

# High voltage power supplies



## Design examples

**HCL 35-20000**  
20000 V / 1,5 mA

**HCL 35-35000**  
35000 V / 1 mA

## Function

The rectified line voltage maintains a square wave generator of constant frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For the regulation the square wave voltage is pulse width modulated.

## Features

- Light-weight
- Efficiency appr. 90%
- In units from 12,5 kV on, the HV-components are moulded in (removable) silicon resin.

- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with nominal power
- Voltage and current regulation with automatic, sharp transition
- Control mode indicated by LED
- Voltage and current setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- 4½ digits DVM for voltage and current
- Suitable for capacitive loads

## Design

- Depending on voltage and nominal power ½19" or 19" table-top case
- 19" rackadapters are available as accessories

## Outputs

- At all units are the outputs on the rear.
- Mating HV-connectors are included.

## Technical Data

- Mains connection: 230 V  $\pm$ 10% 47 Hz to 63 Hz
- Ambient temperature: 0°C to +40°C

- Output polarity: Positive or negative, the polarity has to be indicated with the order
- Output isolation: The "0V" terminal is connected to earth, but may be disconnected on need. The "0V" terminal than is earthy and may float with respect to earth up to  $\pm$ 300 V.

**Further high-voltage power supplies see page 38**

# High voltage power supplies

## Series HCL from 3500 V to 35000 V / 14 W to 350 W

All further data apply for voltage and current regulation and refer to the rated value, if not otherwise stated.

- Setting range:  
from appr. 0,1% to 100%
- Setting resolution:  
 $\pm 1 \times 10^{-4}$
- Reproducibility:  
 $1 \times 10^{-3}$
- Residual ripple:  
 $< 1 \times 10^{-4}$ pp  
typ.  $5 \times 10^{-5}$ pp
- Deviation:  
for  $\pm 10\%$  mains voltage  
variation:  $< \pm 1 \times 10^{-5}$   
  
for no load / full load:  $< \pm 2 \times 10^{-4}$   
  
over 8 hours under constant  
conditions:  $< \pm 1 \times 10^{-4}$   
  
within the temperature range:  
 $< \pm 1,5 \times 10^{-4} / K$
- Recovery time:  
  
Voltage control:  
 $< 1$  ms for load changes from  
10% to 100%  
or from 100% to 10%.

### Current control:

- $< 10$  ms for load changes  
causing an output change of  
less than 10% of the rated  
voltage
- Setting time at nominal load:  
 $< 100$  ms to 500 ms, depending  
on type, for output voltage  
changes from 10% to 90% or  
90% to 10%.
- Discharging time constant for  
output without load:  
appr. 1 to 10 sec.  
(depending on type).

### Options

- Analog programming
- Analog programming, floating
- Computer interface  
IEEE 488 and RS 232
- Polarity reversal switch, in  
combination with the analog  
programming or computer  
interface remote controlled
- Lower ripple
- Higher stability

Type	Voltage	Current	Width	Height	Depth	Weight
HCL 14 - 3500	0 - 3500 V	0 - 4 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4 kg
HCL 35 - 3500	0 - 3500 V	0 - 10 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4 kg
HCL 140 - 3500	0 - 3500 V	0 - 40 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4 kg
HCL 350 - 3500	0 - 3500 V	0 - 100 mA	19" / 443 mm	2 HU / 89 mm	450 mm	7 kg
HCL 14 - 6500	0 - 6500 V	0 - 2 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4 kg
HCL 35 - 6500	0 - 6500 V	0 - 5 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4 kg
HCL 140 - 6500	0 - 6500 V	0 - 20 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4 kg
HCL 350 - 6500	0 - 6500 V	0 - 50 mA	19" / 443 mm	2 HU / 89 mm	450 mm	7 kg
HCL 14 - 12500	0 - 12500 V	0 - 1 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4,3 kg
HCL 35 - 12500	0 - 12500 V	0 - 2,5 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4,3 kg
HCL 140 - 12500	0 - 12500 V	0 - 10 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4,3 kg
HCL 350 - 12500	0 - 12500 V	0 - 25 mA	19" / 443 mm	2 HU / 89 mm	450 mm	7,5 kg
HCL 14 - 20000	0 - 20000 V	0 - 0,6 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4,3 kg
HCL 35 - 20000	0 - 20000 V	0 - 1,5 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4,3 kg
HCL 140 - 20000	0 - 20000 V	0 - 6 mA	½19" / 222 mm	2 HU / 89 mm	450 mm	4,3 kg
HCL 350 - 20000	0 - 20000 V	0 - 15 mA	19" / 443 mm	2 HU / 89 mm	450 mm	7,5 kg
HCL 35 - 35000	0 - 35000 V	0 - 1 mA	19" / 443 mm	2 HU / 89 mm	450 mm	7,7 kg
HCL 140 - 35000	0 - 35000 V	0 - 4 mA	19" / 443 mm	2 HU / 89 mm	450 mm	7,7 kg
HCL 350 - 35000	0 - 35000 V	0 - 10 mA	19" / 443 mm	2 HU / 89 mm	450 mm	7,7 kg

Mating HV-connectors are included

For orders without polarity reversal switch, please indicate the output polarity with the order.

For 3,5 kV and 6,5 kV type SHV, recommended cable RG 58, see page 57

For 12,5 kV and 20 kV type HS 21, recommended cable 130 660, "

For 35 kV type F3430, recommended cable RG 11, "

# High voltage power supplies

## Design examples



**HCN 14 - 12500**  
12500 V / 1 mA



**HCN 140 - 6500**  
6500 V / 20 mA



**HCN 700 - 20000**  
20000 V / 30 mA

# High voltage power supplies

## Series HCN from 3500 V to 150 kV / 14 W to 4200 W

### Function

The rectified line voltage maintains a square wave generator of constant frequency, whose AC voltage is transformed, rectified and filtered, producing the output voltage. For the regulation the square wave voltage is pulse width modulated.

### Features

- Compact size
- Efficiency appr. 90%
- In units from 6,5 kV ; 12,5 kV or 20 kV on (depending on power) the HV-components are moulded in (removable) silicon resin.
- Unlimited operation with rated current in a short-circuit condition
- Unlimited operation with nominal power
- Voltage and current regulation with automatic, sharp transition
- Control mode indicated by LED
- Voltage and current setting with 10-turn potentiometers with precision scale; the adjusting knob can be locked
- 3½ digit DVM for voltage and current (at ½19" switch-selected)
- Standard starting current limitation for units from 700 W nominal power on
- Suitable for capacitive loads

### Design

- Up to 35 W, 20 kV nominal power - ½19" table-top case, from 140 W nominal power on, 19" table-top case.
- 19" rack-adapters see page 56

### Outputs

- For units up to 35 kV nominal voltage, the output is located on the front panel, from 65 kV nominal voltage on the rear
- Mating HV-connectors are included. From 65 kV on, delivery complete with 3 m cable

### Technical Data

- Mains connection: up to 1400 W nominal power 230 V  $\pm 10\%$  47 Hz to 63 Hz; from 2800 W nominal power on 400 V  $\pm 10\%$  47 Hz to 63 Hz three-phase
- Ambient temperature: 0°C to +40°C
- Output polarity: positive or negative, the polarity has to be indicated with the order  
  
As an option units up to 65 kV are available with polarity reversal switch
- Output isolation: The "0V" terminal is connected to earth, but may be disconnected on need. The "0V" terminal than is earthy and may float with respect to earth up to  $\pm 300$  V.

All further data apply for voltage and current regulation and refer to the rated value, if not otherwise stated.

- Setting range: from appr. 0,1% to 100%
- Setting resolution:  $\pm 1 \times 10^{-4}$
- Reproducibility:  $\pm 1 \times 10^{-3}$
- Residual ripple:  $< 1 \times 10^{-4}$ pp typ.  $5 \times 10^{-5}$ pp
- Deviation: for  $\pm 10\%$  mains voltage variation:  $< \pm 1 \times 10^{-5}$   
  
for no load / full load:  $< \pm 2 \times 10^{-4}$   
  
over 8 hours under constant conditions:  $< \pm 1 \times 10^{-4}$   
  
within the temperature range:  $< \pm 1,5 \times 10^{-4} / K$
- Recovery time:  
  
Voltage control:  
 $< 1$  ms for load changes from 10% to 100% or from 100% to 10%.

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

- Setting time at nominal load:  $< 100$  ms to 500 ms, depending on type, for output voltage changes from 10% to 90% or 90% to 10%.
- Discharging time constant for output without load: appr. 1 to 10 sec. (depending on type).

### Options

- Analog programming
- Analog programming, floating
- Computer interface IEEE 488 and RS 232
- DVM with higher resolution
- Polarity reversal switch, up to 65 kV.
- Lower ripple
- Higher stability

For more information on our options please see pages 60 and 61. Also, some options may contain changes of the description of the unit.

Types see next pages

We also supply units with higher voltages up to 200 kV with polarity reversal !

High voltage power supplies with higher power and higher voltage ratings please see from page 42 on, series HCH.

# High voltage power supplies

## Series HCN from 3,5 kV to 20 kV / 14 W to 4200 W

Type	Voltage	Current	Width	Height	Depth	Weight
HCN 14 - 3500	0 - 3500 V	0 - 4 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	3 kg
HCN 35 - 3500	0 - 3500 V	0 - 10 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	4 kg
HCN 140 - 3500	0 - 3500 V	0 - 40 mA	19" / 443 mm	3 HU / 133 mm	350 mm	6 kg
HCN 350 - 3500	0 - 3500 V	0 - 100 mA	19" / 443 mm	3 HU / 133 mm	350 mm	7 kg
HCN 700 - 3500	0 - 3500 V	0 - 200 mA	19" / 443 mm	3 HU / 133 mm	550 mm	11 kg
HCN 1400 - 3500	0 - 3500 V	0 - 400 mA	19" / 443 mm	4 HU / 177 mm	550 mm	21 kg
HCN 2800 - 3500 3)	0 - 3500 V	0 - 800 mA	19" / 443 mm	8 HU / 355 mm	550 mm	35 kg
HCN 4200 - 3500 3)	0 - 3500 V	0 - 1,2 A	19" / 443 mm	8 HU / 355 mm	650 mm	50 kg
HCN 14 - 6500	0 - 6500 V	0 - 2 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	4 kg
HCN 35 - 6500	0 - 6500 V	0 - 5 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	5 kg
HCN 140 - 6500	0 - 6500 V	0 - 20 mA	19" / 443 mm	3 HU / 133 mm	350 mm	6 kg
HCN 350 - 6500	0 - 6500 V	0 - 50 mA	19" / 443 mm	3 HU / 133 mm	350 mm	7 kg
HCN 700 - 6500	0 - 6500 V	0 - 100 mA	19" / 443 mm	3 HU / 133 mm	550 mm	11 kg
HCN 1400 - 6500	0 - 6500 V	0 - 200 mA	19" / 443 mm	4 HU / 177 mm	550 mm	21 kg
HCN 2800 - 6500 3)	0 - 6500 V	0 - 400 mA	19" / 443 mm	8 HU / 355 mm	550 mm	35 kg
HCN 4200 - 6500 3)	0 - 6500 V	0 - 600 mA	19" / 443 mm	8 HU / 355 mm	650 mm	50 kg
HCN 14 - 12500	0 - 12500 V	0 - 1 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	4 kg
HCN 35 - 12500	0 - 12500 V	0 - 2,5 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	5 kg
HCN 140 - 12500	0 - 12500 V	0 - 10 mA	19" / 443 mm	3 HU / 133 mm	350 mm	12 kg
HCN 350 - 12500	0 - 12500 V	0 - 25 mA	19" / 443 mm	3 HU / 133 mm	350 mm	14 kg
HCN 700 - 12500	0 - 12500 V	0 - 50 mA	19" / 443 mm	3 HU / 133 mm	550 mm	16 kg
HCN 1400 - 12500	0 - 12500 V	0 - 100 mA	19" / 443 mm	4 HU / 177 mm	550 mm	23 kg
HCN 2800 - 12500 3)	0 - 12500 V	0 - 200 mA	19" / 443 mm	8 HU / 355 mm	550 mm	35 kg
HCN 4200 - 12500 3)	0 - 12500 V	0 - 300 mA	19" / 443 mm	9 HU / 399 mm	650 mm	50 kg
HCN 14 - 20000	0 - 20000 V	0 - 0,6 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	4 kg
HCN 35 - 20000	0 - 20000 V	0 - 1,5 mA	½19" / 222 mm	3 HU / 133 mm	350 mm	5 kg
HCN 140 - 20000	0 - 20000 V	0 - 6 mA	19" / 443 mm	3 HU / 133 mm	350 mm	13 kg
HCN 350 - 20000	0 - 20000 V	0 - 15 mA	19" / 443 mm	3 HU / 133 mm	350 mm	14 kg
HCN 700 - 20000	0 - 20000 V	0 - 30 mA	19" / 443 mm	3 HU / 133 mm	550 mm	19 kg
HCN 1400 - 20000	0 - 20000 V	0 - 60 mA	19" / 443 mm	4 HU / 177 mm	550 mm	25 kg
HCN 2800 - 20000 3)	0 - 20000 V	0 - 120 mA	19" / 443 mm	8 HU / 355 mm	550 mm	50 kg
HCN 4200 - 20000 3)	0 - 20000 V	0 - 200 mA	19" / 443 mm	9 HU / 399 mm	650 mm	60 kg

3) Mains connection three-phase

Other power or voltage ratings are available on request

# High voltage power supplies

## Series HCN from 35 kV to 150 kV / 35 W to 4200 W

Type	Voltage	Current	Width	Height	Depth	Weight
HCN 35 - 35000	0 - 35000 V	0 - 1 mA	19" / 443 mm	3 HU / 133 mm	350 mm	15 kg
HCN 140 - 35000	0 - 35000 V	0 - 4 mA	19" / 443 mm	3 HU / 133 mm	450 mm	17 kg
HCN 350 - 35000	0 - 35000 V	0 - 10 mA	19" / 443 mm	4 HU / 177 mm	450 mm	22 kg
HCN 700 - 35000	0 - 35000 V	0 - 20 mA	19" / 443 mm	6 HU / 266 mm	450 mm	30 kg
HCN 1400 - 35000	0 - 35000 V	0 - 40 mA	19" / 443 mm	7 HU / 310 mm	550 mm	45 kg
HCN 2800 - 35000 3)	0 - 35000 V	0 - 80 mA	19" / 443 mm	9 HU / 399 mm	650 mm	60 kg
HCN 4200 - 35000 3)	0 - 35000 V	0 - 120 mA	19" / 443 mm	11 HU / 487 mm	650 mm	90 kg
HCN 35 - 65000	0 - 65000 V	0 - 0,5 mA	19" / 443 mm	*3 HU / 221 mm	**350 mm	17 kg
HCN 140 - 65000	0 - 65000 V	0 - 2 mA	19" / 443 mm	*5 HU / 221 mm	**450 mm	50 kg
HCN 350 - 65000	0 - 65000 V	0 - 5 mA	19" / 443 mm	*5 HU / 221 mm	**450 mm	55 kg
HCN 700 - 65000	0 - 65000 V	0 - 10 mA	19" / 443 mm	*8 HU / 355 mm	550 mm	65 kg
HCN 1400 - 65000	0 - 65000 V	0 - 20 mA	19" / 443 mm	*9 HU / 399 mm	550 mm	70 kg
HCN 2800 - 65000 3)	0 - 65000 V	0 - 40 mA	19" / 443 mm	*9 HU / 399 mm	650 mm	80 kg
HCN 140 - 100000	0 - 100000 V	0 - 1 mA	19" / 443 mm	5 HU / 221 mm	550 mm	60 kg
HCN 350 - 100000	0 - 100000 V	0 - 3 mA	19" / 443 mm	8 HU / 355 mm	550 mm	68 kg
HCN 700 - 100000	0 - 100000 V	0 - 6 mA	19" / 443 mm	8 HU / 355 mm	550 mm	73 kg
HCN 1400 - 100000	0 - 100000 V	0 - 12 mA	19" / 443 mm	11 HU / 487 mm	750 mm	90 kg
HCN 140 - 150000	0 - 150000 V	0 - 0,5 mA	19" / 443 mm	10 HU / 444 mm	750 mm	110 kg
HCN 350 - 150000	0 - 150000 V	0 - 2 mA	19" / 443 mm	10 HU / 444 mm	750 mm	130 kg
HCN 700 - 150000	0 - 150000 V	0 - 4 mA	19" / 443 mm	10 HU / 444 mm	750 mm	140 kg

3) Mains connection three-phase

All units up to 65 kV are available with polarity reversal switch. For units without polarity reversal switch, please indicate the output polarity.

\*) With the option polarity reversal switch these units are 2 HU / 90 mm higher.

\*\*) With the option polarity reversal switch these units are 550 mm deep.

For units with higher voltage and higher power see series HCH page 43.