

DATASHEET

HIGH-VOLTAGE POWER SUPPLIES – HCP SERIES



TABLETOP MODELS UP TO 15KW
RACK-MOUNTED MODELS UP TO 15kW – ON REQUEST



PRODUCT PROPERTIES AND DATA

FUNCTION:

The HCP series power supplies (**H**igh Voltage-**C**hopper-**P**ower Supply) are highly stable switch-mode power supplies with low ripple. Due to the high switching frequency the power supply has a low residual ripple in the generated output voltage with high stability, good regulation dynamics, and at the same time only a low amount of stored energy.

CHARACTERISTICS:

- Compact design (19" housing), low weight, even at high output voltages
- Efficiency approx. 90%
- Permanently short-circuit and flash-over proof
- Can be operated indefinitely with rated current in case of a short-circuit
- Can be operated indefinitely with rated power
- Voltage and current control with automatic transfer and control mode display with LEDs
- Adjustable overvoltage limit (V-LIMIT)
- 4½-digit digital display for current and voltage in all power classes
- Voltage and current are set using a ten-turn potentiometer with a lockable precision dial
- Set-point display via a button
- Set-point adjustment possible with disabled output
- Push-button switch for output voltage (OUTPUT)
- Any load type, in principle, any passive two-terminal network is possible

We will be pleased to advise you – contact us at: sales@fug-elektronik.de or +49 8039 400 77 0.

POSSIBLE OPTIONS:

- Coarse/fine-potentiometers (99% / 1%) for more accurate adjustment of voltage and / or current
- Analog programming/interface
- Analog programming/interface, floating
- Computer interfaces -IEEE 488, RS 232, RS 422, Profi-bus DP, USB, LAN (more on request)
- Electronically controlled polarity reversal switch (up to 35kV remotely controllable when ordered with a programming or interface, for higher voltages, please contact us). Please specify the output polarity, when ordering without polarity reversal switch.
- Lower ripple
- Higher stability
- Lower stored energy
- Power limitation

More options and special solutions on request. Some options may involve changes to the description of the unit - especially concerning the mechanical design.

HIGH-VOLTAGE POWER SUPPLY OPERATING MODES:

The HV output's polarity is positive or negative; a reverse polarity switch is optionally available. The power supplies can be operated in the LOCAL, ANALOG (optional) and DIGITAL (optional) operating modes.

TECHNICAL SPECIFICATIONS

All data given here apply for voltage and current control during internal operation (LOCAL) and refer to the maximum output values.

DIMENSIONS:

Depending on the output voltage and/or power, either a 1/2 19" or 19" desktop housing. The height and depth of the high-voltage power supply depends on its power rating and output voltage. Detailed information can be found in the type table at the end of this document.

A special version as 19" rack-mounted or with optional rack adapter is available.

ELECTRICAL SPECIFICATION:

Mains connection:	Up to 1400W rated power 230V $\pm 10\%$ 47 - 63Hz From 2800W rated power 400V $\pm 10\%$ 3-phase 47 - 63Hz, also refer to the details on the type plate. The N and PE (protective earth) connections are always required!
Protection class:	I
Overvoltage category:	II
Output:	Output values, voltage / current, see front panel or the equipment card
Short-circuit resistance:	The power supply is short-circuit and flash-over proof. The maximum current can be drawn at any output voltage, even in the event of a short-circuit.
Efficiency:	approx. 90%
Output polarity:	Positive or negative, optionally available with a polarity reversal switch, see details on the device or on the equipment card
Output isolation:	The "0V" terminal is connected to the PE (EARTH). Current return preferably takes place via the screen of the output cable.
Voltage setting range:	Using the VOLTAGE potentiometer, approx. 0.1% to 100% of the rated value
Current setting range:	Using the CURRENT potentiometer, approx. 0.1% to 100% of the rated value
Setting resolution:	$< \pm 1 \times 10^{-3}$ of rated value with potentiometer on front panel $< \pm 1 \times 10^{-5}$ of rated value with fine potentiometer 1×10^{-4} of rated value with option interface
Displays:	DVM for voltage and current, range ± 20000 LEDs for status messages voltage control / current control.
Reproducibility:	$\pm 1 \times 10^{-3}$ of rated value with potentiometer on front panel $\pm 1 \times 10^{-4}$ of rated value with option interface
Residual ripple:	$< 1 \times 10^{-4}$ pp (peak to peak), typ. 5×10^{-5} pp of rated value (measuring band width 30Hz bis 10MHz) $< 3 \times 10^{-5}$, typ. $< 1,5 \times 10^{-5}$ of rated value RMS
Control time:	
Voltage control:	< 1 ms with load changes from 10% to 100% or 100% to 10%, respectively
Current control:	< 10 ms with load changes that effect a change of less than 10% in the output voltage.
Setting time at rated load:	< 100 ms...500ms, depending on type, for changes in the output voltage from 10 to 90% or 90 to 10%, respectively
Discharge time constant:	with output free of load, max. 10s
Control deviation:	with $\pm 10\%$ network change: $< \pm 1 \times 10^{-5}$ of the rated value, with open circuit / full load: 2×10^{-4} of the rated value, over 8 hours: $< \pm 1 \times 10^{-4}$ of the rated value, with temperature deviations $< \pm 1,5 \times 10^{-4}$ /K of the rated value

AMBIENT CONDITIONS:

Operation:	
Operation location:	Only for use in dry indoor areas
Temperature:	0°C bis +40°C

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Humidity:	Max. relative humidity 80% up to 31°C, decreasing linearly down to 50% relative humidity at 40°C
Altitude:	Up to 2000m above sea level
Pollution degree:	1
Protection type:	IP20
Cooling:	The heat generated in the power supply unit is dissipated by convection or, in the case of high-power units, by forced ventilation.
Transport / Storage:	
Temperature:	-20°C bis +50°C
Humidity:	No precipitation and max. relative humidity of 80%
Storage rooms:	Dust-free and dry

DC POWER SUPPLY COMPONENTS

FRONT VIEW WITH CONTROLS:

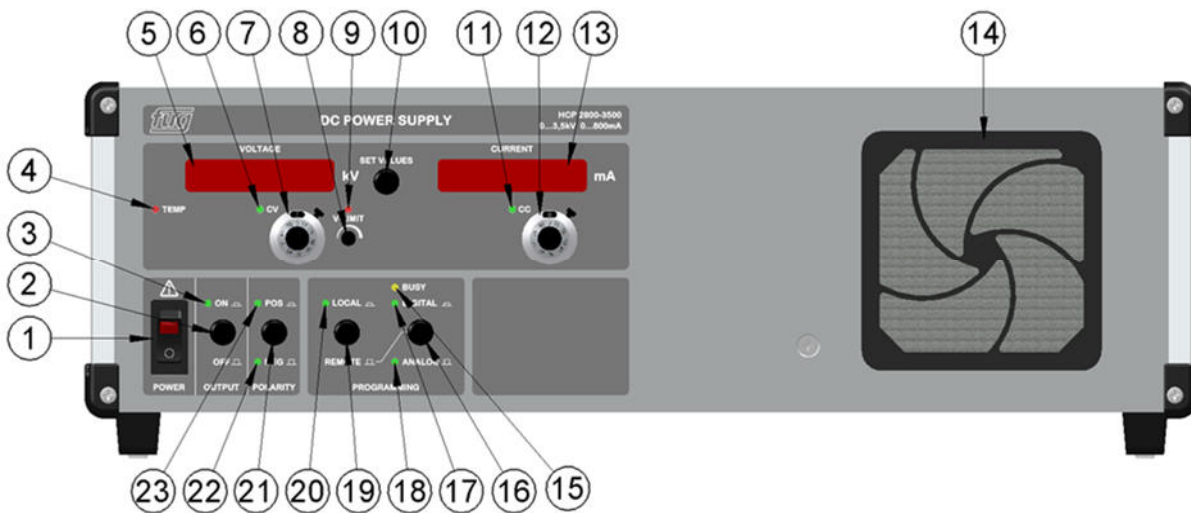


Figure: Front Panel – Sample HCP 2800 - 3500. Different dimensions apply for DC power supplies with higher performance

1	AC power switch with indicator light Disconnects the power supply from the mains, two-pole switching	13	Current display flashing: Set point not flashing: Actual value
2	DC output ON (OUTPUT) There is no mains disconnection!	14	Air inlet (depending on device type)
3	DC output ON LED Lights up green when the controller and therefore the power stage is operating (OUTPUT ON)	15	(Optional) LED BUSY displays data traffic on the digital interface
4	Over-temperature LED: Internal device temperature too high, fan failed or contaminated. (Use is type-dependent)	16	(Optional) Switching the operation mode between REMOTE/ANALOG and REMOTE/DIGITAL
5	Voltage display flashing: Set point; not flashing: Actual value	17	(Optional) LED indicating digital programming active

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6	LED for constant voltage control mode (Constant Voltage)	18	(Optional) LED indicating Analog programming/interface active
7	Lockable ten-turn potentiometer for voltage adjustment	19	(Optional) Switching the operation mode setting between LOCAL and REMOTE
8	Set-point limit adjustment for voltage V-LIMIT (can only be operated with a tool)	20	(Optional) LED indicating local control mode active
9	LED for active voltage set-point limit	21	(Optional) Local output polarity adjustment Without polarity reversal, polarity labelled using coloured stickers: RED: POSITIVE; BLUE: NEGATIVE
10	SET VALUES Switch displays between Set-point and Actual output mode, displays flash when in set-point mode.	22	(Optional reverse polarity switch) LED set for negative output voltage
11	LED for constant current control mode (Constant Current)	23	(Optional reverse polarity switch) LED set for positive output voltage
12	Lockable ten-turn potentiometer for current adjustment		

REAR VIEW WITH SINGLE-PHASE AC INPUT:

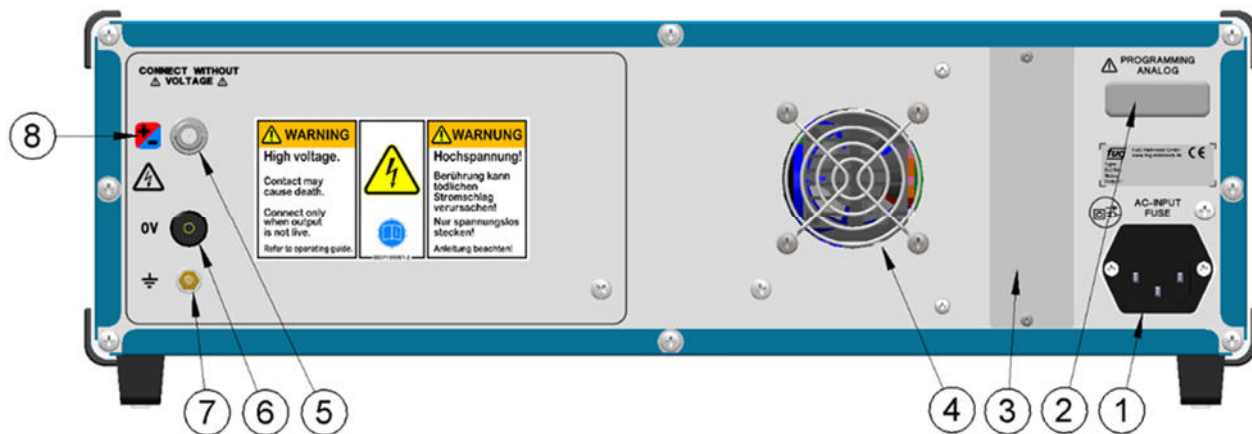


Figure: Rear panel – sample HCP 700 - 6500 with reverse polarity switch. For DC power supplies with higher performance or other voltages, other dimensions may apply. The elements' layout may vary from that shown here.

1	AC input with mains fuses Up to 700W: IEC connector (as shown) with integrated fuse, at 1400W, C20 mains cable in accordance with IEC60320-C20, equipped with automatic circuit breaker.
2	(Optional) 15-pin Sub-D connector for Analog programming/interface
3	(Optional) Slot for digital interface (e.g.: IEEE-488, RS232, USB, LAN, ...)
4	Air outlet (depending on device type)
5	HV output (dedicated for screened HV- cable with grounded screen, which can be used for current return)
6	0V load connection, internally connected to the 0V of the electronics. This 0V connection is permanently connected to the protective conductor (PE).
7	Earth bolt (is permanently connected to the protective conductor (PE): This connection must be connected to the ground of the load!
8	Polarity indication: RED: POSITIVE BLUE: NEGATIVE RED/BLUE: OPTIONAL POLARITY REVERSAL SWITCH

REAR VIEW WITH THREE-PHASE AC INPUT:

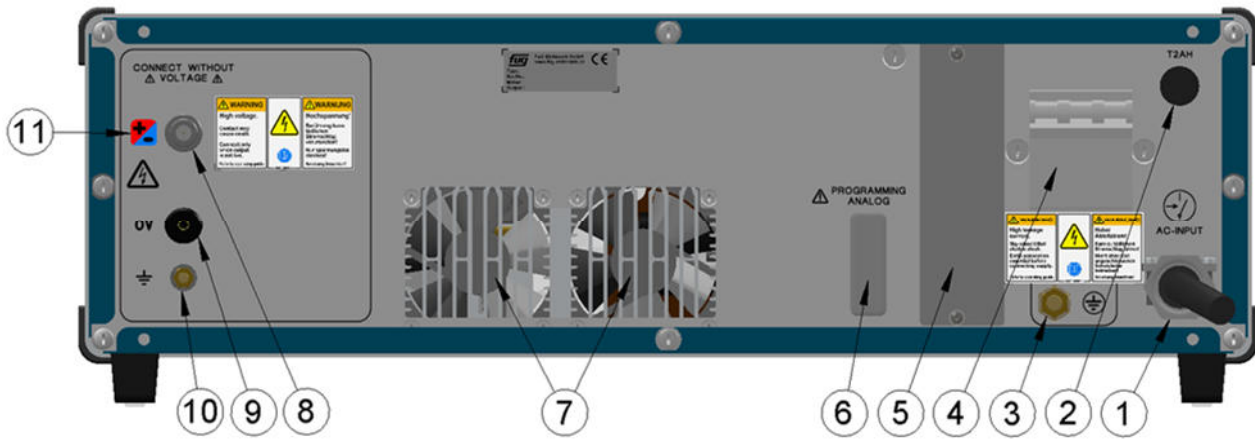


Figure: Example HCP 2800 - 6500. For DC power supplies with higher power or other voltages, other dimensions may apply. The rear panel layout may vary from that shown here.

1	Mains input with fixed installed cable, for 3phase mains
2	Fuse holder for internal electronics fuse
3	Earthing bolt (only for power supplies with 3phase mains input). These power supplies have to be properly connected to earth via this earthing bolt with 10mm ²
4	Automatic circuit breaker, fuse holder
5	Option port for digital interface (e.g., IEEE 488, RS232, USB, LAN)
6	(Option) 15pol Sub-D Connection for Analog programming/interface
7	Air outlet (depending on device type)
8	HV output (dedicated for screened HV- cable with grounded screen, which can be used for current return)
9	0V load connection, internally connected to the 0V of the electronics. This 0V connection is permanently connected to the protective conductor (PE).
10	Earth bolt (is permanently connected to the protective conductor (PE): This connection must be connected to the ground of the load!
11	Polarity indication: RED: POSITIVE BLUE: NEGATIVE RED/BLUE: OPTIONAL POLARITY REVERSAL SWITCH

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TYPE TABLE

Type	Voltage	Current	Width	Height	Depth	Weight
HCP 14 - 3500 ●	0 - 3500 V	0 - 4 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	3 kg
HCP 35 - 3500 ●	0 - 3500 V	0 - 10 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	4 kg
HCP 140 - 3500 ●	0 - 3500 V	0 - 40 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	6 kg
HCP 350 - 3500 ●	0 - 3500 V	0 - 100 mA	½19" / 222 mm	3 HE / 133 mm	450 mm	7 kg
HCP 700 - 3500 ●	0 - 3500 V	0 - 200 mA	19" / 443 mm	3 HE / 133 mm	350 mm	11 kg
HCP 1400 - 3500 ●	0 - 3500 V	0 - 400 mA	19" / 443 mm	3 HE / 133 mm	450 mm	13 kg
HCP 2800 - 3500 3)	0 - 3500 V	0 - 800 mA	19" / 443 mm	3 HE / 133 mm*	550 mm**	25 kg
HCP 5000 - 3500 3)	0 - 3500 V	0 - 1,5 A	19" / 443 mm	6 HE / 266 mm	650 mm	40 kg
HCP 10000 - 3500 3)	0 - 3500 V	0 - 3 A	19" / 443 mm	9 HE / 399 mm	650 mm	75 kg
HCP 15000 - 3500 3)	0 - 3500 V	0 - 4,5 A	19" / 443 mm	12 HE / 535 mm	650 mm	110 kg
HCP 14 - 6500 ●	0 - 6500 V	0 - 2 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	3 kg
HCP 35 - 6500 ●	0 - 6500 V	0 - 5 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	4 kg
HCP 140 - 6500 ●	0 - 6500 V	0 - 20 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	6 kg
HCP 350 - 6500 ●	0 - 6500 V	0 - 50 mA	½19" / 222 mm	3 HE / 133 mm	450 mm	7 kg
HCP 700 - 6500 ●	0 - 6500 V	0 - 100 mA	19" / 443 mm	3 HE / 133 mm	350 mm	11 kg
HCP 1400 - 6500 ●	0 - 6500 V	0 - 200 mA	19" / 443 mm	3 HE / 133 mm	450 mm	13 kg
HCP 2800 - 6500 3)	0 - 6500 V	0 - 400 mA	19" / 443 mm	3 HE / 133 mm*	650 mm	25 kg
HCP 5000 - 6500 3)	0 - 6500 V	0 - 750 mA	19" / 443 mm	6 HE / 266 mm	650 mm	40 kg
HCP 10000 - 6500 3)	0 - 6500 V	0 - 1,5 A	19" / 443 mm	9 HE / 399 mm	650 mm	75 kg
HCP 15000 - 6500 3)	0 - 6500 V	0 - 2,3 A	19" / 443 mm	12 HE / 535 mm	650 mm	110 kg
HCP 14 - 12500 ●	0 - 12500 V	0 - 1 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	4 kg
HCP 35 - 12500 ●	0 - 12500 V	0 - 2,5 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	5 kg
HCP 140 - 12500 ●	0 - 12500 V	0 - 10 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	7 kg
HCP 350 - 12500 ●	0 - 12500 V	0 - 25 mA	19" / 443 mm	3 HE / 133 mm	450 mm	11 kg
HCP 700 - 12500 ●	0 - 12500 V	0 - 50 mA	19" / 443 mm	3 HE / 133 mm	550 mm	16 kg
HCP 1400 - 12500 ●	0 - 12500 V	0 - 100 mA	19" / 443 mm	3 HE / 133 mm	650 mm	21 kg
HCP 2800 - 12500 3)	0 - 12500 V	0 - 200 mA	19" / 443 mm	6 HE / 266 mm	550 mm	35 kg
HCP 5000 - 12500 3)	0 - 12500 V	0 - 400 mA	19" / 443 mm	6 HE / 266 mm	650 mm	40 kg
HCP 10000 - 12500 3)	0 - 12500 V	0 - 800 mA	19" / 443 mm	9 HE / 399 mm	650 mm	75 kg
HCP 15000 - 12500 3)	0 - 12500 V	0 - 1,2 A	19" / 443 mm	12 HE / 535 mm	650 mm	110 kg
HCP 14 - 20000 ●	0 - 20000 V	0 - 0,6 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	4 kg
HCP 35 - 20000 ●	0 - 20000 V	0 - 1,5 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	5 kg
HCP 140 - 20000 ●	0 - 20000 V	0 - 6 mA	½19" / 222 mm	3 HE / 133 mm	350 mm	7 kg
HCP 350 - 20000 ●	0 - 20000 V	0 - 15 mA	19" / 443 mm	3 HE / 133 mm	450 mm	11 kg
HCP 700 - 20000 ●	0 - 20000 V	0 - 30 mA	19" / 443 mm	3 HE / 133 mm	550 mm	16 kg
HCP 1400 - 20000 ●	0 - 20000 V	0 - 60 mA	19" / 443 mm	3 HE / 133 mm	650 mm	21 kg
HCP 2800 - 20000 3)	0 - 20000 V	0 - 120 mA	19" / 443 mm	6 HE / 266 mm	650 mm	35 kg
HCP 4200 - 20000 3)	0 - 20000 V	0 - 200 mA	19" / 443 mm	6 HE / 266 mm	650 mm	45 kg
HCP 35 - 35000 ●	0 - 35000 V	0 - 1 mA	19" / 443 mm	3 HE / 133 mm	450 mm	10 kg
HCP 140 - 35000 ●	0 - 35000 V	0 - 4 mA	19" / 443 mm	3 HE / 133 mm	450 mm	12 kg
HCP 350 - 35000 ●	0 - 35000 V	0 - 10 mA	19" / 443 mm	3 HE / 133 mm	450 mm	17 kg
HCP 700 - 35000 ●	0 - 35000 V	0 - 20 mA	19" / 443 mm	3 HE / 133 mm	550 mm	20 kg
HCP 1400 - 35000 ●	0 - 35000 V	0 - 40 mA	19" / 443 mm	3 HE / 133 mm	650 mm	25 kg

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HCP 2800 - 35000 3)	0 - 35000 V	0 - 80 mA	19" / 443 mm	6 HE / 266 mm	650 mm	45 kg
HCP 4200 - 35000 3)	0 - 35000 V	0 - 120 mA	19" / 443 mm	7 HE / 310 mm	650 mm	50 kg
HCP 35 - 65000	0 - 65000 V	0 - 0,5 mA	19" / 443 mm	3 HE / 133 mm*	450 mm**	17 kg
HCP 140 - 65000	0 - 65000 V	0 - 2 mA	19" / 443 mm	3 HE / 133 mm*	450 mm**	21 kg
HCP 350 - 65000	0 - 65000 V	0 - 5 mA	19" / 443 mm	6 HE / 266 mm	450 mm**	45 kg
HCP 700 - 65000	0 - 65000 V	0 - 10 mA	19" / 443 mm	8 HE / 355 mm*	550 mm**	55 kg
HCP 1400 - 65000	0 - 65000 V	0 - 20 mA	19" / 443 mm	8 HE / 355 mm*	650 mm	70 kg
HCP 2800 - 65000 3)	0 - 65000 V	0 - 40 mA	19" / 443 mm	8 HE / 355 mm*	650 mm	80 kg
HCP 140 - 100000	0 - 100000 V	0 - 1 mA	19" / 443 mm	5 HE / 221 mm	550 mm	50 kg
HCP 350 - 100000	0 - 100000 V	0 - 3 mA	19" / 443 mm	5 HE / 221 mm	550 mm	55 kg
HCP 700 - 100000	0 - 100000 V	0 - 6 mA	19" / 443 mm	8 HE / 355 mm	550 mm	73 kg
HCP 1400 - 100000	0 - 100000 V	0 - 12 mA	19" / 443 mm	9 HE / 399 mm	550 mm	90 kg
HCP 140 - 150000	0 - 150000 V	0 - 0,5 mA	19" / 443 mm	10 HE / 433 mm	750 mm	110 kg
HCP 350 - 150000	0 - 150000 V	0 - 2 mA	19" / 443 mm	10 HE / 433 mm	750 mm	130 kg
HCP 700 - 150000	0 - 150000 V	0 - 4 mA	19" / 443 mm	10 HE / 433 mm	750 mm	140 kg
HCP 1400 - 150000	0 - 150000 V	0 - 8 mA	19" / 443 mm	12 HE / 535 mm	750 mm	160 kg
HCP 140 - 200000	0 - 200000 V	0 - 0,4 mA	19" / 443 mm	12 HE / 535 mm	750 mm	160 kg
HCP 350 - 200000	0 - 200000 V	0 - 1,5 mA	19" / 600 mm	29 HE / 1500 mm	600 mm	180 kg
HCP 700 - 200000	0 - 200000 V	0 - 3 mA	19" / 600 mm	38 HE / 2000 mm	800 mm	200 kg
HCP 1400 - 200000	0 - 200000 V	0 - 6 mA	19" / 600 mm	38 HE / 2000 mm	800 mm	220 kg
HCP 140 - 300000	0 - 300000 V	0 - 0,3 mA	19" / 600 mm	29 HE / 1500 mm	750 mm	180 kg
HCP 350 - 300000	0 - 300000 V	0 - 1 mA	19" / 600 mm	38 HE / 1500 mm	600 mm	200 kg
HCP 700 - 300000	0 - 300000 V	0 - 2 mA	19" / 600 mm	38 HE / 2000 mm	800 mm	220 kg
HCP 1400 - 300000	0 - 300000 V	0 - 4 mA	19" / 600 mm	38 HE / 2000 mm	800 mm	250 kg

3) Three phase mains connection

*) With polarity reversal switch these units will be 2 HU higher.

**) With polarity reversal switch these units will be 100mm deeper.

***) The dimensions are valid for the power part. The high voltage part is housed in a separate oil filled container. Weight stated: Power part / High voltage container

All specifications are subject to change without further notice.

Please feel free to contact our sales team for any further questions:

Mail: sales@fug-elektronik.de

Phone: +49 8039 400 77 0