

DC Power Supply
EPS/HC 40010-1000-M
10kW

Manual

102787
S/N: 2653
Rev.: 01
Date: 28.08.2017
Editor: SCJ / GRF



Before commissioning, read the warning and safety instructions as well as the entire user manual.

DC power supply

in switch mode technology, air cooled

Mains supply 3 x 380 V-460 V AC / 50-60 Hz without Neutral

Interface: analog



DC-output: 10 V / 1000 A

**continuously variable
in constant current or constant voltage regulation**

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1 General security information

1.1 Class-A device

This device is defined as a **class-A**-device.

Warning: This device is provided to be used only in industrial environment! In other environments, a sufficient electromagnetic tolerance could not be assured without additional installation measures.

1.2 Security



This DC power supply was delivered after a thorough function- and safety-check. Only qualified staff shall connect the rectifier module and put it into operation. Service and maintenance is only to be performed by qualified personnel.

Any manipulation or repairing is life endangering. Observe all instructions of the manufacturer; else, the warranty for DC power supplies and accessories will expire.



Parts carrying a life-endangering voltage potential are installed inside the casing.

These are marked with warning labels.

Any manipulation of the electrical parts is life endangering and by doing so, including improper operation, cancels the guarantee.



Attention!

Do not operate any DC power supply with one or more loose cable connectors!

If during operation one or more plugs are pulled out of the boards inside the modules, electronic parts and the power unit could be destroyed!



This DC power supply was constructed in consideration of the threat analysis and the relevant safety regulations. Further, all relevant technical specifications are respected. Therefore, this technology is state-of-the-art and guarantees a maximum of safety and functionality.

The safety and functionality can only be kept if the all relevant arrangements are done.

The operator of the installation is responsible for the adherence of safety rules.

**Attention!**

Don't use the handles on the front side of the device to carry or move the device!

They are made to pull the device out of a rack or a cabinet.

Danger of accident!

The operator has to ensure that

- the DC power supply is only to be used for the application released by the manufacturer

Active loads such as batteries or generators must never be connected to the DC generator (danger of destruction)!

- the installation is only to be put into operation if it is in an accurate condition and all safety devices are checked regularly.
- all requested individual protective equipment for operator and maintenance personnel is available and is to be used.
- the operating and maintenance manual is available and in an accurate condition
- mounting, repairing, electrical installation, adjusting and maintenance are only to be performed by qualified personnel.

**Security information**

The manufacturer recommends installing the DC power supplies in cabinets or other protective casings.

If the modules are not installed inside cabinets or other casings, make sure that they are protected against dropping particles, water, dust and vapor!

The DC power supplies are only to be operated in the permissible ranges of current, voltage, environmental temperature and atmospheric humidity according to the rating plate and the operating manual.

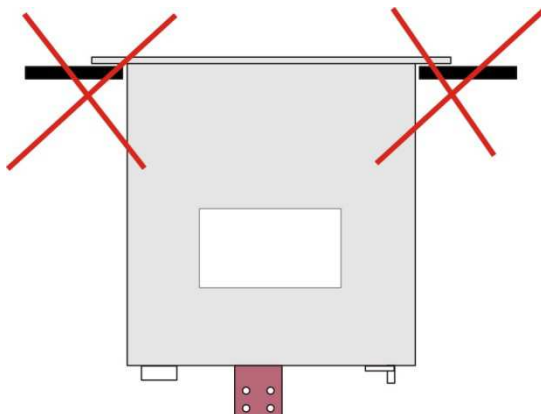
1.3 Installation of the DC power supply modules

While mounting the module and the DC connectors, observe especially the following:

- Don't tighten screws with a lever, don't bent any rails or panels.
- The units must be mounted in a horizontal way.
- Ensure an unhindered airflow at the air input and air output.
- Observe the installation instructions of the electrical installation.

Attention

Never hang up the unit on the front panel!



1.4 Operation conditions

DC power supplies are not to be operated in an explosive environment. Ensure a sufficient airflow to avoid an internal overheating. Always install the rectifiers directly on to a strong surface and never near an object that may block the airflow.

Keep a distance from

at least 50 cm

from air inlet and outlet to walls or other devices.

The cooling air must be free from any chemical contamination and free from particles, steam and dust.

The unit must be protected from dropping particles, dripping water and splash water.

The DC power supply should be fixed on the installation place by using the mounting holes.



Attention!

High weight and sharp metal edges!

Wear personal protective clothing!

Do not use DC bus bars and other connectors to lift or move the device.

1.5 Intended purpose

Device for industrial application

According to the norms

DIN EN 61000-3-12 (VDE 0838-12):2012-06
EN 61000-3-12:2011

this device is only to be used for industrial applications. Offering and selling the device to the general public is not provided.

2 After transportation

Check the device and the packaging and transportation material for damages caused by transportation! Never put a device into operation if there are visible or hidden transportation damages!



Attention:

After transportation, all electrical connections accessible by the customer must be checked! Vibrations during transportation may loosen the screws of clamps.

Check mains wiring and output connections as well as control cables.

Loose cable connections may cause overheating of clamps and cables and will lead to destruction of the installation.

2.1 Transportation locking devices

Make sure no transportation locking material is left at the device before putting into operation.

Remove labels and stickers that are not necessary for safe operation.

3 **Storage**

Aluminum electrolytic capacitors are built into direct and pulse power supplies in the EPS/HC series and into their control components to ensure correct operation. These components are subject to natural ageing processes.

Aluminum electrolyte capacitors containing liquid electrolyte age over time due to the electrolyte slowly drying out, depending on temperature.

As a result, these devices should not be stored for longer than six months. If you keep replacement devices in storage, they should be integrated into systems after six months at the latest. If not, they should be connected to the power supply in non-operational mode for at least an hour before they are installed and also at least once a year to recondition the electrolyte capacitors.

Important

Condensate may form on the external surfaces of devices if air humidity is high.

This condensation may cause the external casing to corrode. It is therefore recommended to store these devices in a dry and/or air-conditioned room with adequate ventilation to prevent such corrosion.

Ensure that the ventilation openings are not covered when you mount the devices. Each device should be left to adjust to room temperature for a couple of hours after installation before it is put into operation.

3.1 **Environmental conditions for storage**

Ambient temperature: 0 °C to +50 °C (for storage only)
Air humidity: 15 to 95 %, non-condensing

4 General description

The DC power supply type **EPS/HC** is a sophisticated switch mode type rectifier. The electronic components fit in a 6U rack-mounting casing.

The switching on and off as well as the adjustment of the output parameters is done by analog signals at connector X5.2.

A control unit is to be connected to the control input.

The electronic regulation guarantees the correctness of the output parameters during the operation, even with variable loads at the DC output.

The device is temperature protected. In case of rising interior temperature, first the fan speed increases. If the temperature is still increasing, the device decreases the output current automatically; in extreme case, the output is set to zero. After a cooling phase, the output power is increased automatically.



Attention:

Auto-re-start after cooling down!

Do not use the device at higher environmental temperature (see “Technical data”)!

4.1 Indirect-coupling (galvanic isolation) of control signals

The control signals are indirect-coupled from the power output stage and from PE potential.

4.2 Switch mode technology

This device was designed as switch mode type DC power supply. The advantages of the switch mode technology are:

- very compact design
- maximum regulation accuracy
- very low ripple
- high efficiency; optimized power factor (0.95, correlated to nominal DC values)

4.3 Cooling

The device is air cooled by fan. The cooling air inlet is located in the back panel of the device.

The cooling air outlet is located in the front panel of the device.

The cooling air duct is especially sealed to protect the electronic components of the device (optimized cooling air conduct; protection against destructive dust). While choosing the installation place, please observe however, that the unit is not in contact with corrosive fume.

Keep a distance from at least 50 cm to the air inlet and outlet!

5 Mounting, Installation

The unit can be directly installed on a plane surface.

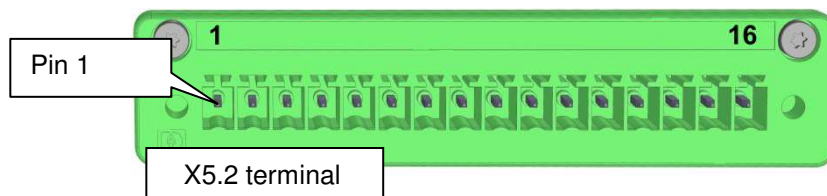
For the installation in cabinets, the manufacturer offers special mounting rails that can diversify depending on the cabinet.

While choosing the installation place, please observe however that the unit is not in contact with corrosive fume.

If the unit is exposed to corrosive fume and high atmospheric humidity (>70%), provide the unit and operating area with fresh air.

6 Connector X5.2

Connect the X5.2 terminal to the signals that are necessary for your application.



If the DC power supply is in operation with an external control unit, connect the DC power supply to the control unit as the documentation of the control unit shows.

6.1 Control cable

Use shielded control cable with wire cross section of $12 \times 0.34 \text{ mm}^2$.

Connect one end of the shield to PE.

6.2 Indirect-coupling

The analog control signals

I-act.	0 ... 10 V	U-act.	0 ... 10 V
I-set	0 ... 10 V	U-set	0 ... 10 V

are indirect-coupled from DC power stage and PE potential.

6.3 Service connector X5.2, connecting scheme

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	X5.2
I-act. 0 ... 10 V output	U-act. 0 ... 10 V output	Ref. GND	I-set 0 ... 10 V input	U-Ref. 10.2 V output	U-set 0 ... 10 V input	I-act. 0 ... 60 mV GND	I-act. 0 ... +60 mV	--	COM / GND	--	Extern ON	Blocking	Relay NO	Relay COM	Relay NC	
AK00000015																

6.4 Specifications of the analog-connection

Maximum load of the analog outputs:

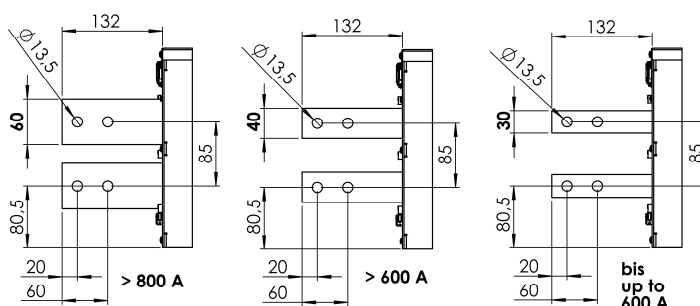
Reference 10 V:	3 mA, potentiometer with min. 10 k
Act. Values 10 V:	3 mA
Signal 60 mV:	>10 kOhm

Input resistance:

Analog set values:	20 kOhm;
0 - 10 V	(+4 % admissible)
Digital inputs:	>10 kOhm (level: +5 V)

7 DC connection

Connect the DC output of the DC power supply to the load.



Check for right polarity and contact.

Look for the

DIN VDE 0298-4 : 2013-06

admitted cable cross section and the correct polarity.

Attention:

The connection of active loads as batteries or DC-machines to the DC output would cause damages to the unit!

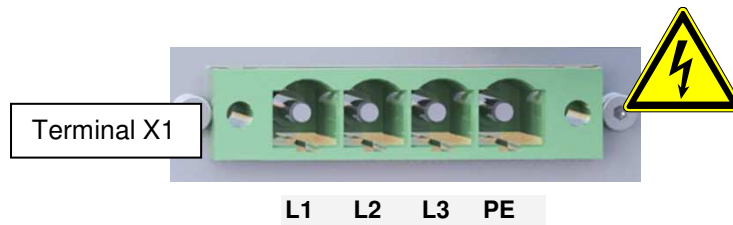
Please check:

Do not wire the power supply cable and the DC-cables into a roll or bind the supply cable and the DC-wiring together with other wires. Otherwise, overheating is possible.

8 Main supply

Supply voltage and phase current: see „Technical Data“

Connect main supply to terminal X1:



Mains cable specification

Only connect supply cables that are in conformance with the following standards:

DIN VDE 0298-4 / 2013-06

Use equivalent regulations that are valid for the country the device is used in.

Provide for an allowable external fuse admitted to

DIN VDE 0636-2 / 2014-09 / DIN EN 60269-2

Please check:

Make sure that the supply cables could be directly connected to your main supply.

Avoid the use of cable extensions and multiple power sockets.

Do not wire the power supply or the DC-cables into a roll or bind the supply and the DC-cables together with other wires. Otherwise, overheating is possible.

Use the delivered plug!

9 Operation

9.1 Operation

If the main is connected to X1 terminal the unit is ready for operation.

The switching ON and OFF as well as the controlling of the DC output (current and voltage) is done via signals on terminal X5.2.

The readback signals I-act and U-act are sent to terminal X5.2.

9.2 Extern ON

To switch the **DC power supply ON**, use the **Extern-ON function**. It is wired to pin 10 (GND) and pin 12 (ON) of the X5.2-terminal.



Attention:

The unit is not disconnected from mains if the function is set to OFF!

Use only potential free contacts!

If the Blocking contact is closed (see below „Blocking“) the DC power supply cannot be switched on!

To clear errors the Extern-ON contact must be opened longer than 1 second.

9.3 Blocking (switching the DC output OFF)

To switch the **DC output OFF**, use the **BLOCKING function**. It is wired to pin 10 (GND) and pin 13 (BLOCKING) of the X5.2-terminal.



The Blocking function has priority over the Extern-ON contact (see above „Extern ON“). If the Blocking contact is closed the DC power supply cannot be switched on!

Attention:

The unit is not disconnected from mains if the DC output is set to BLOCKING!

Use potential free contacts!

9.4 Constant current regulation (CC)

If a constant current is needed, follow these terms:

First move the output voltage to the highest admitted level for your process using the voltage set signal **U-set**: Supply 10 V DC to X5.2/6 (related to X5.2/3, GND). If possible, use the **Uref.** signal 10.2 V DC at **X5.2/5** to set the output voltage to maximum. If another signal than the Uref. signal is used, the GND potential of the external control signal is to be connected to X5.2/3.

Now use the current set signal **I-set** to adjust your DC-current: Supply 0 - 10 V DC to **X5.2/4** (related to X5.2/3, GND) to set the output current from 0 A to I_{nom} . If possible, use the **Uref.** signal 10.2 V DC at **X5.2/5** to set the output current to maximum. If another signal than the Uref. signal is used, the GND potential of the external control signal is to be connected to X5.2/3.

Both, the current and the voltage readout value I-act. and U-act., will be given out at X5.2/1 and X5.2/2 (0 - 10 V each, related to GND).

Attention:

If one set signal, the current or voltage one, is set to zero the DC output is blocked!

9.5 Constant voltage regulation (CV)

If a constant voltage is needed, follow these terms:

First move the output current to the highest admitted level for your process using the current set signal **I-set**: Supply 10 V DC to X5.2/4 (related to X5.2/3, GND). If possible, use the **Uref.** signal 10.2 V DC at **X5.2/5** to set the output current to maximum. If another signal than the Uref. signal is used, the GND potential of the external control signal is to be connected to X5.2/3.

Now use the voltage set signal **U-set** to adjust your DC-voltage: Supply 0 - 10 V DC to **X5.2/6** (related to X5.2/3, GND) to set the output voltage from 0 V to U_{nom} . If possible, use the **Uref.** signal 10.2 V DC at **X5.2/5** to set the output voltage to maximum. If another signal than the Uref. signal is used, the GND potential of the external control signal is to be connected to X5.2/3.

Both, the current and the voltage readout value I-act. and U-act. , will be given out at X5.2/1 and X5.2/2 (0 - 10 V each, related to GND).

Attention:

If one set signal, the current or voltage one, is set to zero the DC output is blocked!

9.6 Readout values for current and voltage

The read out values I-act. and U-act. are wired up to the terminal X5.2
pin 1 (I-act.) and pin 2 (U-act).

The signals are

0 - 10 V for 0A - I_{nom}
and
0 - 10 V for 0V - U_{nom} .

The signals I-act. and U-act. are related to Ref. GND (pin X5.2/3).

9.7 I-act. signal 0 - 60 mV

The I-act. signal 0 - 60 mV is a reference signal for the actual output current.

Signal:

0 – 60 mV for 0 - I_{nom} : X5.2/7 = GND I-act., X5.2/8 = 0 to +60 mV

9.8 Error relay

The error relay is an internal relay that indicates if the DC power supply is in operation, or if the system is off. The relay contacts are connected to pin 14 – 16 of the service connector X5.2.

15 = COM 16 = NC 14 = NO

- **relay contact X5.2/14 and X5.2/15 closed** = in operation,

- **relay contact X5.2/16 and X5.2/15 closed** = mains supply
OFF, or internal error.

Attention:

The BLOCKING function and ON function do not influence the error relay!

The error relay is switching to "Error / OFF" position (15 / 16 closed) if there is an internal error, missing phase or low voltage.

Attention!

Do not overload the relay contacts!

Max. load of the error relay contacts: 48 V / 500 mA

10 LED signals

On the connecting side of the device, a LED is installed. This LED shows several operating states of the rectifier:

LED off:	not in operation; no control voltage or control error (e.g. supply voltage missing, defective fuse, reset / loading mode)
LED steady on:	in operation
flashing slowly:	not ready for operation (see information on control device)
flashing fast:	communication error, i.e. defective control cable, contact interrupted



Consider:

This LED just shows status information of the rectifier unit. There is no safety function linked to the LED.

11 Service and maintenance

This device is extensively maintenance-free.

It is recommended to perform the following maintenance tasks at regular intervals:

- Clean the fans and the air ducts
- Check up the fans on functionality and unusual noises
- Verify the quality and cleanliness of the cooling air
- Check and possibly retightening of electrical connections
- Cleaning of the contact surfaces of the DC connections
- Visual check of the casing (protecting grade still kept?)
- Visual check of all accessible electrical connections within the casing
- Check up all connections done by the customer

The maintenance intervals are to be defined by the customer and / or operator. The intervals are depending on the environmental conditions and operation cycles.

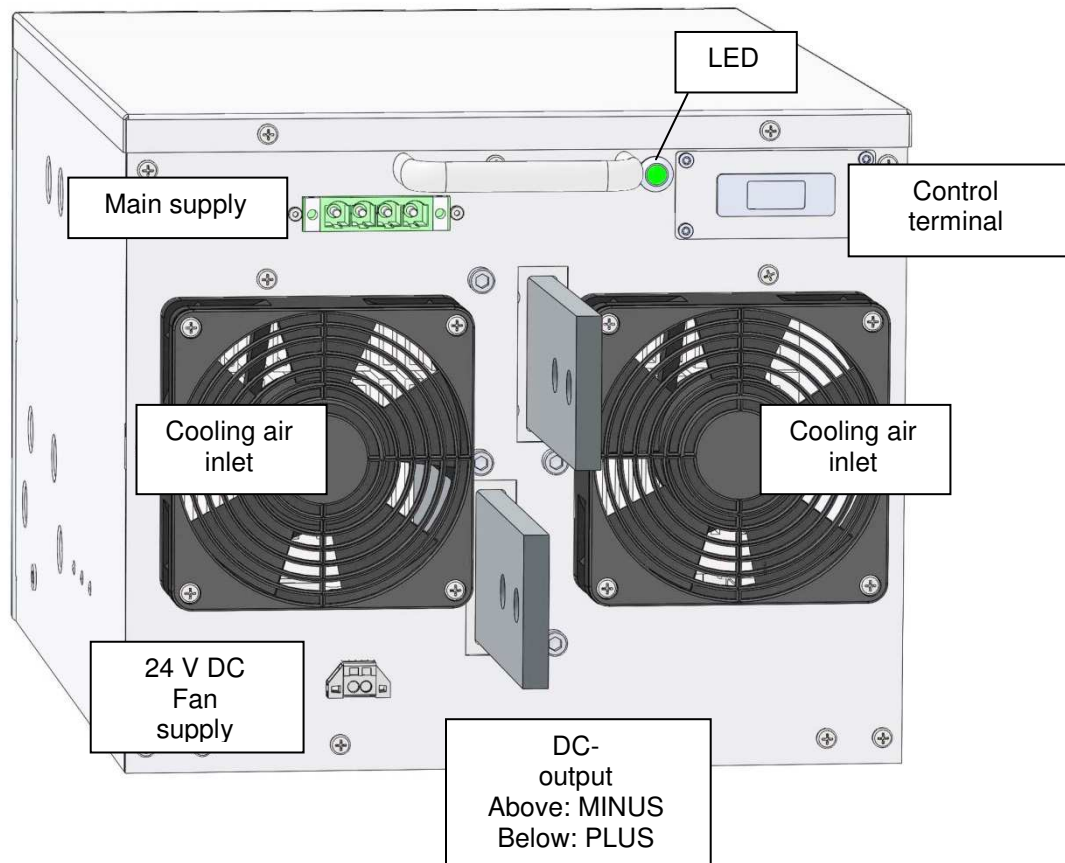
Do not clean the units with strong cleaning agents. Adjustment and maintenance work should only be done under strict safety precautions, especially if the work must be done while the device is switched on. Inside the unit, there are no controls to be used during operation.

This device was manufactured under high quality standards and has passed several function and safety tests during the production process. If there should be any trouble however, please contact the manufacturer.

12 Technical data

Device type:	EPS/HC 40010-1000-M
Function:	EPS DC power supply
Mains voltage:	3 x 380 V-460 V AC (+/-10 %) 50-60 Hz
Neutral connector:	no
Phase current at 400V AC:	17 A / phase
required cable cross section of the mains cable:	DIN VDE 0298-4 : 2013-06
DC output voltage:	0 ... 10 V, continuously variable
DC output current:	0 ... 1000 A, continuously variable
required cable cross section of the DC cable:	DIN VDE 0298-4 : 2013-06
Ripple:	< 1 % between 2 – 100 % of the nominal output current
Regulation inaccuracy voltage:	< 0.5 % correlated to the nominal DC values. regulation range current and voltage: 2 – 100 %
Regulation inaccuracy current:	< 1 % correlated to the nominal DC values. regulation range current and voltage: 2 – 100 %
Cyclic duration factor:	100 %
Environmental temperature:	0 to +35 °C
Noise suppression:	according to EN 55011 curve A
Internal fuse:	- -
Protection grade:	IP20 / for cooling duct: IP53
Cooling:	Air, by fan
Cooling air consumption:	500 m ³ /h
Weight:	40 kg
Dimensions:	see drawings below
Casing (color):	stainless steel

13 Back side view



14 Spare parts

A detailed list of spare parts is available on request. Please provide the device serial number at your request.

15 Warranty and delivery conditions

The general trading conditions of the manufacturer are effective.

16 Service department contact

In the event of a fault, please check first the error messages or the FAQ in this manual.
If you are unable to eliminate the fault yourself, please contact our Customer Service. When you do so, have the following information to hand:

Place of manufacture of system: Schongau in Germany or Inzing in Austria. The information can be found on the type plate (see Section **Fehler! Verweisquelle konnte nicht gefunden werden.**).

Device information: Model, project no. (C 000 xxx) and article number according to type plate or display in the "Info" menu.

An exact description of the problem (which consumers are being operated, does the problem occur regularly or sporadically, etc.)

State of LEDs on the assembly groups or circuit boards:

Which red LEDs are lit?

Which yellow LEDs are lit?

Which green LEDs are lit?

Current status messages in the display

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List of changes

Revision	Date	Editor	Chapter	Page	Remark
01	28.08.17	Schumann			Eingeführt