HED Series

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0.2kV - 6kV; 12W
PRECISION REGULATED, REVERSIBLE POLARITY
HIGH VOLTAGE POWER SUPPLIES

▪ FEATURES

- Precise high voltages up to 6kV at max. 12W
- Polarity electronically reversible
- Patented resonance converter technology
- Very low ripple and noise
- Very low EMI
- Inhibit, Kill Enable and ON inputs
- 3U/8HP cassette
- Modified versions available on request
- Made in Germany

HED modules are highly precise and highly stable analog controlled high voltage power supplies with reversible output polarity. The HED series covers output voltages of up to 6 kV in a 3U/8HP cassette. A version in a compact metal box is available too (HMD series). The maximum output power is 12W

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). Output Polarity control as well as Inhibit, Kill Enable and remote ON inputs are provided.

The patented resonant converter technology guarantees high efficiency and low EMI.

Output Voltage V_{NOM}	Max. Output Current I_{NOM}	Model	Internal Capacitance Nominal	Damping Resistor	Discharge Resistor
0 – 200V *	10mA	**HED-0.2R10-24-#-E**	450nF	0.10kΩ	12MΩ
0 – 500V	10mA	**HED-0.5R10-24-#-E**	450nF	0.10kΩ	12MΩ
0 – 1000V	10mA	**HED-1R10-24-#-E**	240nF	0.10kΩ	12MΩ
0 – 1500V	8mA	**HED-1.5R8-24-#-E**	130nF	0.10kΩ	12MΩ
0 – 2000V	6mA	**HED-2R6-24-#-E**	40nF	0.10kΩ	25MΩ
0 – 3000V	4mA	**HED-3R4-24-#-E**	40nF	0.10kΩ	25MΩ
0 – 4000V	3mA	**HED-4R3-24-#-E**	27nF	0.22kΩ	30MΩ
0 – 5000V	2mA	**HED-5R2-24-#-E**	10nF	0.68kΩ	30MΩ
0 – 6000V	1.5mA	**HED-6R1.5-24-#-E**	10nF	0.68kΩ	30MΩ

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

▪ SPECIFICATIONS

Input Supply Voltage (V_{IN}):	+24V_{DC} ± 5%	
Input Supply Current:	120mA max.	(@ V_{OUT} = 0)
	800mA max.	(@ V_{OUT} = V_{NOM}, max load)
Output Current Limit:	(1.02-1.04) ∗ I_{NOM}	
Output Current Limit Control:	0 - I_{NOM}	
Line Regulation:	< 1 ∗ 10^{-5} ∗ V_{NOM}	(ΔV_{OUT} / ΔV_{IN} min to max supply voltage)
Load Regulation:	< 5 ∗ 10^{-5} ∗ V_{NOM}	(ΔV_{OUT} / ΔR_{LOAD} no load to rated load)
Temperature Coefficient:	50ppm/K	
Ripple:	typ. ≤ 3mV_{PP}, max. 7mV_{PP}	(@ f>10Hz)

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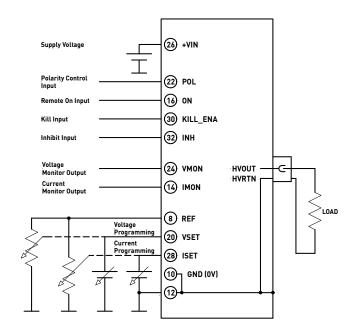|	
Supply / Control Connector:	DIN 41612 H15 male
Output Connector:	SHV (front panel)
Control:	analog control signals: VSET, ISET, VMON, IMON 5V control inputs: POL, ON, KILL_ENA, INH
Reference Voltage (V_{REF}):	5V (1mA) or 10V ** (1mA) (model dependent). This reference voltage is intended for external potentiometers to program the output voltage and/or current (connect wipers to VSET, ISET respectively)
Voltage Setting (VSET):	V_{VSET} = 0 to V_{REF} results in V_{OUT} = 0 to V_{NOM} ±1% (input impedance: 4.7MΩ)
Current Limit Setting (ISET):	V_{ISET} = 0 to V_{REF} results in I_{OUT} = 0 to I_{NOM} ±1% Connecting ISET to REF through a 10kΩ resistor results in current limit = I_{NOM}
Voltage Monitor (VMON):	V_{OUT} = 0 to V_{NOM} results in V_{VMON} = 0 to V_{REF} ±1% (output impedance: 10kΩ/100nF)
Current Monitor (IMON):	I_{OUT} = 0 to I_{NOM} results in V_{IMON} = 0 to V_{REF} ±1% (output impedance: 10kΩ/100nF)
Polarity Control (POL):	5V level, switchable at V_{OUT} = 0 High or open: V_{OUT} positive (red LED) Low: V_{OUT} negative (green LED) **The polarity may only be reversed when the output voltage is 0V!** Typical switching sequence: switch output off (ON -> High) **->** wait 4s for ramp down / discharge **->** reverse polarity (POL) **->** switch output on (ON -> Low)
Remote ON (ON):	5V level, active Low Low: V_{OUT} according to V_{VSET} or V_{ISET} with ramp ca. V_{NOM}/4s High or open: V_{OUT} = 0 with ramp ca. V_{NOM}/4s
Kill Enable (KILL_ENA):	5V level, active High High: V_{OUT} = 0 without ramp as soon as signal INH becomes active Restoring the output voltage is only possible after applying KILL_ENA or ON again Low or open: V_{OUT} according to V_{VSET} or V_{ISET}
Inhibit (INH):	5V level, active Low Low: V_{OUT} = 0 High or open: V_{OUT} according to V_{VSET} with ramp ca. V_{NOM} / 4s
Protection:	Overload, arc and output short circuit. **Only one short circuit or arc event per second allowed!** In case of higher arc/S.C. frequency the RMS output current must be limited to I_{NOM}
Temperature Range:	Operating: 0°C to +40°C Storage: -20°C to +85°C
Cooling:	Convection cooling; has to be sufficient under load conditions
Humidity:	≤ 70%
Dimensions:	Euro cassette 3U x 8HP x 160mm

All voltages are referenced to GND.

Specifications for stability, ripple and noise are valid in the range 2% * VNOM < VOUT ≤ VNOM, ISET ≥ 4% * INOM, 25°C, after 1h warm up
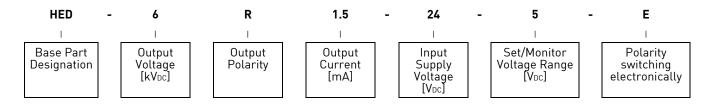
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▪ CONNECTION DIAGRAM

▪ PIN FUNCTION DESCRIPTIONS

Pin No.	Designation	Function
8	REF	Reference Voltage Output
10	GND (0V)	Power 0V (connected to pin 12)
12	GND	Signal GND (connected to pin 10)
14	IMON	Current Monitor Output
16	ON	HV ON Input
20	VSET	Voltage Programming Input
22	POL	Polarity Control 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 and HVRTN are internally connected;
the case is connected to GND.

▪ ORDERING INFORMATION

HED	–	6	R	1.5	–	24	–	5	–	E

Base Part Designation	Output Voltage [kV$_{DC}$]	Output Polarity	Output Current [mA]	Input Supply Voltage [V$_{DC}$]	Set/Monitor Voltage Range [V$_{DC}$]	Polarity switching electronically

Example: HED-6R1.5-24-5-E   (HED series, 6kV, reversible polarity, 1.5mA, 24V supply, 5V reference, polarity switching electronically)

* Models with 200V output voltage range on request only. Minimum quantities may apply.

** Models with 10V control/monitor voltage level on request only. Minimum quantities may apply.