

# High voltage power supplies

## Series HCP from 3,5 kV to 150 kV / 14 W to 15000W



### Design example

**HCP 140 - 12500**  
12500V / 10mA

### Features:

- Compact size and light weight
- Efficiency approx. 90%
- For units from 12.5kV nominal voltage on, all HV components are moulded in (removable) silicon
- Short-circuit & flashover proof
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with rated power
- Voltage and current regulation with automatic sharp transition, indicated by LEDs
- Adjustable overvoltage protection (limitation of set value)
- 4½ digit DVM's for voltage and current for all models
- Voltage and current setting by means of 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Indication of set point values by means of button for switch-over of the displays
- Set point adjustment possible with locked output, release of output voltage by means of "ON" / "OFF" switch
- Suitable also for inductive and capacitive loads
- Suitable for photomultipliers

### Function:

In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.

A low residual ripple of the output voltage, together with a high stability, high regulation speed and a low stored energy are all achieved by virtue of the high switching frequency.

### Design:

- ½19" or 19" table-top case (depending on output voltage and power).
- 19" Rack-adapters for mounting into a 19" rack are available as accessory.

### Output:

Output isolation:  
The required output polarity must be stated with the order. The requested output polarity will then be available at the HV connector and the "0V" terminal will be firmly connected to earth.

If required, the "0V" terminal can be made floating against earth up to ± 300V. A polarity reversal switch is optionally available.

### Output terminals:

All output terminals are located at the rear side of the unit. High voltage connectors with the appropriate dielectric strength are delivered with the power supply.

For nominal voltage of 65kV and higher the HV- plug will be delivered ready mounted to 3m cable.

### Technical Data:

- Mains connection:
  - up to 1400W nominal power: 230V ±10% 47Hz to 63Hz
  - for 2800W and higher: 400V ±10% 47Hz to 63Hz, three-phase
- Ambient temperature: 0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated): (For explanations please refer to Definitions and Terms on page 61.)

- Setting range: from approx. 0,1% to 100%
- Setting resolution:  $\pm 1 \times 10^{-4}$
- Residual ripple:  $< 1 \times 10^{-4}$ pp + 50mVpp, typ.  $5 \times 10^{-5}$ pp
- Recovery time:
  - Voltage control: <1ms for load changes from 10% to 100% or from 100% to 10%
  - Current control: <10ms for load changes causing an output change of less than 10% of the rated voltage
- Setting time at nominal load: <500ms for changes of the output voltage from 10% to 90% or 90% to 10%
- Discharging time constant for output without load: approx. 2sec. to 10sec., depending on type

### Deviation:

- for ±10% mains voltage variation:  $< \pm 1 \times 10^{-5}$
- for no load / full load:  $< 2 \times 10^{-4}$
- over 8 h under constant conditions:  $< \pm 1 \times 10^{-4}$
- within the temperature range:  $< \pm 1,5 \times 10^{-4} / K$

### Possible Options:

- Coarse/fine-potentiometers (99% / 1%) for more accurate adjustment of voltage and / or current
- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 54)
- electronically controlled polarity reversal switch (Up to 35kV remotely controllable when ordered with a programming or interface, please ask us for higher voltages.) Please specify the output polarity, when ordering without polarity reversal switch. (see page 56)
- Lower ripple (see page 56)
- Higher stability (see page 56)
- Lower stored energy (see page 56)
- Power limitation (see page 56)

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 supplies

## Series HCP from 3,5 kV to 150 kV / 14 W to 45000W



Type	Voltage	Current	Width	Height	Depth	Weight
HCP 14 - 3500	● 0 - 3500 V	0 - 4 mA	½19" / 222 mm	3 U / 133 mm	350 mm	3 kg
HCP 35 - 3500	● 0 - 3500 V	0 - 10 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP 140 - 3500	● 0 - 3500 V	0 - 40 mA	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
HCP 350 - 3500	● 0 - 3500 V	0 - 100 mA	½19" / 222 mm	3 U / 133 mm	450 mm	7 kg
HCP 700 - 3500	● 0 - 3500 V	0 - 200 mA	19" / 443 mm	3 U / 133 mm	350 mm	11 kg
HCP 1400 - 3500	0 - 3500 V	0 - 400 mA	19" / 443 mm	3 U / 133 mm	450 mm	13 kg
HCP 2800 - 3500 3)	0 - 3500 V	0 - 800 mA	19" / 443 mm	3 U / 133 mm	550 mm	25 kg
HCP 5000 - 3500 3)	0 - 3500 V	0 - 1,5 A	19" / 443 mm	6 U / 266 mm	650 mm	40 kg
HCP 10000 - 3500 3)	0 - 3500 V	0 - 3 A	19" / 443 mm	9 U / 399 mm	650 mm	75 kg
HCP 15000 - 3500 3)	0 - 3500 V	0 - 4,5 A	19" / 443 mm	12 U / 535 mm	650 mm	110 kg
HCP 14 - 6500	● 0 - 6500 V	0 - 2 mA	½19" / 222 mm	3 U / 133 mm	350 mm	3 kg
HCP 35 - 6500	● 0 - 6500 V	0 - 5 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP 140 - 6500	● 0 - 6500 V	0 - 20 mA	½19" / 222 mm	3 U / 133 mm	350 mm	6 kg
HCP 350 - 6500	● 0 - 6500 V	0 - 50 mA	½19" / 222 mm	3 U / 133 mm	450 mm	7 kg
HCP 700 - 6500	● 0 - 6500 V	0 - 100 mA	19" / 443 mm	3 U / 133 mm	350 mm	11 kg
HCP 1400 - 6500	0 - 6500 V	0 - 200 mA	19" / 443 mm	3 U / 133 mm	450 mm	13 kg
HCP 2800 - 6500 3)	0 - 6500 V	0 - 400 mA	19" / 443 mm	3 U / 133 mm	650 mm	25 kg
HCP 5000 - 6500 3)	0 - 6500 V	0 - 750 mA	19" / 443 mm	6 U / 266 mm	650 mm	40 kg
HCP 10000 - 6500 3)	0 - 6500 V	0 - 1,5 A	19" / 443 mm	9 U / 399 mm	650 mm	75 kg
HCP 15000 - 6500 3)	0 - 6500 V	0 - 2,3 A	19" / 443 mm	12 U / 535 mm	650 mm	110 kg
HCP 14 - 12500	● 0 - 12500 V	0 - 1 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP 35 - 12500	● 0 - 12500 V	0 - 2,5 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
HCP 140 - 12500	● 0 - 12500 V	0 - 10 mA	½19" / 222 mm	3 U / 133 mm	350 mm	7 kg
HCP 350 - 12500	● 0 - 12500 V	0 - 25 mA	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCP 700 - 12500	● 0 - 12500 V	0 - 50 mA	19" / 443 mm	3 U / 133 mm	550 mm	16 kg
HCP 1400 - 12500	0 - 12500 V	0 - 100 mA	19" / 443 mm	3 U / 133 mm	650 mm	21 kg
HCP 2800 - 12500 3)	0 - 12500 V	0 - 200 mA	19" / 443 mm	5 U / 221 mm	650 mm	35 kg
HCP 5000 - 12500 3)	0 - 12500 V	0 - 400 mA	19" / 443 mm	6 U / 266 mm	650 mm	40 kg
HCP 10000 - 12500 3)	0 - 12500 V	0 - 800 mA	19" / 443 mm	9 U / 399 mm	650 mm	75 kg
HCP 15000 - 12500 3)	0 - 12500 V	0 - 1,2 A	19" / 443 mm	12 U / 535 mm	650 mm	110 kg
HCP 14 - 20000	● 0 - 20000 V	0 - 0,6 mA	½19" / 222 mm	3 U / 133 mm	350 mm	4 kg
HCP 35 - 20000	● 0 - 20000 V	0 - 1,5 mA	½19" / 222 mm	3 U / 133 mm	350 mm	5 kg
HCP 140 - 20000	● 0 - 20000 V	0 - 6 mA	½19" / 222 mm	3 U / 133 mm	350 mm	7 kg
HCP 350 - 20000	● 0 - 20000 V	0 - 15 mA	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCP 700 - 20000	● 0 - 20000 V	0 - 30 mA	19" / 443 mm	3 U / 133 mm	550 mm	16 kg
HCP 1400 - 20000	0 - 20000 V	0 - 60 mA	19" / 443 mm	3 U / 133 mm	650 mm	21 kg
HCP 2800 - 20000 3)	0 - 20000 V	0 - 120 mA	19" / 443 mm	5 U / 221 mm	650 mm	35 kg
HCP 4200 - 20000 3)	0 - 20000 V	0 - 200 mA	19" / 443 mm	6 U / 266 mm	650 mm	45 kg

All units up to 35kV optionally available with electronically controlled polarity reversal switch.

3) Three phase mains connection

# High voltage power supplies

## Series HCP from 3,5 kV to 150 kV / 14 W to 45000W



Type	Voltage	Current	Width	Height	Depth	Weight
HCP 35 - 35000 ●	0 - 35000 V	0 - 1 mA	19" / 443 mm	3 U / 133 mm	450 mm	10 kg
HCP 140 - 35000 ●	0 - 35000 V	0 - 4 mA	19" / 443 mm	3 U / 133 mm	450 mm	11 kg
HCP 350 - 35000 ●	0 - 35000 V	0 - 10 mA	19" / 443 mm	3 U / 133 mm	450 mm	12 kg
HCP 700 - 35000	0 - 35000 V	0 - 20 mA	19" / 443 mm	3 U / 133 mm	550 mm	17 kg
HCP 1400 - 35000	0 - 35000 V	0 - 40 mA	19" / 443 mm	3 U / 133 mm	650 mm	25 kg
HCP 2800 - 35000 3)	0 - 35000 V	0 - 80 mA	19" / 443 mm	5 U / 221 mm	650 mm	45 kg
HCP 4200 - 35000 3)	0 - 35000 V	0 - 120 mA	19" / 443 mm	7 U / 310 mm	650 mm	50 kg
HCP 35 - 65000	0 - 65000 V	0 - 0,5 mA	19" / 443 mm	3 U / 133 mm*	450 mm**	17 kg
HCP 140 - 65000	0 - 65000 V	0 - 2 mA	19" / 443 mm	3 U / 133 mm*	450 mm**	21 kg
HCP 350 - 65000	0 - 65000 V	0 - 5 mA	19" / 443 mm	6 U / 266 mm*	450 mm**	45 kg
HCP 700 - 65000	0 - 65000 V	0 - 10 mA	19" / 443 mm	8 U / 355 mm	550 mm	55 kg
HCP 1400 - 65000	0 - 65000 V	0 - 20 mA	19" / 443 mm	8 U / 355 mm*	550 mm**	65 kg
HCP 2800 - 65000 3)	0 - 65000 V	0 - 40 mA	19" / 443 mm	8 U / 355 mm*	550 mm**	70 kg
HCP 140 - 100000	0 - 100000 V	0 - 1 mA	19" / 443 mm	5 U / 221 mm	550 mm	50 kg
HCP 350 - 100000	0 - 100000 V	0 - 3 mA	19" / 443 mm	5 U / 221 mm	550 mm	55 kg
HCP 700 - 100000	0 - 100000 V	0 - 6 mA	19" / 443 mm	8 U / 355 mm	550 mm	73 kg
HCP 1400 - 100000	0 - 100000 V	0 - 12 mA	19" / 443 mm	9 U / 399 mm	550 mm	90 kg
HCP 140 - 150000	0 - 150000 V	0 - 0,5 mA	19" / 443 mm	8 U / 355 mm	750 mm	110 kg
HCP 350 - 150000	0 - 150000 V	0 - 2 mA	19" / 443 mm	8 U / 355 mm	750 mm	130 kg
HCP 700 - 150000	0 - 150000 V	0 - 4 mA	19" / 443 mm	8 U / 355 mm	750 mm	140 kg

3) Three phase mains

● short term delivery

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

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

Mating high voltage connectors (from 65kV on complete with 3m cable) are included in the scope of delivery.

Other mating high voltage cables you'll find beginning with page 59.

All units up to 35kV optionally available with electronically controlled polarity reversal switch and for 65 kV with manually operated polarity reversal switch.

For orders without polarity switch please state the required output polarity.

# High voltage power supplies, high power Series HCH from 650 V to 200 kV / to 50 kW



## Features:

- Efficiency up to 90%
- Short-circuit & flashover proof
- In units up to 20kV nominal voltage the HV-components are isolated in air. From 35kV on the isolation is with oil.
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with rated power
- Voltage and current regulation with automatic sharp transition, indicated by LEDs
- Limitation of inrush current on switching on
- Voltage and current setting by means of 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Interlock loop to monitor the external load and internal loop as a standard

## Function:

In principle, the rectified line voltage drives a square wave generator of fixed frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For regulation, the square wave voltage is pulse width modulated.

## Design:

Depending on Voltage and Power the units are built as single or double 19" cabinets, or as a oil- filled HV container with the power electronics on the top or in a separate rack.

## Design example

**HCH 50000 - 20000**  
20kV / 2,5 A

## Output:

**Output isolation:**  
The required output polarity must be stated with the order. The requested output polarity will then be available at the HV connector and the "0V" terminal will be firmly connected to earth. If required, the "0V" terminal can be made floating against earth up to  $\pm 50V$ . A polarity reversal switch is optionally available.

**Output terminals:**  
All output terminals are located at the rear side of the cabinet or at the top of the HV container. High voltage connectors with the appropriate dielectric strength are delivered with the power supply. For nominal voltage of 65kV and higher the HV-plug will be delivered ready mounted to 10m cable.

## Technical Data:

**Mains connection:**  
up to 1400W nominal power:  
230V  $\pm 10\%$  47Hz to 63Hz  
for 2800W and higher:  
400V  $\pm 10\%$  47Hz to 63Hz,  
three-phase  
**Ambient temperature:**  
0°C to +40°C

The following data applies for voltage and current regulation, and refers to the rated value (unless otherwise stated):  
(For explanations please refer to Definitions and Terms on page 61.)

**Setting range:**  
from approx. 0,1% to 100%

**Setting resolution:**  
 $\pm 1 \times 10^{-4}$

**Residual ripple:**  
 $< 2 \times 10^{-3} \text{pp} + 50 \text{mVpp}$

**Recovery time:**

**Voltage control:**  
 $< 1 \text{ms}$  for load changes from 10% to 100% or from 100% to 10%

**Current control:**  
 $< 10 \text{ms}$  for load changes causing an output change of less than 10% of the rated voltage

**Setting time at nominal load:**  
 $< 100 \text{ms}$  for changes of the output voltage from 10% to 90% or 90% to 10%

**Discharging time constant for output without load:**  
approx. 1sec. to 10sec., depending on type

**Deviation:**  
for  $\pm 10\%$  mains voltage variation:  
 $< \pm 1 \times 10^{-4}$   
for no load / full load:  
 $< 5 \times 10^{-4}$   
over 8 h under constant conditions:  
 $< \pm 2 \times 10^{-4}$   
within the temperature range:  
 $< \pm 1,5 \times 10^{-4} / K$

## Possible Options:

- Analogue programming (see page 52)
- Analogue programming, floating (see page 52)
- Computer interface - IEEE 488, RS 232, RS 422, Profibus DP (more on request) (see page 52)
- Polarity reversal switch. Please specify the output polarity, when ordering without polarity reversal switch. (see page 56)
- Lower ripple (see page 56)
- Higher stability (see page 56)
- Shorter setting time (see page 56)
- Roller blades for cabinet units

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