- The return current to the power supply (battery discharge current) is displayed in Tbl 56 when the power supply is switched off (except in case a blocking diode is utilized).

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
End of charge voltage	at 10 °C battery temperature	V	Do not use	55,6		Not recommended	
	at 20 °C battery temperature	V		55,0			
	at 30 °C battery temperature	V		54,3			
	at 40 °C battery temperature	V		53,6			
Circuit breaker		A		15 – 16	13 – 16		
Return current	Typical value	mA		14	10		

Tbl 56: Charging of batteries

8.2 Parallel use to increase output power

The power supplies CPS20x0 can be paralleled to increase the output power. If more than three units are connected in parallel, a fuse or circuit breaker with a rating as displayed in Tbl 57 is required on each output. Alternatively, a diode or redundancy module can also be utilized.

Model			CPS1005	CPS2010		CPS2020	
	Detail	Unit	E	D	E	D	E
Circuit breaker	U.S.A.	A	-	15		30	
	IEC	A		16		32	

Tbl 57: Circuit breaker at parallel use

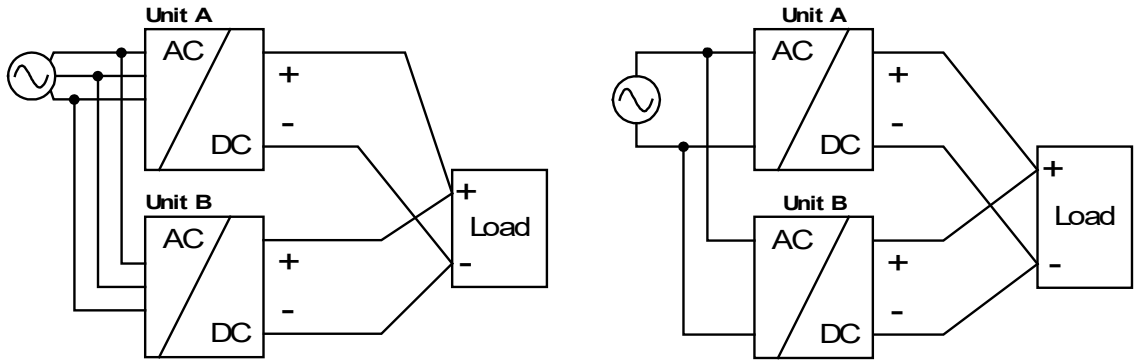
The output voltage shall be adjusted to the same value (±100 mV) in single mode with the same load conditions on all units, or the units can be left with the factory settings. After the adjustments, the jumper on the front of the unit shall be moved from single mode to parallel mode, in order to achieve load sharing. If no jumper is plugged in, the unit is in single mode (factory setting).

NOTICE

Note the regulations regarding mounting and de-rating to avoid possible overheating.

- Keep the installation clearance of between two power supplies and avoid installing the power supplies on top of each other.
- Do not use power supplies in parallel in mounting orientations other than the standard mounting orientation:
- Do not use power supplies in any other condition where a de-rating of the output current is required.
- Pay attention that leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.

- Do **not** use the CPS1005E in parallel use.



CPS2xxxD CPS2xxxE

Picture 8-1: Connection in parallel use

At the CPS2020 the parallel mode regulates the output voltage in such a manner that the voltage at no load is approximately 4% higher than at nominal load. Energize all units at the same time to avoid the overload hiccup mode. It also might be necessary to cycle the input power (turn-off for at least five seconds), if the output was in hiccup mode due to overload or short circuits and the required output current is higher than the current of one unit.

8.3 Parallel use for redundancy

The power supplies can be paralleled for redundancy to gain higher system availability. Redundant systems require a certain amount of extra power to support the load in case one power supply unit fails. The simplest way is to put two power supplies in parallel. In case one power supply unit fails, the other one is automatically able to support the load current without any interruption.

NOTICE

Risk of damage! Two power supplies in pararallel does not cover failures such as an internal short circuit in the secondary side of the power supply, as the defective unit becomes a load for the other power supplies and the output voltage can not be maintained any more.

- Use decoupling diodes
- Use decoupling devices

It is recommended to build redundant power systems by

- usage of separate input fuses for each power supply.
- usage of one additional power supply to cover the higher power demand.
- monitoring of the individual power supply units e.g. by using the DC-OK relay contact of the power supply.
- usage of separate mains systems for each power supply.

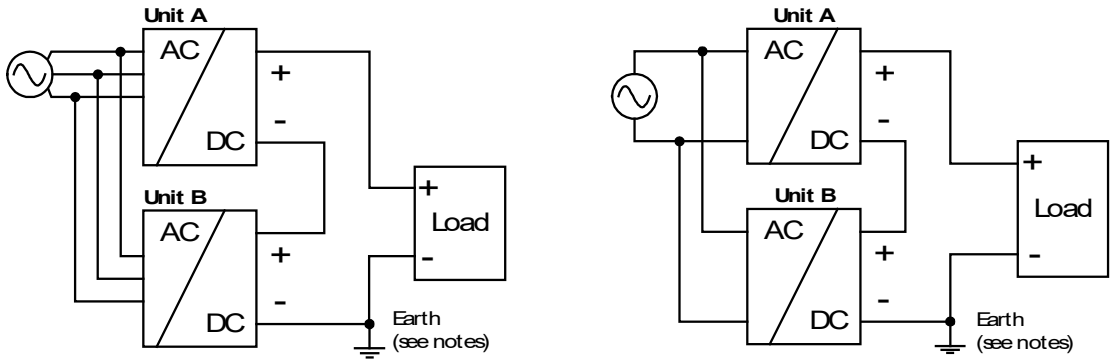
8.4 Series operation

The power supplies of the same type can be connected in series for higher output voltages. It is possible to connect as many units in series as needed, providing the sum of the output voltage does not exceed 150 V. Voltages with a potential above 60 V are not SELV any more and can be dangerous. Such voltages must be installed with a protection against touching. Earthing of the output is required when the sum of the output voltage is above 60 V, except for the CPS2010D.

NOTICE

Risk of damage! Note the regulations regarding mounting and operation.

- Avoid return voltage, which is applied to the output terminals.
- Keep the installation clearance between two power supplies and avoid installing the power supplies on top of each other.
- Do not use power supplies in parallel in mounting orientations other than the standard mounting orientation:
- Pay attention that leakage current, EMI, inrush current, harmonics will increase when using multiple power supplies.



CPSxxxxD CPSxxxxE

Picture 8-2: Connection in series operation

9 Maintenance

The products of the cyber® power supply are maintenance-free within their service life and within the specified environmental and operating conditions. Carrying out regular preventive maintenance measures according to the information in the machine maintenance plan of the machine manufacturer increases the availability of the machine. **WITTENSTEIN cyber motor** recommends performing the following maintenance:

- Check of the mechanical and electrical connections in accordance with the machine maintenance plan, at least every 1000 operating hours or at least every 3 months.
- Inspection of moving cables and lines in accordance with the machine maintenance plan, but at least every 500 operating hours or at least once a month.
- Check of the function and cleanliness of the cooling system in accordance with the machine maintenance plan, but at least every 1000 operating hours or at least every 3 months.
- Removal of dust, chips and other soiling from housings, cooling fins and other connections according to the degree of soiling, but at least every 8000 operating hours or at least every 12 months.

⚠ CAUTION

Hot surfaces at the product can cause severe injuries.

- Let the products cool down long enough after switching them off.
- Wear protective gloves or do not work on hot surfaces.

9.1 Cleaning

Cleaning the machine as specified by the machine manufacturer increases the availability of the machine. The cyber® power supply products are built into the machine in accordance with the machine manufacturer's specifications. **WITTENSTEIN cyber motor** recommends observing the following principles when cleaning the products:

- Remove dust, chips and other dirt from the product.
- If necessary, use suitable, non-aggressive cleaning agents.
- Carry out a compatibility test before using cleaning agents.

⚠ CAUTION

During cleaning work, handling errors can lead to severe crushing injuries.

- When cleaning the machine, secure it against restarting and unwanted movements.
- Only use suitable cleaning agents for cleaning work.

⚠ CAUTION

Hot surfaces at the product can cause severe injuries.

- Let the products cool down long enough after switching them off.
- Wear protective gloves or do not work on hot surfaces.

9.2 Visual inspection

Perform a visual inspection during maintenance in accordance with the machine manufacturer's specifications and record all anomalies in the machine maintenance plan.
WITTENSTEIN cyber motor recommends observing the following principles when performing a visual inspection:

- Visually check the mechanical and electrical connections.
- Check cables and lines for visible damage.
- Check mechanical components for damage and abrasion.
- Check the machine for leaks and contamination.

	Regular visual inspection and definition of measures help to prevent malfunctions and unscheduled downtimes.

9.3 Disassembly

	**⚠ CAUTION** **During mechanical disassembly, handling errors can lead to serious crushing injuries as well as to damage to the product or the application.** • During disassembly, secure the machine against restarting and unintended movement. • Have all mechanical disassembly carried out by qualified personnel only. • For disassembly, only use suitable tools.

	**⚠ CAUTION** **Hot surfaces at the product (e.g. housing, motor housing) can cause serious injuries.** • Let the products cool down for a sufficient period after switching it off. • When working with hot surfaces, always wear protective gloves.

Shut down the machine before dismantling the cyber® power supply products. When shutting down, observe the instructions in the machine documentation. **WITTENSTEIN cyber motor** recommends the following basic procedure:

- Switch off all power and control voltages including the main switch of the machine.
- Secure the machine against unintentional movements, against being switched on again and against being operated by unauthorized persons.
- Wait for electrical systems to discharge and disconnect electrical connections if necessary.
- Before dismantling, secure all components against falling or movement before loosening the mechanical connections.
- Drain any existing coolant channels before opening.
- Dismantle the product from the machine and store the product properly.
- Record all work carried out in the machine maintenance plan.

9.4 Disposal

The products in the cyber® power supply can be returned in accordance with WEEE 2002/96/EC to **WITTENSTEIN cyber motor** for disposal free of charge if there are no deposits such as oils, greases, adhesives or other impurities. Furthermore, the return must not contain any inappropriate foreign substances or components.

Please deliver the products to be disposed of free of charge to the following address:

WITTENSTEIN cyber motor GmbH
Customer Service
Walter-Wittenstein-Straße 1
D-97999 Igersheim

The packaging materials consist of foil and cardboard. Dispose of the packaging materials at the designated disposal points and observe the applicable national regulations. For ecological reasons, the packaging materials should not be returned.

10 Service & Support

WITTENTSTEIN cyber motor supports you with service and support. You will reach our Customer Service:

Customer Service	
Phone	+49 (0) 7931 493 15900
E-mail	service@wittenstein-cyber-motor.de
Address	**WITTENSTEIN cyber motor GmbH** Customer Service Walter-Wittenstein-Straße 1 D-97999 Igersheim

Tbl 58: Contact data WITTENSTEIN cyber® motor Customer Service

- Please have the following information ready:
- Detailed description of the malfunction and the circumstances.
- Type code and serial number of the relevant product.
- Telephone number and email-address for queries

	• Consult your company's installation instructions for possible malfunctions and information on troubleshooting.

Revision history

Revision	Date	Comment	Chapter
01	29.03.2022	New version	All

WITTENSTEIN cyber motor GmbH · Walter-Wittenstein-Straße 1 · 97999 Igersheim · Germany
Tel. +49 7931 493-15800 · info@wittenstein-cyber-motor.de

WITTENSTEIN Inc. · 1249 Humbracht Circle · Bartlett, IL 60103 · USA
Tel. +1 630 540 5300 · info@wittenstein-us.com

WITTENSTEIN S.P.A. · Via Giosuè Carducci 125 · 20099 Sesto San Giovanni MI · Italy
Tel. +39 02 241357-1 · info@wittenstein.it

WITTENSTEIN (Hangzhou) Co., Ltd. · No. 355 Tianmushan West Road · 311122 Hangzhou · Zhejang · China
Tel. +86 571 8869 5852 / 5851 · info@wittenstein.cn

WITTENSTEIN Ltd. · 2-6-6 Shibadaimon · Minato-ku · Tokyo 105-002 · Japan
Tel. +81 3 6680 2835 · sales@wittenstein.jp

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www.wittenstein-cyber-motor.de