

**0.5kV - 20kV; 60W/80W**  
**VERSATILE, PRECISION REGULATED**  
**HIGH VOLTAGE POWER SUPPLIES**

▪ **FEATURES**

- Precise high voltages up to 20kV at 60W/80W
- Positive or negative polarity
- Output voltage and current control
- Internal reference voltage
- Stable output voltage
- Low ripple and noise
- Low EMI
- Inhibit, Kill Enable and ON inputs
- Capacitor charger option
- Patented resonance converter technology
- 3U/12HP cassette
- Modified versions available on request
- Made in Germany



Output Voltage V <sub>NOM</sub>	Max. Output Current I <sub>NOM</sub>	Model	Max. Ripple / Noise	Internal Capacitance nominal	Internal Capacitance at V <sub>NOM</sub>	Damping Resistor	Discharge Resistor
				Basic Model			
				Capacitor Charger (option C)			
0 – 500V	120mA	<b>HEE-0.5x120-24-#</b>	0.1V <sub>PP</sub> *	3000nF 2000nF	2000nF	0.02kΩ 0.11kΩ	5MΩ 5MΩ
0 – 1 000V	60mA	<b>HEE-1x60-24-#</b>	0.1V <sub>PP</sub> *	1200nF 220nF	220nF	0.1kΩ 0.4kΩ	55MΩ 55MΩ
0 – 1 500V	40mA	<b>HEE-1.5x40-24-#</b>	0.1V <sub>PP</sub> *	750nF 150nF	150nF	0.1kΩ 1.5kΩ	55MΩ 55MΩ
0 – 2 000V	30mA	<b>HEE-2x30-24-#</b>	0.2V <sub>PP</sub> *	600nF 200nF	200nF	0.1kΩ 1.5kΩ	55MΩ 55MΩ
0 – 2 000V	40mA	<b>HEE-2x40-24-#</b>	0.3V <sub>PP</sub>	600nF 200nF	200nF	0.1kΩ 1.5kΩ	55MΩ 55MΩ
0 – 3 000V	20mA	<b>HEE-3x20-24-#</b>	0.5V <sub>PP</sub> *	140nF 60nF	12nF	1kΩ 2kΩ	55MΩ 55MΩ
0 – 4 000V	15mA	<b>HEE-4x15-24-#</b>	2V <sub>PP</sub> *	64nF 24nF	9nF	1kΩ 2kΩ	55MΩ 55MΩ
0 – 5 000V	12mA	<b>HEE-5x12-24-#</b>	2.5V <sub>PP</sub> *	64nF 24nF	6nF	1.4kΩ 2.35kΩ	500MΩ 500MΩ
0 – 6 000V	10mA	<b>HEE-6x10-24-#</b>	0.5V <sub>PP</sub> *	64nF 24nF	5nF	3.6kΩ 10.5kΩ	500MΩ 500MΩ
0 – 8 000V	7mA	<b>HEE-8x7-24-#</b>	4V <sub>PP</sub>	22.0nF 7.6nF	3.2nF	9.0kΩ 13.5kΩ	500MΩ 250MΩ
0 – 10 000V	6mA	<b>HEE-10x6-24-#</b>	1V <sub>PP</sub>	22.0nF 7.6nF	2.6nF	9.0kΩ 13.5kΩ	500MΩ 250MΩ
0 – 15 000V	4mA	<b>HEE-15x4-24-#</b>	120V <sub>PP</sub>	6.8nF 6.8nF	2.8nF	13.5kΩ 13.5kΩ	330MΩ 330MΩ
0 – 20 000V	3mA	<b>HEE-20x3-24-#</b>	400V <sub>PP</sub>	3.0nF 3.0nF	1.4nF	55kΩ 55kΩ	330MΩ 330MΩ

- x:** output voltage polarity designator: "P" or "N" for positive or negative respectively  
**#:** set/monitor voltage range designator: "5" for 0-5V (standard) or  
"10" for 0-10V on request (minimum order quantity applies).  
**\***: available with reduced ripple on request (minimum order quantity applies).

Minimum order quantity may apply for certain models.

HEE modules are versatile, precise and stable analog controlled high voltage power supplies. The HEE series covers output voltages of up to 20kV in a 3U/12HP cassette. A version in a compact metal box providing up to 30kV is available too (HME series). The maximum output power is 60W, and 80W on selected models.

The HV output is brought out via SHV, HB11 or HB21 connectors, depending on the output voltage. 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.

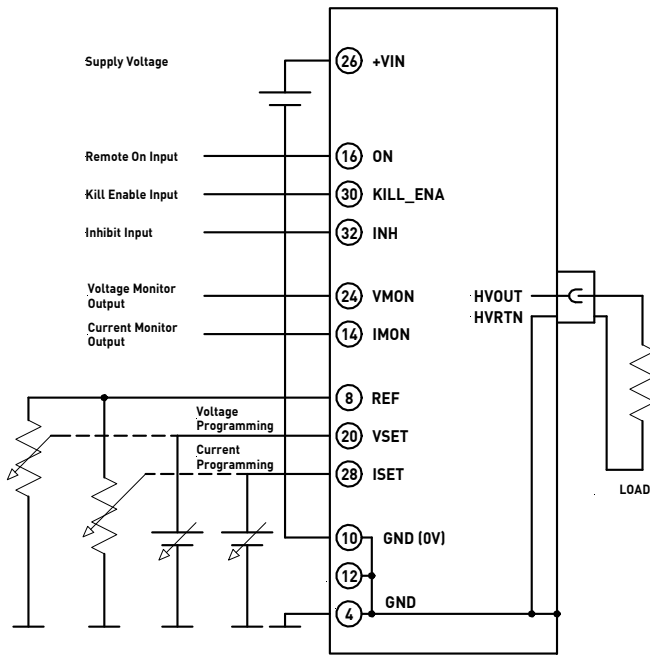
The HEE modules can be equipped as capacitor charger with very low output voltage overshoot (option C).

## ■ SPECIFICATIONS

Input Supply Voltage ( $V_{IN}$ ):	+22.8V <sub>DC</sub> to +26.4V <sub>DC</sub> (max 3.5A - 60W models, max. 4.5A - 80W models)
Output Polarity:	positive or negative; factory fixed
Output Current Limit:	$(1.02 - 1.04) * I_{NOM}$
Line Regulation:	standard: $< 1 * 10^{-4} * V_{NOM}$ ( $\Delta V_{OUT} / \Delta V_{IN}$ min to max supply voltage) option C: $< 2 * 10^{-4} * V_{NOM}$
Load Regulation:	$< 2 * 10^{-4} * V_{NOM}$ ( $\Delta V_{OUT} / \Delta R_{LOAD}$ no load to rated load)
Temperature Coefficient:	$2 * 10^{-4}/K$
Control:	analog control signals: VSET, ISET, VMON, IMON 5V control inputs: INH, KILL_ENA, ON
Reference Voltage ( $V_{REF}$ ):	5.0V (max. 1mA); 10.0V (max. 1mA) optionally for -10 models. 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 $V_{NOM} \pm 1\%$
Voltage Ramp Up/Down:	standard: ca. $0.25 * V_{NOM}/s$ capacitor charger models (C): $< 50ms$ to $V_{NOM}$
Current Limit Setting (ISET):	$V_{ISET} = 0$ to $V_{REF}$ results in $I_{OUT} = 0$ to $I_{NOM} \pm 1\%$
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 $V_{REF}$
Repeat Accuracy:	$< 1\% * V_{OUT}$ (capacitor charger models)
Efficiency:	$> 80\%$ (at rated output power)
Remote ON (ON):	active Low (10k $\Omega$ pullup to +5V) Low (0V to 1V): $V_{OUT}$ according to $V_{VSET}$ High (3.5V to 10V) or open: $V_{OUT} = 0$ The output voltage ramps up/down at ramp speed given above.
Kill Enable (KILL_ENA):	5V level, active High High: $V_{OUT} = 0$ without ramp if signal INH is active Restoring the output voltage is only possible after applying INH or ON again Low or open: $V_{OUT}$ according to $V_{VSET}$
Inhibit (INH):	active Low (10k $\Omega$ pullup to +5V) Low (0V to 1V): $V_{OUT}$ off High (3.5V to 10V) or open: $V_{OUT}$ according to $V_{VSET}$ The output will be shut off immediately without ramp by INH=Low. After power-on or shutdown due to an error condition (input voltage out of range, over-temperature, output overvoltage) INH must be held Low for $>300ms$ to re-establish normal operation.
Protection:	Remote ON (ON) or Inhibit (INH) signals must not be used for safety-relevant shut down! Overload, arc, output short circuit, over-voltage, over-temperature. <b>Only one short circuit or arc event per second allowed!</b> In case of higher arc/S.C. frequency the RMS output current must be limited to $I_{NOM}$
Supply / Control Connector:	DIN 41612 H15 male
Output Connector:	0.5kV – 6kV models: SHV 8kV – 10kV models: HB11 15kV – 20kV models: HB21
Temperature Range:	Operating: $-20^{\circ}C$ to $+50^{\circ}C$ Storage: $-20^{\circ}C$ to $+85^{\circ}C$
Cooling:	Convection cooling; has to be sufficient under load conditions
Humidity:	20% to 90% non-condensing
Dimensions:	Euro cassette 3U x 12HP x 160mm

All voltages are referenced to GND

## CONNECTION DIAGRAM



## PIN FUNCTION DESCRIPTIONS

Pin No.	Designation	Function
4	GND	Signal Ground
8	REF	Reference Voltage Output
10, 12	GND (0V)	Supply Voltage Ground
14	IMON	Current Monitor Output
16	ON	HV ON Input
20	VSET	Voltage Programming Input
24	VMON	Voltage Monitor Output
26	+VIN	Input Supply Voltage
28	ISET	Current Programming Input
30	KILL_ENA	Kill Enable Input
32	INH	Inhibit Input

GND, GND (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	-	3	P	20	-	24	-	5	-	C
Base Part Designation		Output Voltage [kV <sub>DC</sub> ]	Output Polarity	Output Current [mA]		Input Supply Voltage [V <sub>DC</sub> ]		Set/Monitor Voltage Range [V <sub>DC</sub> ]		Options (if applicable)

Examples: HEE-3P20-24-5 (HEE series, 2kV, positive polarity, 30mA, 24V supply, 5V reference)

HEE-3P20-24-5-C (HEE series, 2kV, positive polarity, 30mA, 24V supply, 5V reference, capacitor charger option)

### Disclaimer

The information given in this data sheet is technical data, not assured product characteristics. It has been carefully checked and is believed to be accurate; however, no responsibility is assumed for inaccuracies. The user has to ensure by adequate tests that the product is suitable for his application regarding safety and technical aspects. hivolt.de GmbH & Co. KG does not assume any liability arising out of the application or use of any product described.

### Safety Advice

Design, installation and inspection of machinery and devices carrying high voltage require accordingly trained and qualified personnel. Appropriate safety rules and directives must be complied with.

Improper handling of high voltage can mean severe injuries or death and may cause serious collateral damage!