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***Rosenheim - Germany***

# Technische Unterlagen / Technical Manual

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**ISO 9001 : 2000**

Typ /Type

## HCE 7 - 125 NEG

Fabrik-Nr. / Serial No.

**14803-01-01** **2007/03**

F.u.G. Elektronik GmbH

*Nieder- und Hochspannungs-Netzgeräte*

# High Voltage Power Supplies HCE - Series

power class 7W and 35W

**certified according to DIN EN ISO 9001**

## Operating Instructions

**This instruction is only dedicated to electrical experts and people with a suitable technical education, which are familiar with electrical risks and can keep the risk for themselves and other people as low as possible.**

**For the operation of this unit only a.m. persons are admitted.**

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**Juli 2002**

# 1. Sicherheitshinweise (D)

***Diese Betriebsanleitung richtet sich ausschließlich an Elektrofachkräfte und Personen mit einer geeigneten technischen Ausbildung, die sich der Gefahren bewußt sind und die Gefährdung für sich und andere möglichst gering halten können. Für die Bedienung des Netzgerätes sind nur o.g. Personen zugelassen.***

***Die Netzgeräte liefern je nach Typ sehr hohe Spannungen und / oder sehr hohe Leistungen!***
***Überzeugen Sie sich vor Inbetriebnahme davon, daß nichts und niemand durch diese Spannung gefährdet wird!***

***Vor Inbetriebnahme***
*Lesen Sie unbedingt die ganze Betriebsanleitung! Beachten Sie alle darin enthaltenen Hinweise und Warnungen. Das Nichtbefolgen dieser Betriebsanleitung verletzt die Sicherheitsbestimmungen beim Betrieb der Geräte. Für Folgen, die aus der Nichtbeachtung der Sicherheitshinweise entstehen, kann FuG keine Haftung übernehmen.*

***Netzspannung***
*Überprüfen Sie, ob die auf dem Typenschild angegebene Netzspannung und Frequenz mit Ihrer örtlichen Netzspannung übereinstimmt.*

***Ausgang***
***Die Ausgangsanschlüsse sind abhängig von Spannung und Leistung steckbar oder klemmbar. Hohe Leistungen sind nur klemmbar. Sorgen Sie für spannungs- und leistungsgerechte Verbindungen. Für Hochspannung verwenden Sie nur die mitgelieferten Stecker.***

***Erdung***
*Das Gerät ist mit einer Schutzerde ausgestattet (Schutzklasse 1). Zum Schutz gegen die Gefahr elektrischer Schläge muß das Gerät über ein Netzkabel mit Schutzleiter angeschlossen werden.*
*Zum Potentialausgleich mit dem Verbraucher und zur Sternpunkterdung einer Anlage muß der Erdungsbolzen verwendet werden.*

***Betriebsräume***
*Die Geräte dürfen nur in sauberen und trockenen Räumen betrieben werden. Stellen Sie sicher, daß durch die Lüftungsschlitze keine Gegenstände oder Flüssigkeiten in das Gehäuse gelangen können.*
*Wegen der Gefahr der Funkenbildung darf das Gerät nicht in der Nähe von brennbaren Gasen und Dämpfen betrieben werden.*

***Kühlung***
*Die im Gerät entstehende Verlustwärme wird durch Konvektion bzw. Zwangsbelüftung abgeführt. Es muß ein Luftaustausch mit der Umgebungsluft möglich sein (siehe Abschnitt 2.1.)*

***Gerät öffnen***
*Das Gerät darf vom Bedienungspersonal nur geöffnet werden, um interne Schalter umzuschalten, die in der Bedienungsanleitung beschrieben sind (z.B. Adreßschalter IEEE 488-Bus, ist bei manchen Geräten inseitig).*
***Vor dem Öffnen muß das Gerät vom Netz getrennt werden!***

***ACHTUNG!***
***Im Gerät befinden sich Kondensatoren, die sich nur langsam entladen (typische Entladezeit 5min) oder sich im Fehlerfall gar nicht entladen.***
*Benutzen Sie nur isoliertes Werkzeug.*
*Wartungs- und Reparaturarbeiten dürfen nur von geschultem Servicepersonal ausgeführt werden.*

***Symbole***

***Beachten Sie unbedingt die Betriebsanleitung, bevor Sie Schalter oder Buchsen mit diesem Kennzeichen betätigen bzw. beschalten!***

***Kennzeichen für Hochspannung führende Ausgänge***

***Kennzeichen für Gehäusemasse auf Schutzleiterpotential***

# 1. Safety Instructions (GB)

***This instruction is dedicated only to electrical experts and people with a suitable technical education, are familar with electrical risks and can keep the risk for themselves and for others as low as possible. Only authorized personel as mentioned above should be allowed to operate teh power supplies.***

***The power supplies, depending on type, create very high voltages and / or very high power!***
***Convince yourself first, that nothing and nobody can be endangered by this voltage, before operating the unit!***

***Before operating the unit***
*Make sure that you have read and understood the operating instruction manual! Ensure that you observe all the hints and warnings contained within it.*
*In not following the operating instructions, you contravene the safety regulations for operating units of this type. FuG accepts no liability for consequences arising from the failure to follow these safety instructions.*

***Input voltage***
*Check whether the input voltage and frequency for your power supply noted on the lable corresponds with your actual input voltage.*

***Output***
***The output terminals depend on the voltage and power with plugs or clamps. Take care for adequate voltage and power connections. For high voltage use only the enclosed connectors.***

***Ground***
*The unit is provided with a safety ground (German safety class 1). For protection against electric shocks the unit must be connected to mains via a cable with non-fused earthed conductor.For electrical potential equalization to the load and to the center of the AC-net the earth stud must be used.*

***Operating enviroment***
*The units may only be operated in a clean, dry enviroment. Ensure that no objects or liquids can get into the case through the ventilation slits.*
*Because of the risc of sparcs the unit should not be operated in the vicinity of flammable gases or fumes.*

***Cooling***
*The units are air cooled by convection or forced ventilation. Therefore, ensure that an adequate air-flow is available, (pay attetion to section 2.1.)*

***Opening the unit***
*The unit may be opened by operating personnel only to operate internal switches as decribed in the operating instructions, (e.g. address switch IEEE 488 interface, which is inside the case in some types).*
***Before opening , ensure that the unit is unplugged from the mains!***

***ATTENTION!***
***The unit contains capacitors, which discharge themselves only very slowly (typical discharge time 5 min) or, in worst case, do not discharge at all.***
*For switch over use insulated tools only. Maintenance or repair of this units should only be carried out by trained service personnel who are aware of the inherent dangers of such equipments.*

***Symbols***

***Strictly follow the operating instructions before you either change switches, or connect sockets, marked with this symbol!***

***Symbol for High Voltage outputs***

***Symbol for chassis earth, potential safety earth.***

## Content:

# 1. Safety Instructions

**The units of the series HCE deliver dangerously High Voltages!**
**Ensure that nothing, and nobody, will be endangered by this High Voltage before putting the unit into operation!**

**Attention !** **The full dielectric strength of the high voltage connectors is only realized when fully mated together.**

**Before putting into operation** Make sure that you have read and understood the operating instruction manual! Ensure that you observe all the hints and warnings contained within it. In not following the operating instructions, you contravene the safety regulations for operating units of this type. FuG accepts no liability for consequences arising from the failure to follow these safety instructions.

**Mains voltage** Check whether the input voltage for your power supply, noted on the type label, corresponds to your actual mains voltage.

**Earth** The unit is provided with a safety earth (German safety class I). For protection against electric shocks, the unit must be connected to the mains via a suitable 3 or 5-pole cable with a non-fused earth conductor.
For electrical potential equalization to the load, and to the center of the AC-supply, the earth stud must be used.

**Operating environment** The units may only be operated in a clean, dry environment.
Please make sure that no objects or liquids can enter the casing through the ventilating aperture.
Because of the risk of sparks, the unit should not be operated in the vicinity of flammable gases or fumes.

**Cooling** To ensure a adequate cooling, the ambient temperature should not exceed **40°C**.
This unit is air cooled by convection.
Therefore , please ensure an adequate air-flow is available, and ensure that nothing is placed either above or below the unit which may impede this air-flow.
Do not expose the unit directly to solar radiation.

If the unit is used as a plug-in component, sufficient air-flow must be provided.

**Opening the unit** **Before opening, ensure that the unit is disconnected from the mains!**
The unit may be opened by operating personnel only for the purpose of operating switches as described in the operating instructions.

**ATTENTION!** **The unit contains capacitors, which discharge only very slowly (typical discharge time 5 min -<50V ) or, in worst case, do not discharge at all.**

For switch over use isolated tools only.

Maintenance or repair of this unit should only be carried out by trained service personnel who are aware of the inherent dangers of such equipment.

**Symbols**

**Adhere strictly to the operating instructions before you either change switches, or connect sockets, marked with this symbol!**

**Symbol for HIGH VOLTAGE OUTPUTS**

**Symbol for chassis earth, potential safety earth.**

# 2. General

The units of the series HCE (**H**igh Voltage **C**hopper Power Supplies in **E**URO-size) are high stable DC- power supplies with low ripple.

**High Voltage Output**

**ATTENTION. The units supply dangerously HIGH VOLTAGE!**

**Polarity**

The power supplies have a fixed polarity, **positive or negative.**
The wanted polarity can only be fixed in the factory. One pole lies on the HV terminal, the other pole on the "0V" terminal and is inside the unit connected to earth by a wire bridge.

**Short-circuit Protection**

All units are short-circuit proof. The maximum current can be supplied for all output voltages, even into a short-circuit.

**ATTENTION! During short-circuit or flash over, the internal filter-capacitors will be discharged very fast. The output current is only limited by internal safety resistors, and can reach a value 500 x nominal value.**

**Load Types**

The type of load is not critical. All passive bipolar loads can be connected.

**Series Connection**

Power supplies of the series HCE may be connected in series, even if they have different nominal voltages, but than the center point must be connected to earth.

**Parallel Connection**

Parallel connection is supported.

**Type Number**

From the type number you can see both the power class and the maximum output voltage of the unit.

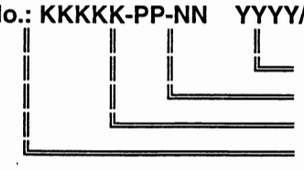
Example: **HCE 35 - 20 000** = Power class 35W / Nominal voltage 20 000V

Modified types with differing electrical or mechanical data are indicated by a "M" within the type number, or are marked with a sticker "**modifiziert**"
(e.g. HCE 35**M** - 20 000).
(In this case pay attention to the description in section 8. "Special Models")

**Serial Number**

The label on the rear of the unit, the technical manual and the circuit diagrams show the serial number.
It has the following content:

**Serial.- No.: KKKKK-PP-NN YYYY/MM**



Delivery Year / Month
Consecutive number out of this item
Item number
Internal order number

**IMPORTANT**

**Please indicate on all further enquiries for warranty, service or spare parts orders the serial number, as well as the model number, of the unit.**

## 2.1. Setup Information

**Operating position** The units may only be operated in horizontal position.

**Class of pollution** The units are concepted for the pollution class 2 (normal, not conductive pollution).

**EMC** The units are built according to the current standards.

**Transport** If the power supply is equipped with lifting appliances or handles, the weight of the unit must be shared to these points.

## 2.2. Preparation for Installation

**Mains Voltage** Check whether the input voltage for your power supply, noted on the type label, corresponds to your actual mains voltage. Use only the enclosed delivered mains cable.

**Earth, Safety Conductor** The unit is provided with a safety earth (German safety class I). For protection against electric shocks, the unit must be connected to the mains via a suitable 3 or 5-pole cable with a non-fused earth conductor.
For electrical potential equalization to the load, and to the center of the AC-supply, the earth stud must be used.

**Fuses** Internal: See type label.
External: On mains side next higher size, characteristics delay-action or if automatic cut-out is used, characteristics "G" or "K".

**Load connection** The load has to be connected on the HV terminal of the power supply. The return current may flow back via the screen of the HV-cable or via a separate line to the "0V" terminal. The output current must not flow back via mains earth! The screen of the HV-cable always must be connected to earth.

On load side a suitable overvoltage arrestor or earthing) must be provided to ensure, that due to a mistakenly opened 0V back connection on the power supply, the voltage does not exceed the max. permissible earthy potential of the load with respect to earth.
(see also "Output Isolation", section 4. Technical Data)

## 2.3. Description

The power supplies series HCE are 3HU EURO-cassettes, different width 14PU, 21PU or 28PU, depending on type.

19" chassis for 84PU are available as accessories.

All controls and displays are on the front panel.
The AC-Input, the HV-output and the programming terminal are on the rear.

## 2.4. Assembly

The unit mainly consists of 3 function subunits:

- Mains source and oscillating unit.
- HV-transformer, HV-rectifier with filter, HV-divider and current measuring shunt.
- Control unit with measuring and control amplifier, reference voltage generator, pulse width modulator to trigger the oscillator unit, source for the control unit from the mains transformer and a ±15 V voltage stabilizer.

## 2.5. Operating Mode

The rectified mains voltage feeds the rectangular push-pull oscillator stage. For the regulation, the rectangular voltage is pulse width modulated.

**High voltage**

This rectangular voltage is transformed by a HV-transformer and, dependent on type or nominal voltage, rectified by a bridge, a multiplier cascade or a Diode splitting configuration.

**Filtering**

The High Voltage so generated is filtered by a R-C- filter and fed to the output via a protection resistor.

**Voltage measurement**

A precision HV-divider feeds the measured voltage to the control circuit. For a better performance, a voltage derived from a capacitive divider on the end of the rectifier is added.

The divided voltage is normalized by an integrated amplifier to +10V = $V_{nominal}$.

**Voltage control**

The normalized voltage forms the actual value for the control amplifier. The measuring socket and the V-monitor are also supplied from this voltage. The voltage control amplifier compares this voltage with the setting voltage (reference voltage divided by the setting potentiometer or an external programming voltage).

The difference is amplified and fed, as control signal, to the input of the PWM-circuit, which drives the oscillator unit.

**Current measurement**

The current in the earthy pole of the HV-rectifier flows through a current measuring resistor.

The voltage drop on this resistor is also normalized by an integrated amplifier, (+10V = nominal current).

**Current control**

The ±15 V source of the control electronics is monitored.
Runs it below a minimum value, the input of the integrated PWM device is inhibited.

# 3. Operation

## The unit delivers dangerously High Voltage!

**Did you follow the safety instructions in Section 1.**
Please notice in particular point 2.2 Load connection.

**Mains switch ON/OFF**
The mains switch "POWER" is placed on the front panel left side down.
In on condition the switch lights red.

**Internal operation**
Set the switch for the programming to "INT".

**Regulation**
Voltage constant or current constant operation possible.
The operating mode is indicated by a LED
The transition occurs automatically.

**Voltage Adjustment**
Voltage adjustment by screwdriver on a multiturn potentiometer
"ADJUST VOLTAGE" on the front panel

**Current Adjustment**
Current adjustment by screwdriver on a multiturn potentiometer
"ADJUST CURRENT" on the front panel

**Voltage Control**
To operate the power supply in voltage constant mode, the current potentiometer must be set to a value higher than the present load current.
The LED MODE VOLTAGE (V-Reg) is on.

**Current Limitation**
To operate the power supply in current **Limitation** mode, the voltage potentiometer must be set to a value higher than the present output voltage.
The LED MODE CURRENT (C-Limit) is on.

**Wrong Adjustment**
Not following these instructions the power supply will not deliver output voltage or it jumps into another control mode.

**Remarks:**
**no LED lights up** = disturbed operation. Internal fuse defective?
or programming switch set to extern and no enable signal appears
**both LEDs on** = possible, when one of the voltage or current potentiometers is set to zero.

**Monitor Outputs**
The monitor outputs, 2mm sockets on the frontpanel, provide the possibility to measure the output voltage and the output current. The monitor voltages 0 - 10 V correspond to 0 - nominal value.

The monitor voltages are always positive, independent of the polarity of the output voltage. The monitor outputs are short circuit proof.

**Polarity**
The power supply has a fixed polarity. The polarity is indicated by a sticker on the handle. (positive = red ; negative = blue).

**ATTENTION!**
If the unit is switched off or mains fails eventually existing output figures will **not** be displayed.

! Please pay attention on the discharging time !

## 3.1. Analog Programming

**Extern Operation**
Select the operation mode on the programming switch on the front panel.
For external control of the unit by analog programming set the toggle switch ADJUST on the front panel to "EXT".

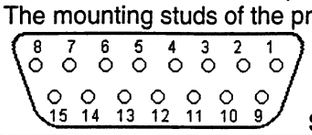
**Programming via Sub-D15 connector on the rear is active.**

**Analog Programming**
On the rear you will find the terminal for the external control of the power supply. Voltage and current can be adjusted by standardized analog signals (0 to 10 V) or by external potentiometers. A special connection allows a combination of internal / external operation.

**ATTENTION!**
**The reference point "0V" (Pins 6 or9) for all external programming voltages is always connected to the output "0V", independent of the output polarity.**
**At an open connection to "0V" - earth, the programming can float up to ± 125 V.**
Please note, that the connection cable of the programming and the following equipment must have a dielectric strength of min. 125 V with respect to earth (screen).
A programming connector with 500 V dielectric strength is enclosed.

**Cable Screening**

The connection lines to the interface terminals must be screened. The screen has to be connected to the earth point of the connector.
The mounting studs of the programming sockets lie on earth.



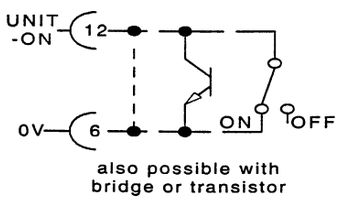

Pin configuration: **Solder side of the plug**

| | | |
|---|---|---|
| 1) **C-LIMIT** | (I-Begr) Status report "Current control" | Regulating active • apx. +15V |
| 2) **V-REG** | (U-Reg) Status report "Voltage control" | Regulating active • apx. +15V |
| 3) **C-MON** | ( I-MON) Monitor output current 0.. nominal • 0..+10V. Ri = 10kΩ | (always positive, independent of the output polarity). |
| 4) **VPS** | (UPS) Slider of the potentiometer "voltage adjustment" | (not with "floating analog programming"). |
| 5) **IPS** | (IPS) Slider of the potentiometer "current adjustment" | (not with "floating analog programming"). |
| 6) **0V** | (0V-dig) Reference for digital signals | |
| 7) n.c. | | |
| 8) **V-SET** | (U-Soll) Rated value for voltage adjustment (Input) | 0..+10V • 0..nominal |
| 9) **0VR** | (0VR) Reference for analog signals | |
| 10) **+10VR** | Reference voltage +10V | ( against Pin 9 max. 2mA loadable ). |
| 11) **V-MON** | (U-Mon) Monitor voltage (Output) 0.. nominal • 0..+10V. Ri = 10kΩ | (always positive, independent of the output polarity) |
| 12) **UNIT-ON** | (Ger.Ein) Power supply ON Bridge to Pin 6 •ON | **(Attention! Only Output-Voltage ON/OFF => No mains disconnection!).** |
| 13) n.c | | |
| 14) n.c. | | |
| 15) **C-SET** | **(I-Soll)** Rated value for current limitation (Input) | 0..+10V • 0..nominal |

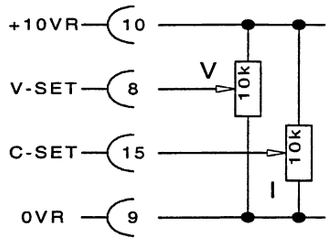
**Examples for Voltage Programming or Current Programming**

An external voltage adjustment implicitly requires the wiring of the current control and vice versa.
The ON/OFF (Trigger) command (12-6 )must implicitly be connected.

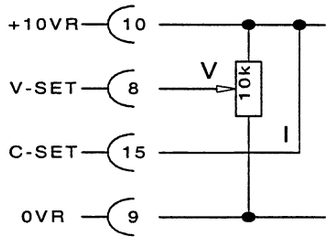
Output ON/OFF



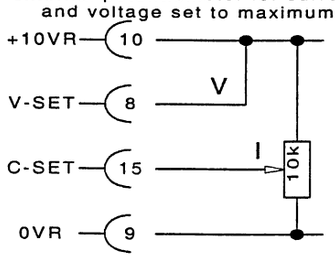

external potentiometers for current and voltage



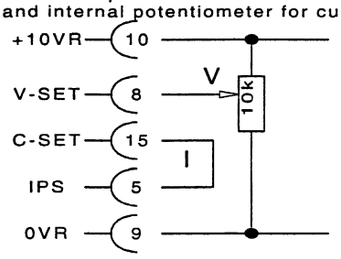

external potentiometer for voltage and current set to maximum



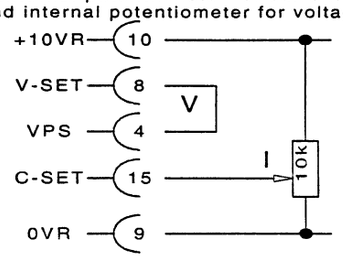

external potentiometer for current and voltage set to maximum




external potentiometer for voltage and internal potentiometer for current




external potentiometer for current and internal potentiometer for voltage




The reference voltage of +10 V or the set values may also be alternatively delivered from other external voltage sources (connect 0V).
No LED on: Perhaps ON-command (pin 12-6 ) not connected.

**ATTENTION!**

**If the unit is switched off or mains fails eventually existing output figures will not be displayed on the monitor terminals.**

## 3.2. Maintenance

HCE series needs no maintenance.

# 4. Technical Data

**All here stated data are valid for voltage and current control in internal operation.**
Changes of the technical data with the options analog and digital programming see section 5.1.

| | |
|---|---|
| **AC - Input** | 230V ±10% 47 - 63 Hz Overvoltage category II according to IEC664.<br>N-connection and PE (non fused earth) always necessary! |
| **EMC Standards** | for single phase systems<br>**EN 50 081 - 1 EN 50 082 - 1**<br>Length of signal- and control lines ≤ 3m |
| **Safety** | The units are in accordance with **EN 61010** (VDE 0411) |
| **Environment Conditions** | **Operating room :** Only for indoor usage (see section 2.1.)<br>**Temperature :** 0 °C to 40 °C<br>**Air humidity :** Max. relative humidity 80% until 31 °C,<br>linear decreasing until 50% relative humidity with 40 °C<br>**Atm press :** Height until 2000 m over NN<br>**Contamination :** 2, according to IEC664 |
| **Protection Class** | IP20 |
| **Output Voltage / Current** | See handle front panel of the power supply. |
| **Output Polarity** | Positive or negative, see indication on the unit. |
| **Output Isolation** | The "0V"- terminal in the factory was connected to earth by a bridge, it ca be changed to earthy by the customer. For that the wire bridge between "0V" and earth must be removed from the floating power supply. In this mode the "0V" terminal is protected by an overvoltage arrestor (150 V) which must not be stressed >±125V for a longer time. The return current must flow back in this case via the "0V" terminal. |
| **Setting Range Voltage** | with potentiometer ADJUST VOLTAGE appr. 0,1% to 100% from nominal value |
| **Setting Current Limitation** | with potentiometer ADJUST CURRENT appr. 0,1% to 100% from nominal value |
| **Reproducibility** | $\pm 1 \times 10^{-3}$ from nominal value, |
| **Setting Resolution** | With trimming potentiometer on the front panel $\pm 1 \times 10^{-4}$ from nominal value |
| **Residual Ripple** | $< 1 \times 10^{-4}$ $_{ss}$ $+50mV_{SS}$ from nominal value typ. $5 \times 10^{-5}$ $_{ss}$ |
| **Deviation** | $< \pm 1 \times 10^{-5}$ from nominal value, for ±10% mains voltage variation<br>$< 2 \times 10^{-4}$ from nominal value, for 0 to 100% load variation<br>$< \pm 1 \times 10^{-4}$ from nominal value, over 8 hours<br>$< \pm 1{,}5 \times 10^{-4}$/K from nominal value |
| **Recovery Time**<br>**voltage control**<br>**current control** | <br><1ms for load variations from 10% to 100% or 100% to 10%<br><10ms for load variations causing an output voltage variation less than 10% of the nominal voltage. |
| **Discharging Time Constant** | at unloaded output 0,5 sec to 5 sec, depending on type |
| **Discharging Time down to < 50V** | **max. one minute** |
| **Display** | LEDs for status report<br>MODE VOTAGE for voltage control /<br>MODE CURRENT for current limitation. |
| **ATTENTION!** | **If the unit is switched off or mains fails eventually existing output figures will not be displayed.** |
| **Mechanics** | **EURO-cassettes, widths: 14PU, 21PU and 28PU**<br>**Depending on type, changes reserved.** |

## 4.1. Calibration

**Calibration Certificate**

All guaranteed data for our power supplies are tested in the factory and documented in an internal test protocol. Furthermore we offer within the scope of our DIN ISO 9001 certified quality system a calibration in our plant.
The customer receives a calibration certificate. We certify the output data and the compliance with our catalog data.

The blue calibration sticker refers to the next recommended date of calibration.

**Subsequent Calibration**

Generally we recommend an annual subsequent calibration.

## 4.2. Certificate of Conformity

CE

The power supplies carry the CE-sign. The EU-conformity declaration certifies, that the unit is in accordance with the regulations of the Board of the European Union for the adjustment of laws of the member states about electromagnetic sociability. (89/336/EEC revised according to the relevant issue)
Conformity is proven by compliance with the following standards: EN 50081-1; EN 50082-1 or EN 50081-2; EN 50082-2.

Further more the accordance with the low voltage guide lines (Electrical equipment's for use within defined voltage limits, 73/23/EWG revised by 93/68/EWG) is confirmed by the compliance with EN 61010.

## 5. Options

For power supplies of the series HCE no options are provided

## 6. Accessories

19"- chassis for HCE-cassettes, 84PU width.

## 6.1. Connectors, Cables

**Output connectors are on the rear.**
**At units up to 650 V nominal voltage the outputs are 4mm safety connectors, from 1250 V nominal voltage on the outputs are HV-sockets, mating HV-connectors are included.**

| Type | Voltage | Connector Type | Mating Cable |
|---|---|---|---|
| **HCE 7 .. 35** | **- 125 .. 650** | **4mm safety connector** | **no preferred type** |
| **HCE 7 .. 35** | **- 1250 .. 6500** | **SHV (R317 005)** | **RG 58** |
| **HCE 7 .. 35** | **- 12500 .. 20000** | **F 3415 AG 6,2** | **LEMO 130 660** |
| **HCE 7 .. 35** | **- 35000** | **F 3430** | **RG 11** |

## 6.2. Mounting Instructions

see enclosed Mounting Instructions

## 7. Warranty, Repairs

Your high voltage power supply has been assembled and tested under stringent quality assurance procedures.

**We provide a 2 years warranty, commencing with the delivery date stated in the serial number.**

This warranty does not cover misuse or attempted repair by untrained personnel.

Enclosed you will find one set of circuit diagrams for service purposes.

In all further enquiries for service or spare parts, please provide both the model and serial number of the unit.

## 8. Special Models

not applicable for standard units

# Übersetzungen/Translations

| DEUTSCH | ENGLISCH |
|---|---|
| Abfallzeit | fall time |
| Abluft | outgoing air |
| Abschaltung | switch-off |
| Abschaltzeit | turn-off time |
| Abschluß (HV-Steckverbindung) | termination |
| Achtung | attention |
| Analog-Programmierung | analog programming |
| Anpreßkraft | clamping force |
| Anschluß | line input |
| Anschlußbuchse (HV-Steckverbindung) | HV socket |
| Anstiegszeit | rise time |
| Anzeige | display |
| Auf / Ab | up / down |
| Anzeige Spannungsvorwahl | display preselected voltage |
| Augangswiderstand | output resistor |
| AUS | off |
| Ausgang | output |
| Ausgangsisolation | output insulation |
| Ausgangssteuerung | output control |
| Ausschaltverlustleistung | turn-off dissipation |
| Begrenzung | limitation |
| Bereich | range |
| Beschreibung | description |
| Betrieb | operation |
| Betriebsstundenzähler | elapsed-hour meter |
| Betriebstemperatur | operating temperature |
| Breite | width |
| Buchse | socket |
| ca. | appr. |
| Dauergrenzstrom | continuous critical current |
| Digital-Programmierung | digital programming |
| dreiphasig | three-phase |
| Durchlaßspannung | conduction voltage |
| Durchlaßstrom | forward current |
| EIN | on |
| Einschaltstrombegrenzung | starting current limitation |
| Einschaltverlustleistung | turn-on dissipation |
| Einschaltzeit | turn-on time |
| Einstellauflösung | setting resolution |
| einstellbar | adjustable |
| Einstellbereich | setting range |
| Energie | energy |
| Entladezeit | discharging time |
| Entladung | discharge |
| Entwicklung | development |
| Ersatzwiderstand | equivalent resistance |
| Fabrik-Nummer | serial number |
| Feinpöt 99%/1% | fine tune potentiometer 99%/1% |
| Fernbedienung | remote control |
| Fertigung | production |
| flink | fast |
| Freigabe | release |
| Frequenz | frequency |

| DEUTSCH | ENGLISCH |
|---|---|
| Frontplatte | front panel |
| Fühler | sense |
| Fühleranschlüsse | sense terminals |
| Garantie | warranty |
| gedrückt | pushed |
| Gegenstecker | mating connector |
| Gehäusetemperatur | case temperature |
| Gerät bereit | stand by |
| Gesamtverlustleistung | total power dissipation |
| Gewicht | weight |
| gezogen | pulled |
| Grenzlastintegral | load limit integral |
| Grenzstrom | critical current |
| Haltestrom | holding current |
| Hauptschalter | main switch |
| Hochspannung | high voltage |
| Hochspannungs-Behälter | HV-container |
| Hochspannungsstecker | high voltage plug |
| Höhe | height |
| HV-AUS | HV-OFF |
| HV-EIN | HV-ON |
| HV-Kabel | HV cable |
| HV-Relais ein | HV relay on |
| Induktivität | inductance |
| Interlock | interlock |
| Interlock HV-Stecker | interlock HV plug |
| Interlock-Schleife | interlock loop |
| Interlockschalter | interlock switch |
| Isolation | insulation |
| Isolations-Prüfspannung | insulation test voltage |
| isoliert | insulated |
| Istwert | actual value |
| Kassette | cassette |
| Klemme | clamp |
| Kondensator | capacitor |
| Kühlkörpertemperatur | heatsink temperature |
| Kühlmitteltemperatur | coolant temperature |
| Kupferschiene | copper bar |
| Kurz ab (kurzzeitige Abschaltung) | brief interruption |
| Kurzschluß | short circuit |
| kurzschlußfest | short-circuit proof |
| Kurzzeitbetrieb | short-time operation |
| Lampen-Test | lamp test |
| Lampenstrom | lamp current |
| Leistung | power |
| Leistung ein/aus | power on/off |
| Leistungsbegrenzung | power limitation |
| Leistungsregelung | power regulation |
| Lichtstrom | luminous flux |
| linear geregelt | linear regulated |
| Lüfter | fan |
| Luftmenge | air quantity |
| Meldung | message |
| Modifikation | modification |
| negativ | negative |
| Nennlast | nominal load |

| DEUTSCH | ENGLISCH |
|---|---|
| Netz | line ( alternativ: mains , power ) |
| Netzanschluß | mains connection |
| Netzeingang | mains input ( alternativ: AC power input ) |
| Netzgerät | power supply |
| Netzfilter | line filter |
| Netzkabel | main cable |
| Netzspannung i.O. | mains voltage ok. |
| nicht zündender Steuerstrom | non-trigger current |
| Niederspannung | low voltage |
| NOT-AUS | emergency off |
| offen | open |
| Periodendauer | period lenght |
| periodischer Einschaltstrom | repetitive turn-on current |
| Phasenfehler | phase failure |
| Pol | terminal |
| Polarität | polarity |
| positiv | positive |
| potentialfreie Programmierung | floating analog programming |
| Programmiergeschwindigkeit | programming speed |
| Programmierung | programming |
| Puls | pulse |
| Pulsausgang | pulse output |
| Qualitätsprüfung | quality control |
| Regelabweichung | deviation |
| Regelung | regulation |
| Regelzeit | regulating time |
| Reset | reset |
| Rückplatte | rear panel |
| Rückseite | rear side |
| rückseitig | on the rear |
| Rückwärts-Sperrstrom | reverse current |
| Schaltverlustleistung | switching dissipation |
| Schirm | screen |
| Schleusenspannung | threshold voltage |
| Schlüsselschalter | key switch |
| Schrank | rack |
| Segmenttest | display-segment test |
| Sicherheit | safety |
| Sicherung | fuse |
| Simulation | simulation |
| Sollwert | set value |
| Spannung | voltage |
| Spannung ein | voltage on |
| Spannung erreicht | charge voltage achieved |
| Spannung i.O. | voltage ok. |
| Spannungsmessung | voltage measurement |
| Spannungsmonitor | voltage monitor |
| Spannungsregelung | voltage control |
| Speicherzeit | storage time |
| Sperrschichttemperatur | junction temperature |
| Spitzensteuerstrom | peak trigger current |
| Spitzenstrom | forward current |
| Spule | coil |
| Stabilität | stability |
| Stecker | plug |
| Steueranschluß | input control |

| DEUTSCH | ENGLISCH |
|---|---|
| Steuerimpulsdauer | trigger pulse duration |
| Steuerspannung | trigger voltage |
| Steuerstrom | trigger current |
| Steuerung | control |
| Steuerung extern | external control |
| Steuerung Netzgerät | power supply control |
| Störung Gerät | unit fault |
| Stoßstrom-Grenzwert | surge current limit value |
| Strom | current |
| Strom-Effektivwert | RMS current |
| Strombegrenzung | current limitation |
| Strommessung | current measurement |
| Strommonitor | current monitor |
| Stromregelung | current control |
| Supraleiter | superconductor |
| Tantal | tantalum |
| Thyristor | thyristor |
| Tiefe | depth |
| Tischgehäuse | table-top case |
| träg | slow |
| Transformator | transformer |
| Transistor | transistor |
| Treiber | driver |
| Trigger / kontinuierlich | trigger / continuous |
| Überlast | overload |
| Überschwinger | overshoot |
| Überspannung | overvoltage |
| Überstrom | overcurrent |
| Übertemperatur | overtemperature |
| Überwachung | monitoring |
| Umschalter | switchover contact |
| Umgebungstemperatur | ambient temperature |
| Unterbrechung | interrupt |
| Unterspannung | undervoltage |
| Verlustleistung | power dissipation |
| verriegeln | lock |
| Vorheizzeit | preheating time |
| Vorwahl | pre setting |
| Vorwärts-Sperrstrom | forward leakage current |
| Wärmetauscher | heat exchanger |
| Wärmewiderstand | thermal resistance |
| Wasserkühlung | water cooling |
| Wassermenge | water quantity |
| Welligkeit | ripple |
| Widerstand | resistor |
| Wiederholbarkeit (Reproduzierbarkeit) | reproducibility |
| Wiederholfrequenz | repetition frequency |
| Wirkungsgrad | efficiency |
| Zeit | time |
| Zerhacker | chopper |
| Zündspannung | ignition voltage |
| Zündstrom | ignition current |
| Nur spannungslos stecken / umpolen | Plug-in / pole inversion only at voltage-free output |

CE

FuG Elektronik GmbH

*Nieder- und Hochspannungs-Netzgeräte*

# EC- Certificate of Conformity

This is to certify that the

DC-Power Supplies

## HCE - Series

**in all power and voltage classes with single-phase mains connection**

**from serial no.: 10080-01-01 to 99999-99-99 YYYY/MM**

YYYY – Year MM – Month

comply with the provisions of the Directive of the European Union on the approximation of the laws of the Member States

-relating to electrical equipment for use within defined voltage limits
( 73/23/EEC revised by 93/68/EEC )

-relating to electromagnetic compatibility
( 89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC, 93/97/EEC )

Conformity is proven by compliance with the following standards:

EN 61010 - 1
EN 61000 – 6 – 1
EN 61000 – 6 – 3
EN 61000 – 3 – 2

Rosenheim, 11 May 2005

F.u.G. Elektronik GmbH

Sales & QM

ppa. A. Elsasser

fug Qualitäts-Sicherung

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**zertifiziert nach DIN EN ISO 9001**

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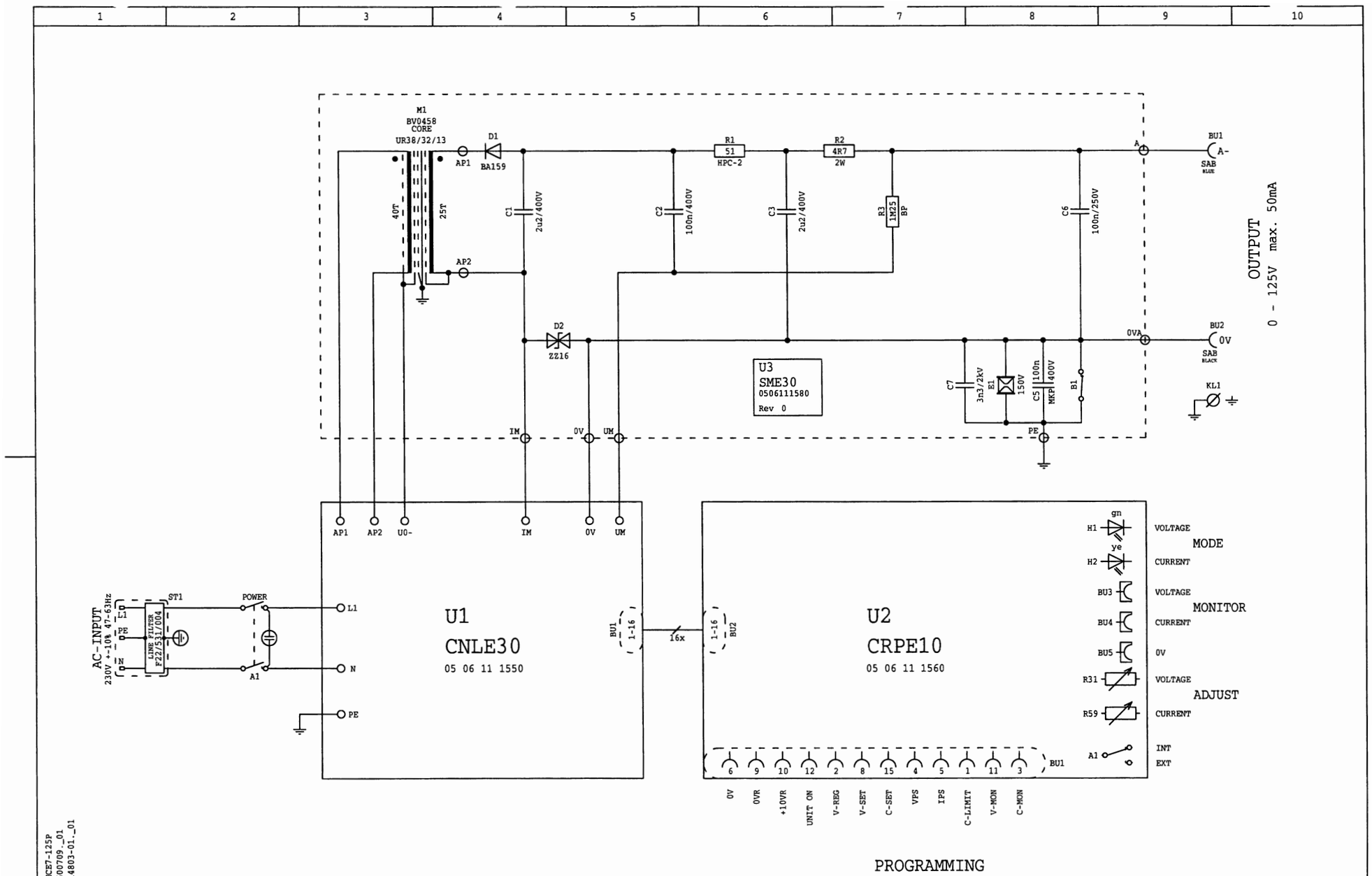
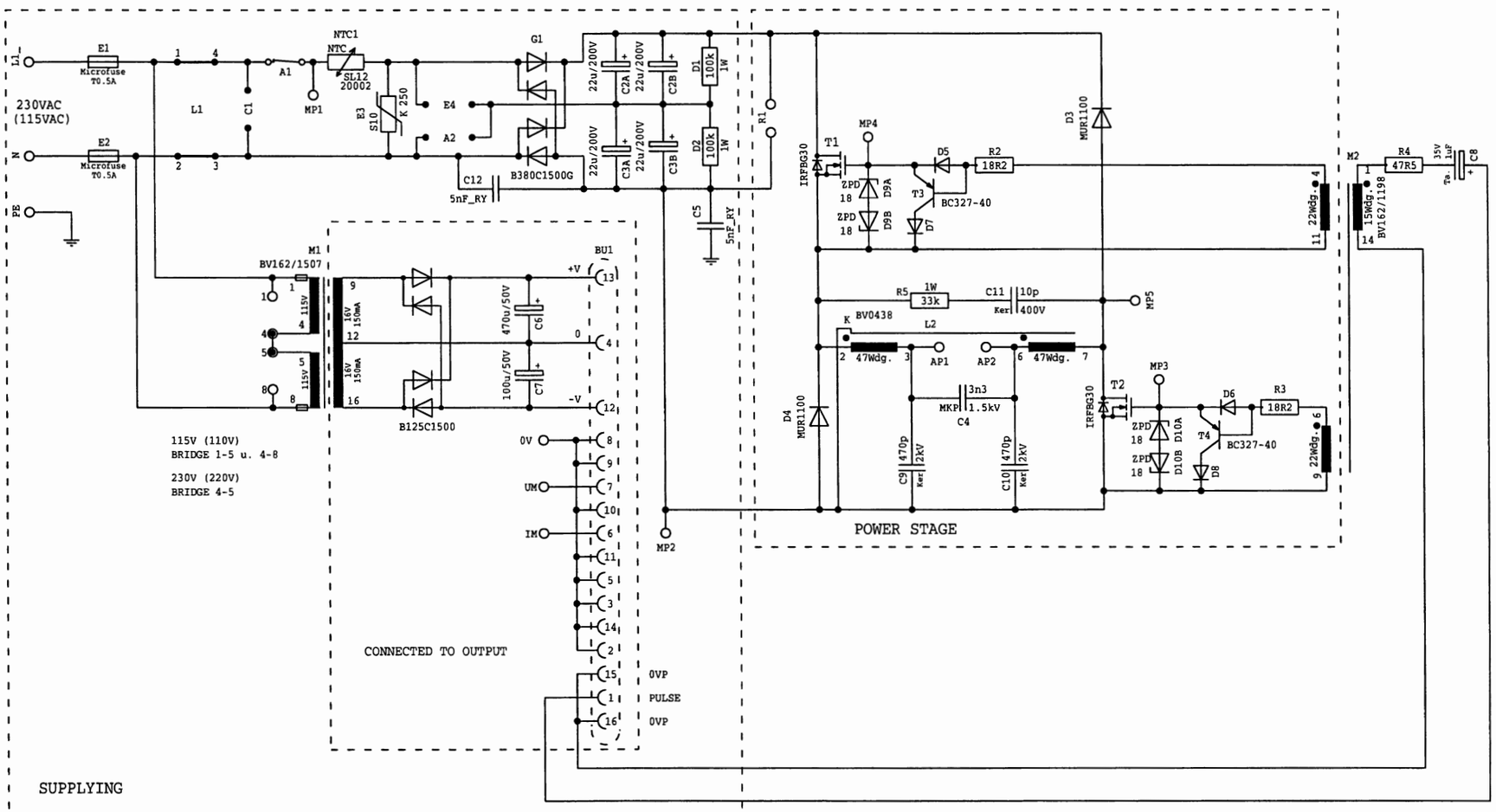



HCE7-125P
600709._01
14803-01._01

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diese Zeichnung darf ohne unsere Einwilligung weder Dritten noch Konkurrenz - firmen mitgeteilt werden. (Par. 1 u. 11 vom 19.7.1901 - u. Par. 823 II BGB ) | CHANGE: | | | REV 0 | MAIN SCHEMATIC | Elektronik GmbH Florianstr.2 D-83024 Rosenheim | TYPE HCE 7 - 125 NEG |
| | DRAWN: | 10.10.05 | Kozak | | | | SER.NO.: 14803-01-01 |
| | CHECKED: | 07. MRZ. 2007 | | | | | PAGE: 1 TOTAL: 3 |




ALL UNMARKED DIODES = 1N4148

PARTS ON PCB: A1-2, Bu1, C1-12, D1-10, E1-4, G1-2, L1-2, M1-2, MP1-5, NTC1, R1-5, T1-4

NOT ON BOARD: E4,A2

cnle30f._12
600709._02

| Platine: | Rev. | LgNr.: | #Format |
|---|---|---|---|
| CNLE30 | F | 0506011550 | #166x100 |



| | | | | | | |
|---|---|---|---|---|---|---|
| CHANGE: | 27.06.02 | Kozak | D1,D2,R1 | | | |
| DRAWN: | 17.02.93 | Kowalski | REV | GROUP | CNLE 30 | |
| CHECKED: | 07. MRZ. 2007 | | 12 | U1 | 05 06 11 1550 | |

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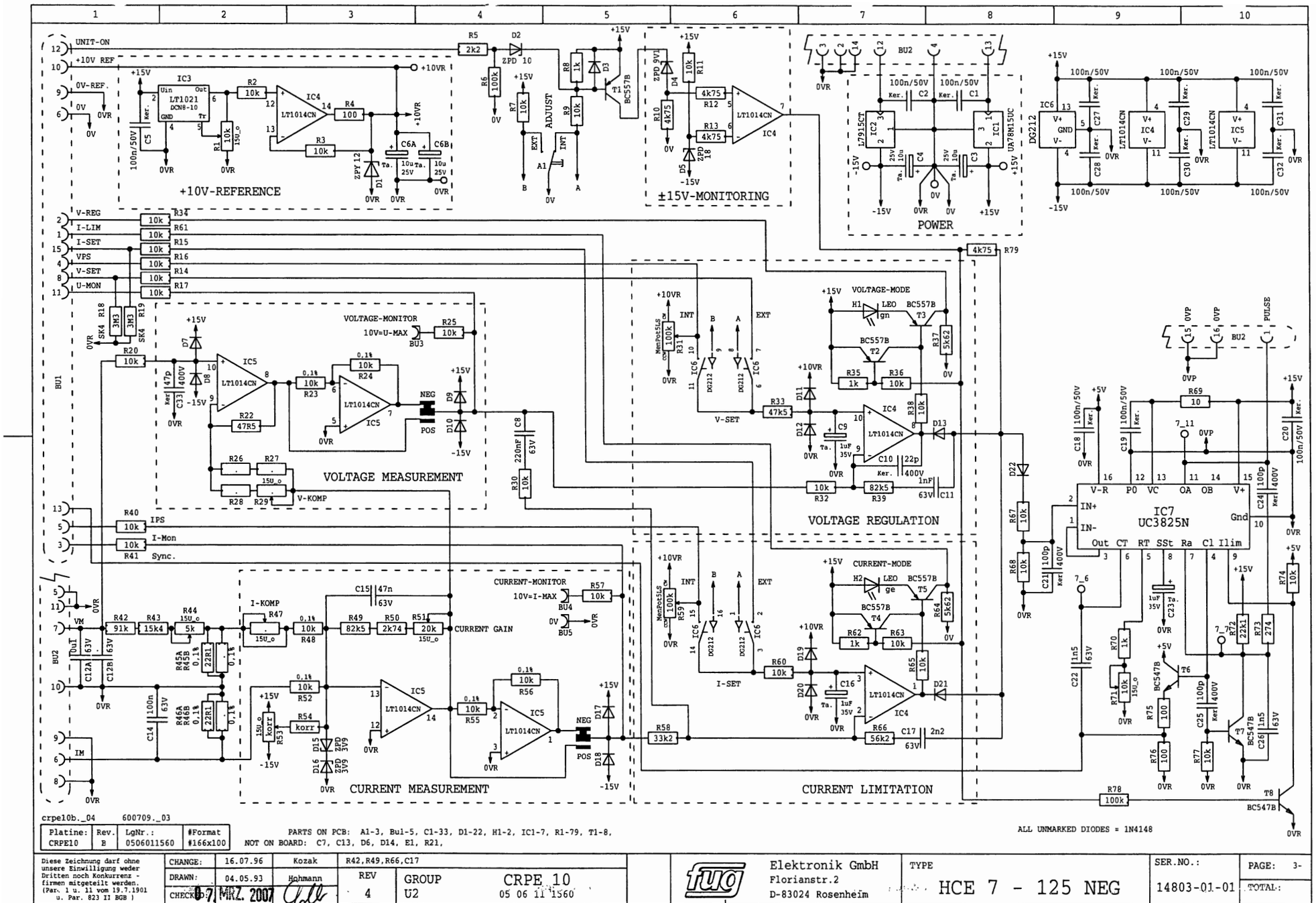
| TYPE | SER.NO.: | PAGE: 2+ |
|---|---|---|
| HCE 7 - 125 NEG | 14803-01-01 | TOTAL: |




crpe10b._04 600709._03

| Platine: | Rev. | LgNr.: | #Format |
|---|---|---|---|
| CRPE10 | B | 0506011560 | #166x100 |

PARTS ON PCB: A1-3, Bu1-5, C1-33, D1-22, H1-2, IC1-7, R1-79, T1-8,
NOT ON BOARD: C7, C13, D6, D14, E1, R21,

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| | | | |
|---|---|---|---|
| CHANGE: | 16.07.96 | Kozak | R42,R49,R66,C17 |
| DRAWN: | 04.05.93 | Hohmann | |
| CHECKED: | 07. MRZ. 2007 | | |

REV 4

GROUP U2

CRPE 10
05 06 11 1560

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TYPE
HCE 7 - 125 NEG

SER.NO.: 14803-01-01

PAGE: 3-

TOTAL: