

# Capacitor charging power supplies

## Series HCK from 2 kV to 65 kV / 100 J/s to 20 kJ/s



**Design example**

**HCK 200 - 12500**  
12500V / 30mA

### Features:

- Efficiency approx. 90%
- In units of 20kV and higher, the HV-components are moulded in (removable) silicon resin. From 35kV / 5000J/s on, the HV-components are isolated in oil
- Continuous charging or triggered charging via potential free external trigger input selectable (opto-coupler input for 12 - 24V).
- Charging with adjustable constant current without overshoot.
- Voltage and current setting by 10-turn potentiometers with precision scale; the adjusting knob can be locked
- Suitable for continuous or compensation charging
- No external protection resistor is required
- Permanent short-circuit proof
- 4½ digit DVM for charging current and output voltage (for table-top models)
- Pre-selection of the output voltage with display
- End of charge signal, when the final voltage is reached, via front panel LED and a potential-free interface for signalling to an external control system (opto-coupler output)
- Suitable for capacitive loads with resistive elements

- The nominal current can be permanently supplied at maximum output voltage

### Function:

The capacitor charging high voltage DC power supplies are designed specifically to the requirements of capacitor charging or capacitor conditioning, i.e. they have a more heavily designed output resistor to withstand a pulsed load and a regulating circuit, optimized for fast switching over between current and voltage regulation and vice versa.

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:

Up to 2500J/s nominal power 19" table-top case, higher power in 19" cabinets (depending on type) with oil isolated external HV-container.

### Output:

- Output isolation:  
The polarity is positive or negative and has to be indicated with the order.  
The "0V"- terminal of the output is connected to earth but may be disconnected as needed. When disconnected, the "0V" (earthy) terminal may float with respect to earth up to ±300V.
- Output terminals:  
For all HCK units the output is on the rear side of the unit or on a separate HV-container. Mating HV-connectors are included, from 35kV on, assembled with 3m cable, from 65kV >5000J/s on with 10m cable.

### Technical Data:

- Mains connection:  
Up to 800J/s nominal power: 230V ±10% 47Hz to 63Hz;  
From nominal power 1600J/s 400V ±10% 47Hz to 63Hz, three-phase
- Ambient temperature:  
0°C to +40°C
- Charging power:  
The specified max. charging power (see table) will be supplied for charging between "0" and the rated voltage. For charging of a partially discharged capacitor a considerably higher charging power, up to the double, can be supplied.

- Setting range for the charging voltage:  
from approx. 1% to 100%
- Setting resolution:  
±1 x 10<sup>-4</sup>
- Reproducibility of the charging voltage with respect to the rated value:  
For ±10% mains voltage variation:  
≤ ±1 x 10<sup>-4</sup>  
Over 8 hours under constant conditions:  
≤ ±1 x 10<sup>-3</sup>  
Within the temperature range:  
≤ ±2 x 10<sup>-4</sup> /K  
For a repetition frequency of <10Hz:  
≤ ±1 x 10<sup>-3</sup>  
For a repetition frequency of >10Hz:  
≤ ±1 x 10<sup>-2</sup>
- Repetition frequency:  
max. 100Hz
- Residual ripple of the charging current:  
approx. 10%pp 20kHz/40kHz)

### Possible Options:

- Analog programming (see page 44)
- Analog programming, floating (see page 44)
- Computer interfaces - IEEE 488, RS 232, RS 422, Profibus DP, LAN, USB (more on request) (see page 46)
- Polarity reversal switch available up to 1600J/s (by request for higher powers) Please specify the output polarity, when ordering without polarity reversal switch. (see page 48)
- Dump switch for the output & the load
- Higher repetition frequency
- Built-in or external discharge circuit for pulse operation
- Higher stability and better reproducibility (see page 48)
- 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.

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| Type                 | Voltage     | Current    | Charg. pow. | Width        | Height         | Depth  | Weight |
|----------------------|-------------|------------|-------------|--------------|----------------|--------|--------|
| HCK 100 - 2000       | 0 - 2000 V  | 0 - 100 mA | 100 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 6 kg   |
| HCK 200 - 2000       | 0 - 2000 V  | 0 - 200 mA | 200 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 7 kg   |
| HCK 400 - 2000       | 0 - 2000 V  | 0 - 400 mA | 400 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 11 kg  |
| HCK 800 - 2000       | 0 - 2000 V  | 0 - 800 mA | 800 J/s     | 19" / 443 mm | 3 U / 133 mm   | 450 mm | 12 kg  |
| HCK 1600 - 2000 3)   | 0 - 2000 V  | 0 - 1,6 A  | 1600 J/s    | 19" / 443 mm | 6 U / 266 mm   | 650 mm | 25 kg  |
| HCK 2500 - 2000 3)   | 0 - 2000 V  | 0 - 2,5 A  | 2500 J/s    | 19" / 443 mm | 6 U / 266 mm   | 650 mm | 40 kg  |
| HCK 5000 - 2000 3)   | 0 - 2000 V  | 0 - 5 A    | 5000 J/s    | 19" / 600 mm | 9 U / 399 mm   | 650 mm | 75 kg  |
| HCK 7500 - 2000 3)   | 0 - 2000 V  | 0 - 7,5 A  | 7500 J/s    | 19" / 600 mm | 12 U / 535 mm  | 650 mm | 110 kg |
| HCK 10000 - 2000 3)  | 0 - 2000 V  | 0 - 10 A   | 10000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 240 kg |
| HCK 20000 - 2000 3)  | 0 - 2000 V  | 0 - 20 A   | 20000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 360 kg |
| HCK 100 - 3500       | 0 - 3500 V  | 0 - 50 mA  | 100 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 6 kg   |
| HCK 200 - 3500       | 0 - 3500 V  | 0 - 100 mA | 200 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 7 kg   |
| HCK 400 - 3500       | 0 - 3500 V  | 0 - 200 mA | 400 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 11 kg  |
| HCK 800 - 3500       | 0 - 3500 V  | 0 - 400 mA | 800 J/s     | 19" / 443 mm | 3 U / 133 mm   | 450 mm | 12 kg  |
| HCK 1600 - 3500 3)   | 0 - 3500 V  | 0 - 800 mA | 1600 J/s    | 19" / 443 mm | 6 U / 266 mm   | 650 mm | 40 kg  |
| HCK 2500 - 3500 3)   | 0 - 3500 V  | 0 - 1,4 A  | 2500 J/s    | 19" / 443 mm | 6 U / 266 mm   | 650 mm | 40 kg  |
| HCK 5000 - 3500 3)   | 0 - 3500 V  | 0 - 2,8 A  | 5000 J/s    | 19" / 600 mm | 9 U / 399 mm   | 650 mm | 75 kg  |
| HCK 7500 - 3500 3)   | 0 - 3500 V  | 0 - 4,2 A  | 7500 J/s    | 19" / 600 mm | 12 U / 535 mm  | 650 mm | 110 kg |
| HCK 10000 - 3500 3)  | 0 - 3500 V  | 0 - 5,7 A  | 10000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 240 kg |
| HCK 20000 - 3500 3)  | 0 - 3500 V  | 0 - 11 A   | 20000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 360 kg |
| HCK 100 - 6500       | 0 - 6500 V  | 0 - 30 mA  | 100 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 6 kg   |
| HCK 200 - 6500       | 0 - 6500 V  | 0 - 60 mA  | 200 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 7 kg   |
| HCK 400 - 6500       | 0 - 6500 V  | 0 - 120 mA | 400 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 11 kg  |
| HCK 800 - 6500       | 0 - 6500 V  | 0 - 250 mA | 800 J/s     | 19" / 443 mm | 3 U / 133 mm   | 450 mm | 12 kg  |
| HCK 1600 - 6500 3)   | 0 - 6500 V  | 0 - 500 mA | 1600 J/s    | 19" / 443 mm | 6 U / 266 mm   | 650 mm | 35 kg  |
| HCK 2500 - 6500 3)   | 0 - 6500 V  | 0 - 750 mA | 2500 J/s    | 19" / 443 mm | 6 U / 266 mm   | 550 mm | 40 kg  |
| HCK 5000 - 6500 3)   | 0 - 6500 V  | 0 - 1,5 A  | 5000 J/s    | 19" / 600 mm | 9 U / 399 mm   | 650 mm | 75 kg  |
| HCK 7500 - 6500 3)   | 0 - 6500 V  | 0 - 2,3 A  | 7500 J/s    | 19" / 600 mm | 12 U / 535 mm  | 650 mm | 110 kg |
| HCK 10000 - 6500 3)  | 0 - 6500 V  | 0 - 3 A    | 10000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 240 kg |
| HCK 20000 - 6500 3)  | 0 - 6500 V  | 0 - 6 A    | 20000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 360 kg |
| HCK 100 - 12500      | 0 - 12500 V | 0 - 15 mA  | 100 J/s     | 19" / 443 mm | 3 U / 133 mm   | 350 mm | 6 kg   |
| HCK 200 - 12500      | 0 - 12500 V | 0 - 30 mA  | 200 J/s     | 19" / 443 mm | 3 U / 133 mm   | 450 mm | 7 kg   |
| HCK 400 - 12500      | 0 - 12500 V | 0 - 60 mA  | 400 J/s     | 19" / 443 mm | 3 U / 133 mm   | 450 mm | 11 kg  |
| HCK 800 - 12500      | 0 - 12500 V | 0 - 120 mA | 800 J/s     | 19" / 443 mm | 3 U / 133 mm   | 450 mm | 21 kg  |
| HCK 1600 - 12500 3)  | 0 - 12500 V | 0 - 250 mA | 1600 J/s    | 19" / 443 mm | 6 U / 266 mm   | 550 mm | 35 kg  |
| HCK 2500 - 12500 3)  | 0 - 12500 V | 0 - 400 mA | 2500 J/s    | 19" / 443 mm | 6 U / 266 mm   | 650 mm | 40 kg  |
| HCK 5000 - 12500 3)  | 0 - 12500 V | 0 - 800 mA | 5000 J/s    | 19" / 600 mm | 9 U / 399 mm   | 650 mm | 75 kg  |
| HCK 7500 - 12500 3)  | 0 - 12500 V | 0 - 1,2 A  | 7500 J/s    | 19" / 600 mm | 12 U / 535 mm  | 650 mm | 110 kg |
| HCK 10000 - 12500 3) | 0 - 12500 V | 0 - 1,5 A  | 10000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 240 kg |
| HCK 20000 - 12500 3) | 0 - 12500 V | 0 - 3 A    | 20000 J/s   | 19" / 600 mm | 38 U / 2000 mm | 800 mm | 360 kg |

### 3) Three phase mains connection

All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

Mating high voltage connectors (from 35kV complete with 3m cable, from 65kV >5000J/s with 10m cable) are included in the scope of delivery. Mating high voltage cables you'll find beginning with page 51. Capacitor chargers with different from the type range voltage or power are available on request. . (From approx. 100V and till approx. 200kV)

# Capacitor charging power supplies

## Series HCK from 2 kV to 65 kV / 100 J/s to 20 kJ/s



**HCK 150000M - 12000**  
12kV / to 35A  
customer specific design,  
4-fould 19" cabinet, cubical



**HCK 5000 - 12500**  
12,5kV / 800mA

**HCK 6750M - 30000**  
(side cover removed)  
30kV / 450mA  
(650mA up to 15kV)



### Design examples

| Type                 | Voltage     | Current    | Charg. pow. | Width           | Height         | Depth     | Weight     |
|----------------------|-------------|------------|-------------|-----------------|----------------|-----------|------------|
| HCK 100 - 20000      | 0 - 20000 V | 0 - 10 mA  | 100 J/s     | 19" / 443 mm    | 3 U / 133 mm   | 350 mm**  | 11 kg      |
| HCK 200 - 20000      | 0 - 20000 V | 0 - 20 mA  | 200 J/s     | 19" / 443 mm    | 3 U / 133 mm   | 350 mm**  | 12 kg      |
| HCK 400 - 20000      | 0 - 20000 V | 0 - 40 mA  | 400 J/s     | 19" / 433 mm    | 3 U / 133 mm   | 450 mm    | 14 kg      |
| HCK 800 - 20000      | 0 - 20000 V | 0 - 80 mA  | 800 J/s     | 19" / 443 mm    | 4 U / 177 mm   | 550 mm    | 25 kg      |
| HCK 1600 - 20000 3)  | 0 - 20000 V | 0 - 160 mA | 1600 J/s    | 19" / 443 mm    | 6 U / 266 mm   | 650 mm    | 35 kg      |
| HCK 2500 - 20000 3)  | 0 - 20000 V | 0 - 250 mA | 2500 J/s    | 19" / 443 mm    | 7 U / 310 mm   | 550 mm    | 40 kg      |
| HCK 5000 - 20000 3)  | 0 - 20000 V | 0 - 500 mA | 5000 J/s    | 19" / 600 mm    | 29 U / 1500 mm | 600 mm    | 120 kg     |
| HCK 10000 - 20000 3) | 0 - 20000 V | 0 - 1 A    | 10000 J/s   | 19" / 600 mm    | 38 U / 2000 mm | 800 mm    | 240 kg     |
| HCK 20000 - 20000 3) | 0 - 20000 V | 0 - 2 A    | 20000 J/s   | 19" / 600 mm    | 38 U / 2000 mm | 800 mm    | 360 kg     |
| HCK 100 - 35000      | 0 - 35000 V | 0 - 5 mA   | 100 J/s     | 19" / 443 mm    | 3 U / 133 mm   | 350 mm**  | 12 kg      |
| HCK 200 - 35000      | 0 - 35000 V | 0 - 10 mA  | 200 J/s     | 19" / 443 mm    | 3 U / 133 mm   | 450 mm    | 12 kg      |
| HCK 400 - 35000      | 0 - 35000 V | 0 - 20 mA  | 400 J/s     | 19" / 433 mm    | 3 U / 133 mm   | 550 mm    | 30 kg      |
| HCK 800 - 35000      | 0 - 35000 V | 0 - 40 mA  | 800 J/s     | 19" / 443 mm    | 4 U / 177 mm   | 550 mm    | 30 kg      |
| HCK 1600 - 35000 3)  | 0 - 35000 V | 0 - 80 mA  | 1600 J/s    | 19" / 443 mm    | 6 U / 266 mm   | 650 mm    | 50 kg      |
| HCK 2500 - 35000 3)  | 0 - 35000 V | 0 - 140 mA | 2500 J/s    | 19" / 443 mm    | 7 U / 310 mm   | 550 mm    | 50 kg      |
| HCK 5000 - 35000 3)  | 0 - 35000 V | 0 - 280 mA | 5000 J/s    | 19" / 600 mm    | 38 U / 2000 mm | 800 mm    | 390 kg     |
| HCK 10000 - 35000 3) | 0 - 35000 V | 0 - 570 mA | 10000 J/s   | 19" / 600 mm    | 38 U / 2000 mm | 800 mm    | 450 kg     |
| HCK 20000 - 35000 3) | 0 - 35000 V | 0 - 1,1 A  | 20000 J/s   | 2x19" / 1200 mm | 38 U / 2000 mm | 800 mm    | 720 kg     |
| HCK 100 - 65000      | 0 - 65000 V | 0 - 3 mA   | 100 J/s     | 19" / 443 mm    | 3 U / 133 mm*  | 450 mm**  | 20 kg      |
| HCK 200 - 65000      | 0 - 65000 V | 0 - 6 mA   | 200 J/s     | 19" / 443 mm    | 5 U / 221 mm*  | 450 mm**  | 30 kg      |
| HCK 400 - 65000      | 0 - 65000 V | 0 - 12 mA  | 400 J/s     | 19" / 433 mm    | 7 U / 310 mm*  | 550 mm    | 55 kg      |
| HCK 800 - 65000      | 0 - 65000 V | 0 - 25 mA  | 800 J/s     | 19" / 443 mm    | 7 U / 310 mm*  | 550 mm    | 60 kg      |
| HCK 1600 - 65000 3)  | 0 - 65000 V | 0 - 50 mA  | 1600 J/s    | 19" / 443 mm    | 8 U / 355 mm*  | 550 mm    | 80 kg      |
| HCK 2500 - 65000 3)  | 0 - 65000 V | 0 - 75 mA  | 2500 J/s    | 19" / 443 mm    | 10 U / 443 mm* | 650 mm    | 120 kg     |
| HCK 5000 - 65000 3)  | 0 - 65000 V | 0 - 150 mA | 5000 J/s    | 19" / 600 mm    | 38 U / 2000 mm | 800 mm    | 460 kg     |
| HCK 10000 - 65000 3) | 0 - 65000 V | 0 - 300 mA | 10000 J/s   | 19" / 600 mm    | 38 U / 2000 mm | 800 mm    | 500 kg     |
| HCK 20000 - 65000 3) | 0 - 65000 V | 0 - 600 mA | 20000 J/s   | 19" / 600 mm    | 29 U / 1500 mm | 600 mm*** | 200/470 kg |

3) Three phase mains connection

All units are available with polarity reversal switch. For orders without polarity switch please state the required output polarity.

**For the final dimensioning of the capacitor charging power supplies, details regarding the load and the operating conditions are necessary.**

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

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

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