# HEE Series

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**0.5kV - 30kV; 60W**
**VERSATILE, PRECISION REGULATED**
**HIGH VOLTAGE POWER SUPPLIES**

## FEATURES

- Precise high voltages up to 30kV at max. 60W
- Positve or negative polarity
- Output voltage and current control
- Internal reference voltage
- Stable output voltage
- Low ripple and noise
- Low EMI
- Capacitor charger option
- Patented resonance converter technology
- 3U/12HP cassette
- Modified versions available on request
- Made in Germany


HEE modules are versatile, precise and stable analog controlled high voltage power supplies. The HEE series covers output voltages of up to 30kV (the >10kV models are preliminary) in a 3U/12HP cassette. A version in a compact metal box is available too (HME series). The maximum output power is 60W.

The HV output is brought out via a SHV connector. The supply and control voltages are connected via an H15 connector. Analog I/O is provided for remote monitoring and control of output voltage and current by means of analog control voltages or potentiometers (internal reference voltage). Inhibit, Kill Enable and remote ON inputs are provided.

The HEE modules can be equipped as capacitor charger with very low output voltage overshoot (option C).
The patented resonant converter technology guarantees high efficiency and low EMI.

| Output Voltage $V_{NOM}$ | Max. Output Current $I_{NOM}$ | Model | | Ripple / Noise @f>10Hz typ. |
|---|---|---|---|---|
| | | Positive Polarity Output | Negative Polarity Output | |
| 0 – 500V | 120mA | **HEE-0.5P120-24-#** | **HEE-0.5N120-24-#** | 0.25$V_{PP}$ |
| 0 – 1 000V | 60mA | **HEE-1P60-24-#** | **HEE-1N60-24-#** | 0.5$V_{PP}$ |
| 0 – 1 500V | 40mA | **HEE-1.5P40-24-#** | **HEE-1.5N40-24-#** | 0.75$V_{PP}$ |
| 0 – 2 000V | 30mA | **HEE-2P30-24-#** | **HEE-2N30-24-#** | 1$V_{PP}$ |
| 0 – 3 000V | 20mA | **HEE-3P20-24-#** | **HEE-3N20-24-#** | 1.5$V_{PP}$ |
| 0 – 4 000V | 15mA | **HEE-4P15-24-#** | **HEE-4N15-24-#** | 2$V_{PP}$ |
| 0 – 5 000V | 12mA | **HEE-5P12-24-#** | **HEE-5N12-24-#** | 2.5$V_{PP}$ |
| 0 – 6 000V | 10mA | **HEE-6P10-24-#** | **HEE-6N10-24-#** | 3$V_{PP}$ |
| 0 – 8 000V | 7mA | **HEE-8P7-24-#** | **HEE-8N7-24-#** | 4$V_{PP}$ |
| 0 – 10 000V | 6mA | **HEE-10P6-24-#** | **HEE-10N6-24-#** | 5$V_{PP}$ |
| 0 – 15 000V | 4mA | **HEE-15P4-24-#** | **HEE-15N4-24-#** | 120$V_{PP}$ |
| 0 – 20 000V | 3mA | **HEE-20P3-24-#** | **HEE-20N3-24-#** | 400$V_{PP}$ |
| **Preliminary Models:** | | | | |
| 0 – 30 000V | 2mA | **HEE-30P2-24-#** | **HEE-30N2-24-#** | |

**#**: set/monitor voltage range designator: "**5**" or "**10**" for 0-5V or 0-10V respectively




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## ▪ SPECIFICATIONS (500V to 20kV models)

| | |
|---|---|
| Input Supply Voltage ($V_{IN}$): | $+24V_{DC}$ ± 5% (max 3.5A) |
| Output Current Limit: | (1.02 - 1.04) * $I_{NOM}$ |
| Line Regulation: | < 1 * $10^{-4}$ * $V_{NOM}$ ($\Delta V_{OUT} / \Delta V_{IN}$ min to max supply voltage) |
| Load Regulation: | < 2 * $10^{-4}$ * $V_{NOM}$ ($\Delta V_{OUT} / \Delta R_{LOAD}$ no load to rated load) |
| Temperature Coefficient: | 2 * $10^{-4}$/K |
| Supply / Control Connector: | DIN 41612 H15 male |
| Output Connector: | 0.5kV to 6kV models: SHV connector<br>8kV to 10kV models: HB11 connector (GES)<br>15kV to 20kV models: HB21 connector (GES) |
| Control: | analog control signals: VSET, ISET, VMON, IMON<br>5V control inputs: HV_ON, KILL_ENA, INHIBIT |
| Reference Voltage ($V_{REF}$): | 5V (1mA) or 10V (1mA) (model dependent).<br>This reference voltage is intended for external potentiometers to program the output voltage and/or current (connect wiper to VSET, ISET) |
| Voltage Setting (VSET): | $V_{VSET}$ = 0 to $V_{REF}$ results in $V_{OUT}$ = 0 to $V_{NOM}$ ±1% |
| Current Limit Setting (ISET): | $V_{ISET}$ = 0 to $V_{REF}$ results in $I_{OUT}$ = 0 to $I_{NOM}$ ±1% |
| Voltage Monitor (VMON) | $V_{OUT}$ = 0 to $V_{NOM}$ results in $V_{VMON}$ = 0 to $V_{REF}$ |
| Current Monitor (IMON) | $I_{OUT}$ = 0 to $I_{NOM}$ results in $V_{IMON}$ = 0 to $V_{REF}$ |
| Remote ON (HV_ON) | 5V level, active Low<br>Low: $V_{OUT}$ according to $V_{VSET}$ with ramp ca. $V_{NOM}$/4s<br>High or open: $V_{OUT}$ = 0 with ramp ca. $V_{NOM}$/4s |
| Kill (KILL_ENA) | 5V level, active High<br>High: $V_{OUT}$ = 0 without ramp if signal INHIBIT is active<br>Restoring the output voltage is only possible after applying INHIBIT or HV_ON again<br>Low or open: $V_{OUT}$ according to $V_{VSET}$ |
| Inhibit (INH) | 5V level, active Low<br>Low: $V_{OUT}$ off<br>High or open: $V_{OUT}$ according to $V_{VSET}$ |
| Protection: | Overload, arc, output short circuit, over-voltage, over-temperature.<br>**Only one short circuit or arc event per second allowed!**<br>In case of higher arc/S.C. frequency the RMS output current must be limited to $I_{NOM}$ |
| Cooling: | Convection cooling; has to be sufficient under load conditions |
| Dimensions: | Euro cassette 3U x 12HP x 160mm |

All voltages are referenced to GND




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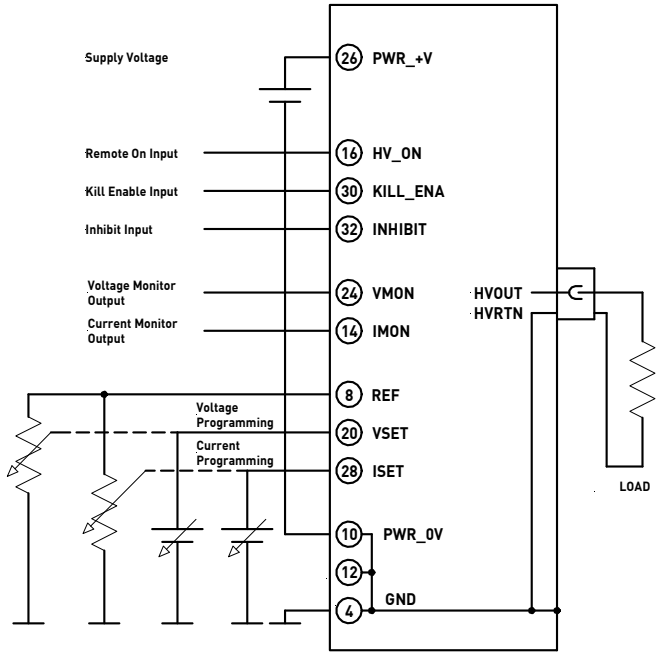
## CONNECTION DIAGRAM




## PIN FUNCTION DESCRIPTIONS

| Pin No. | Designation | Function |
|---|---|---|
| 4 | GND | Signal Ground |
| 8 | REF | Reference Voltage Output |
| 10, 12 | PWR_0V | Supply Voltage Ground |
| 14 | IMON | Current Monitor Output |
| 16 | HV_ON | Remote On Input |
| 20 | VSET | Voltage Programming Input |
| 24 | VMON | Voltage Monitor Output |
| 26 | PWR_+V | Input Supply Voltage |
| 28 | ISET | Current Programming Input |
| 30 | KILL_ENA | Kill Enable Input |
| 32 | INHIBIT | Inhibit Input |

GND, PWR_0V and HVRTN are internally connected; the case is connected to GND.

## OPTIONS

**C** capacitor charger with very low output voltage overshoot

## ORDERING INFORMATION

| HEE | - | 2 | P | 30 | - | 24 | - | 5 | - | C |
|---|---|---|---|---|---|---|---|---|---|---|
| Base Part Designation | | Output Voltage [kVDC] | Output Polarity | Output Current [mA] | | Input Supply Voltage [VDC] | | Set/Monitor Voltage Range [VDC] | | Options (if applicable) |

Examples: HEE-2P30-24-5 (HEE series, 2kV, positive polarity, 30mA, 24V supply, 5V reference)

HEE-2P30-24-5-C (HEE series, 2kV, positive polarity, 30mA, 24V supply, 5V reference, capacitor charger option)





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