

5kJ/s BENCH MOUNT/
FULL RACK

AC-HVDC CAPACITOR CHARGERS

The HCK5K0 series are highly-stable DC power supplies, designed specially to meet the requirements of capacitor charging and capacitor conditioning. They feature a robust output resistor to be able to withstand the demands of a pulsed load. The control circuit is designed for fast transitions from constant current to constant voltage operation.

The equipment is suitable for both continuous and pulsed charging, this is achieved using an adjustable constant current without overshoot. Capacitors with a resistive component are also suitable as loads. Usually, an external protective resistor is not required. It is, however, recommended for applications with very high levels of stored energy.

The specified maximum charging power is achieved when charging from zero volt (0) to the rated voltage. The HCK series can operate in circuits where the load capacitor is fully discharged with each pulse, or in circuits where the load capacitor is only partially discharged with each pulse. The charging process can either be continuous or triggered using the external trigger input.



Dimensions

See mechanical details table

Features

- Output voltages 0-2kVDC to 65kVDC
- Three phase AC input
- Continuous operation at full rated power
- Multi-function control panel with user friendly interface
- Digital, LAN and USB interface option
- Analog programming/interface option
- Manual voltage and current control with digital display
- Set-point display via push-button
- Set-point adjustment possible with disabled output
- Push-button switch for output voltage
- Adjustable overvoltage limit
- CE marked, EN61010-1 safety compliant
- Short circuit & arc protection
- 2 year warranty

Benefits

- Provides maximum device control & flexibility.
- Safe operation ensures maximum protection to the power supply
- High voltage release included for safe operation at high voltage output
- User friendly controls combined with bespoke terminal software gives greater flexibility
- Lighter than the leading brand products & easier to maintain
- Low cost of ownership

Applications

- Capacitor charging
- Capacitor conditioning

Models & Ratings

| Model Number | Polarity | Output Voltage | Charge Power | Output Current | Input Voltage | Frequency |
|---------------|----------|----------------|--------------|----------------|------------------------|------------|
| HCK5K0-2000P | Positive | 0 to +2kV | 5kJ/s | 0 to 5A | 400VAC ±10% 3 phase | 47 to 63Hz |
| HCK5K0-2000N | Negative | 0 to -2kV | | | | 47 to 63Hz |
| HCK5K0-3500P | Positive | 0 to +3.5kV | 5kJ/s | 0 to 2.8A | 400VAC ±10% 3 phase | 47 to 63Hz |
| HCK5K0-3500N | Negative | 0 to -3.5kV | | | | 47 to 63Hz |
| HCK5K0-6500P | Positive | 0 to +6.5kV | 5kJ/s | 0 to 1.5A | 400VAC ±10% 3 phase | 47 to 63Hz |
| HCK5K0-6500N | Negative | 0 to -6.5kV | | | | 47 to 63Hz |
| HCK5K0-12500P | Positive | 0 to +12.5kV | 5kJ/s | 0 to 800mA | 400VAC ±10% 3 phase | 47 to 63Hz |
| HCK5K0-12500N | Negative | 0 to -12.5kV | | | | 47 to 63Hz |
| HCK5K0-20000P | Positive | 0 to +20kV | 5kJ/s | 0 to 500mA | 400VAC ±10% 3 phase | 47 to 63Hz |
| HCK5K0-20000N | Negative | 0 to -20kV | | | | 47 to 63Hz |
| HCK5K0-35000P | Positive | 0 to +35kV | 5kJ/s | 0 to 280mA | 400VAC ±10% 3 phase | 47 to 63Hz |
| HCK5K0-35000N | Negative | 0 to -35kV | | | | 47 to 63Hz |
| HCK5K0-65000P | Positive | 0 to +65kV | 5kJ/s | 0 to 150mA | 400VAC ±10% 3 phase | 47 to 63Hz |
| HCK5K0-65000N | Negative | 0 to -65kV | | | | 47 to 63Hz |

Options

- Analog programming
- Analog programming, floating
- Computer Interfaces – IEEE 488, RS 232, RS 422, RS485, Profibus DP, LAN, USB (more on request)
- Interlock
- Message output voltage <50V
- Higher stability: Stability, over 8 hours under constant conditions $<\pm 1 \times 10^{-5}$
Temperature coefficient $<\pm 1 \times 10^{-5}/K$ within the specified temperature range
- Higher repetition frequency
- Heavy duty castors for rack unit
- Supply voltages other than that shown in the models & ratings table may be specified

Please consult XP Power Sales

Input

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|----------------------|---------|---------|---------|-------|------------------------------|
| Input Voltage | | | | | See models and ratings table |
| Efficiency | | 90 | | % | |
| Oversoltage Category | | II | | | |
| Protection Class | | I | | | |

Output

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|-------------------------------------|---|---------|---------|-------|--|
| Output Voltage Range | 0 | | 65 | kV | See models and ratings table |
| Output Current Range | 0 | | 5 | A | See models and ratings table |
| Output Control | Continuous adjustment from 0 to rated voltage/current by front panel mounted potentiometers | | | | |
| Output Polarity | See models and ratings table | | | | |
| Output Isolation | "0V" terminal is connected to the PE (EARTH), Current return preferably takes place via the screen of the output cable | | | | |
| Stability | | ±0.1 | | % | Over 8 hours under constant conditions after 30 min. warm up |
| Voltage Setting Range | With the VOLTAGE ten-turn potentiometer, approx. 0,1% to 100% of the rated value (stable operation from 1%) | | | | |
| Current Setting Range | With the CURRENT ten-turn potentiometer, approx. 0.1% to 100% of the rated value (stable operation from 1%) | | | | |
| Set Point 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 | | | | |
| Residual Ripple of Charging Current | | | 10 | % | pk-pk, of the rated value |
| Accuracy | Voltage: $< \pm 0.2\%$ of the nominal value Current: within the range of $> 5\text{mA}$ up to $< 200\text{A}$: $\pm 0.2\%$ of the nominal value Outside the above mentioned range: $< \pm 0.5\%$ of the nominal value Additional digital display error $< \pm 2$ digits | | | | |
| Charge Voltage Reproducibility | $\pm 10\%$ mains voltage variation: $< \pm 1 \times 10^{-4}$ of rated value Over 8h: $< \pm 1 \times 10^{-3}$ of rated value in temperature range of $< \pm 2 \times 10^{-4}/\text{K}$ At repetition frequency of $< 10\text{Hz}$: $< \pm 1 \times 10^{-3}$ of rated value At repetition frequency of $> 10\text{Hz}$: $< \pm 1 \times 10^{-2}$ of rated value | | | | |
| Short Circuit Protection | The power supply is short-circuit and flash-over proof. The maximum current can be drawn at any output voltage even at short-circuit. | | | | |
| Repetition Frequency | | | 10 | Hz | Optional up to 100Hz |

Safety Approvals

| Safety Agency | Safety Standard | Notes & Conditions |
|---------------|----------------------------------|--------------------|
| EN | EN61010-1 | |
| CE | Meets all applicable directives | |
| UKCA | Meets all applicable legislation | |

Environmental

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|--------------------|---|---------------|---------|--------|-----------------------|
| Temperature Range | 0 | | +40 | °C | Operating and storage |
| Humidity | Max. relative humidity 80% up to +31°C, decreasing linearly down to 50% relative humidity at +40°C | | | | Operating |
| | No precipitation and max. relative humidity of 80% | | | | Storage |
| Cooling | Heat generated in the power supply unit is dissipated by convection or, in the case of high-power units >400J/s by forced cooling by ventilation. | | | | |
| Operating Altitude | | 6,500 (2,000) | | ft (m) | |
| Protection | Open/short circuits, arcs, overtemperature | | | | |

Signals & Controls

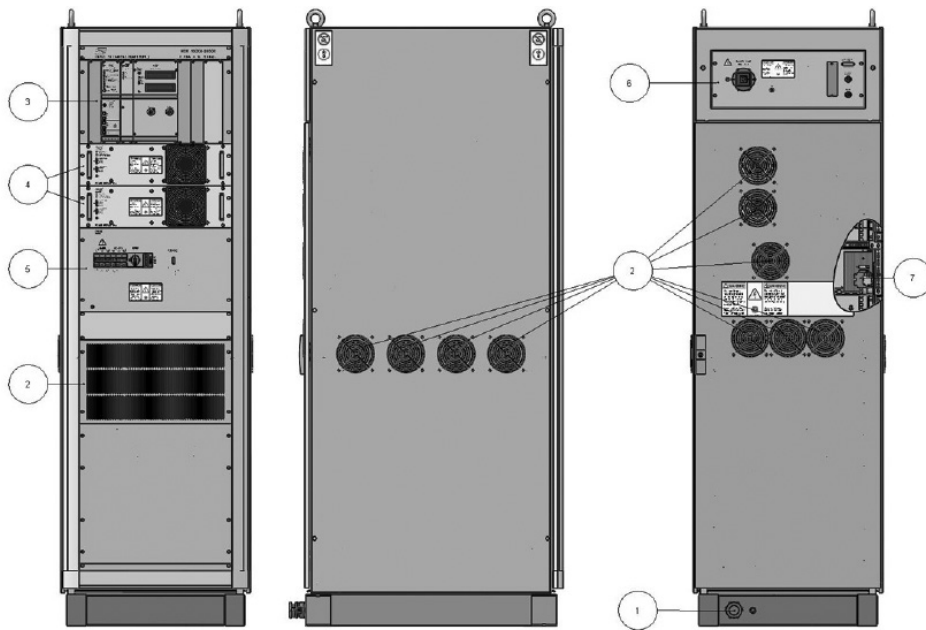
| | Function |
|-----------------------------------|--|
| Front panel | Voltage and current potentiometer, power switch, HV ON/OFF switch, display for current and voltage, voltage limit potentiometer. Display of the output voltage and current set points is possible with the VIEW SET push-button. Feedback after reaching the end of charge voltage is provided using an LED on the front panel and via a voltage-isolated interface – "Trigger" BU2 (optocoupler output). |
| Capacitor charger operating modes | The capacitor charger can be operated without limits over the entire working range. Thus, the rated current can be continuously drawn at maximum voltage. If suitable interface options are present, you can choose between LOCAL, ANALOGUE and DIGITAL operating modes. The HV output's polarity is positive, negative; or reversible (see models & ratings table). |

EMC: Emissions

| Phenomenon | Standard | Notes & Conditions |
|-------------------|-------------|--------------------|
| Harmonic Currents | EN61000-6-2 | |
| Voltage Flicker | EN61000-6-3 | |

Mechanical Details

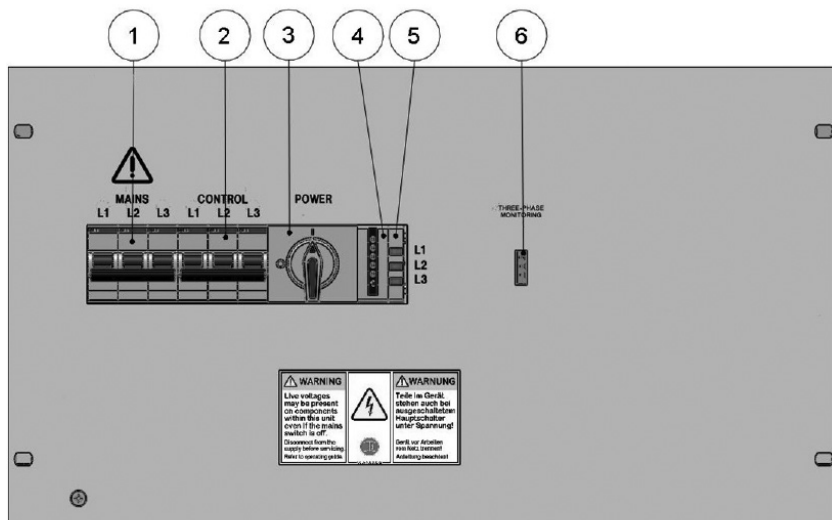
View of cabinet unit (typical example)



| Number | Function | Number | Function |
|--------|--------------|--------|------------------|
| 1 | AC input | 5 | Mains control |
| 2 | Air outlet | 6 | HV output |
| 3 | Electronics | 7 | Mains connection |
| 4 | Power-driver | | |

Cabinet unit shown for illustrative purposes only, dimensions and layout differ by power rating - see mechanical details table.

Cabinet unit: Front view with front panel and AC input (typical example)

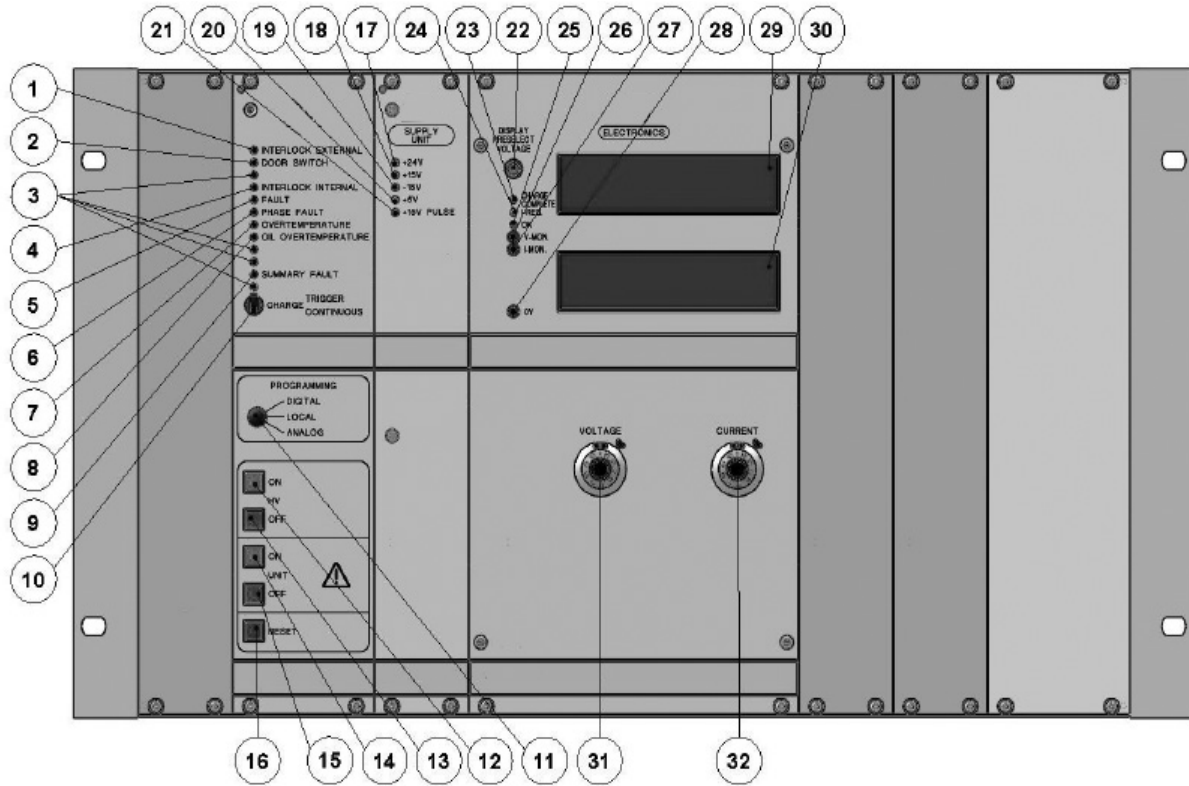


| Number | Function |
|--------|--|
| 1 | Main and automatic circuit breaker, disconnection from the mains |
| 2 | Automatic circuit breaker for electronics, no disconnection from the mains |
| 3 | Main switch |
| 4 | Elapsed hour counter |
| 5 | Status LED L1, L2 and L3 (phase display) |
| 6 | Phase and mains monitoring relay |

Front panel shown for illustrative purposes only, dimensions and layout differ by power rating - see mechanical details table.

Mechanical Details

Cabinet unit: Front panel and electronics (typical example)



Front panel shown for illustrative purposes only, dimensions and layout differ by power rating - see mechanical details table.

| Number | Function | Number | Function |
|--------|---|--------|--|
| 1 | LED external interlock loop open | 17 | LED +24V supply OK |
| 2 | LED door open | 18 | LED +15V supply OK |
| 3 | Unused, free available for special features, e.g., smoke alarm, signal of interface | 19 | LED -15V supply OK |
| 4 | LED internal interlock loop open | 20 | LED +5V supply OK |
| 5 | LED internal error | 21 | LED +15V pulsed power supply OK |
| 6 | LED phase error | 22 | Switch to display of set values/measured values (voltage) |
| 7 | LED unit overtemperature | 23 | LED charging voltage reached "CHARGE COMPLETE" (constant voltage mode) |
| 8 | LED oil overtemperature | 24 | LED current control activated "I-REG" |
| 9 | LED summary fault | 25 | LED status OK |
| 10 | Charging mode: external Trigger - continuous | 26 | Socket for voltage monitoring (0-10V) |
| 11 | Programming (optional): digital – local – analog | 27 | Socket for current monitoring (0-10V) |
| 12 | HV on | 28 | Reference socket "0V" |
| 13 | HV off | 29 | Voltage display (kV) |
| 14 | Mains connection on | 30 | Current display (mA) |
| 15 | Mains connection off | 31 | Fixable ten-turn potentiometer for voltage setpoint |
| 16 | Resetting the error memory | 32 | Fixable ten-turn potentiometer for current set point |

Mechanical Details

Cabinet unit: Power driver (typical example)



Power driver shown for illustrative purposes only, dimensions and layout differ by power rating - see mechanical details table.

| Number | Function | Number | Function |
|--------|--|--------|--|
| 1 | LED internal fuse defective | 8 | LED overcurrent part B |
| 2 | LED asymmetrical voltage at the output stage | 9 | Socket (internal resistance 10kΩ) for monitoring the primary current of the transformer 10A/0.2V |
| 3 | LED driver overtemperature | 10 | Socket for monitoring the PWM signal (PULSE 1B) |
| 4/9 | LED overcurrent part A | 11 | Socket for monitoring the PWM signal (PULSE 2B) |
| 5 | Socket (internal resistance 10kΩ) for monitoring the primary current of the transformer 10A/0.2V | 12 | Reference socket "0V" |
| 6 | Socket for monitoring the PWM signal (PULSE 1A) | 13 | Cooling fan |
| 7 | Socket for monitoring the PWM signal (PULSE 2A) | | |

Charging Process

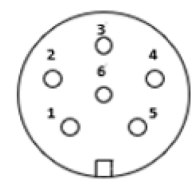
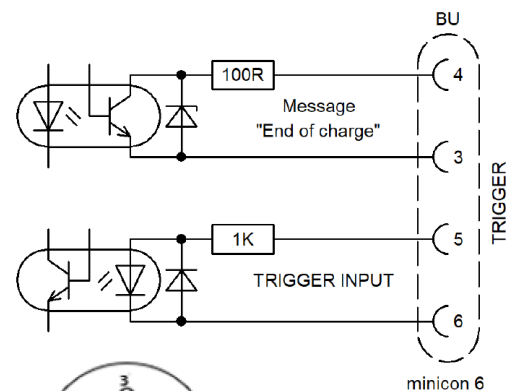
The power supplies are equipped with a "CONTINUOUS/TRIGGER" switch (14) and a 6-pin socket. In the "CONTINUOUS" position, charging happens continuously, in the "TRIGGER" position, charging takes place after release by an external signal on the 6-pin interface.

Trigger-Signal

The triggering is floating via an optocoupler. This input is standardised and designed for a control voltage between +12V and +24V. The control power source polarity is positive to pin 5 and negative to pin 6.

End of charge

When the final charging voltage is reached, this is indicated by the "CV" LED (6) illuminating (voltage reached). It is also reported to the external controller via an optocoupler on the trigger connector. This signal is isolated and it is passed through a downstream transistor from the optocoupler. An open collector signal with 100Ω series resistor is available on pins 3 and 4. (The transistor conducts with approx. 50mA, pin 4 LOW = End of charge).



MINICON 6 pin
(solder side of plug)

| Number | Function | Number | Function |
|--------|---------------------------|--------|-------------------|
| 1/2 | N/C | 5/6 | "Trigger" command |
| 3/4 | "CHARGE COMPLETE" message | 5 | ANODE |
| 3 | EMITTER | 6 | CATHODE GND |
| 4 | COLLECTOR | | |

Mechanical Details

| Model Number | Mounting | Width | | Height | | Depth | Weight |
|---------------|----------------------------|-------|-------|--------|--------|-------|--------|
| HCK5K0-2000P | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 60kg |
| HCK5K0-2000N | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 60kg |
| HCK5K0-3500P | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 60kg |
| HCK5K0-3500N | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 60kg |
| HCK5K0-6500P | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 65kg |
| HCK5K0-6500N | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 65kg |
| HCK5K0-12500P | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 65kg |
| HCK5K0-12500N | Bench mount ⁽¹⁾ | 19" | 443mm | 9U | 399mm | 650mm | 65kg |
| HCK5K0-20000P | Full rack | 19" | 600mm | 33U | 1800mm | 800mm | 360kg |
| HCK5K0-20000N | Full rack | 19" | 600mm | 33U | 1800mm | 800mm | 360kg |
| HCK5K0-35000P | Full rack | 19" | 600mm | 42U | 2200mm | 800mm | 390kg |
| HCK5K0-35000N | Full rack | 19" | 600mm | 42U | 2200mm | 800mm | 390kg |
| HCK5K0-65000P | Full rack | 19" | 600mm | 42U | 2200mm | 800mm | 460kg |
| HCK5K0-65000N | Full rack | 19" | 600mm | 42U | 2200mm | 800mm | 460kg |

Notes:

- 1. Rack mount option

Cables

Mains input cable

3 phase mains: open end

Mating connectors

For control inputs and outputs not included (digital interface cables are commercially available).

Screened HV output cable

3m long with mating connector fitted one end only. Delivered short circuited for safety reasons.