
Series HSF 300W/600W/1200W/1500W in Rack Adapter RA 19-4C

SERIES HSF

The Kepco HSF series of hot-swappable plug-in power supplies are designed to be combined in an N+1 fault-tolerant power system. Built-in active current sharing and or-ing diodes are provided for this purpose. HSF may also be used independently as a multi-output power supply.

HSF 1UR 50W, 100W AND 150W MODELS are 1U low profile power supplies designed for applications where rack height is critical. Up to 4 single outputs or up to 2 redundant pairs with hot swap capability can fit into a single 19" rack.

HSF-PFC 3U 50W, 100W AND 150W MODELS are for high count multi-output (up to 8 independent outputs) and high count parallel applications (up to 4 redundant pairs) with hot swap capability in a single 19" rack.

HSF 3U 300W, 600W AND 1200W/1500W MODELS are for high power density applications capable of wide range voltage programmability. Up to 4 single outputs or up to 2 redundant pairs with hot swap capability can fit into a single 19" rack.

TYPICAL APPLICATIONS

- Industrial Control and Monitoring
- SCADA
- Burn-in and Production Test
- Wireless Communications
- CCTV/Security Systems

UL RECOGNIZED CSA CERTIFIED

This KEPCO product is backed by a firm 5-YEAR WARRANTY

HSF OPTIONS

FEATURE	DESCRIPTION	AVAILABLE ON MODELS	SUFFIX
Meter	Adds front panel meter which displays either voltage or current using a front panel mode switch and includes external current monitoring	HSF 300W, 600W and 1500W	M
Meter + 0V Functionality	Adds front panel meter and also allows output voltage adjustment down to 0V while maintaining full functionality for LED, alarm relay and meter	HSF 300W and 600W	MZ
0V Functionality (No Meter)	Similar to standard models except that the relay functions at a lower output voltage and the DC ON indicator functions down to 0V output voltage W models do not require a minimum load for parallel load sharing	Non-metered HSF 600W	W
Current Monitor	Allows current monitoring via an internal sense resistor (This is standard on 300W, 600W and 1200W/1500W models)	HSF 50W, 100W and 150W (-PFC and -1UR)	C
Improved Efficiency	Offers improved efficiency, lighter weight and a 50W, 28V model	HSF 50W, 100W and 150W (-PFC) and HSF 50W (-1UR)	T
Remote On-Off	Allows remote on-off control (This is standard on 300W, 600W and 1200W/1500W models)	HSF 50W, 100W and 150W (-PFC and -1UR)	X
Current Monitor, Remote On-Off	Includes both current monitoring and remote on-off	HSF 50W, 100W and 150W (-PFC and -1UR)	Y

Four HSF modules shown in RA 19-1U Housing

Rear View

HSF 1U RACK HOUSING

The RA 19-1U rack adapter mounts up to four HSF 50, 100 or 150 Watt-1UR power supplies. Each plug-in power supply is equipped with a power on/off switch, indicator LEDs and voltage test points.

The RA 19-1U provides access to the configuration DIP switches and rack keying without disassembling the rack. It also provides a redundant scheme with modules 1 and 3 being powered from one a-c input and modules 2 and 4 from a second a-c input. Module numbering is left to right facing the front panel.

The rack adapters permit almost any combination of independent, series and/or parallel-redundant operation. Parallel pairs in series provide increased voltage with N+1 redundancy. Each 1U rack adapter can provide up to 200V (series), 140A (parallel), or 100V/70A (parallel-redundant, N+1 pairs). System capability is further increased by multiple 1U rack adapters in parallel/series.

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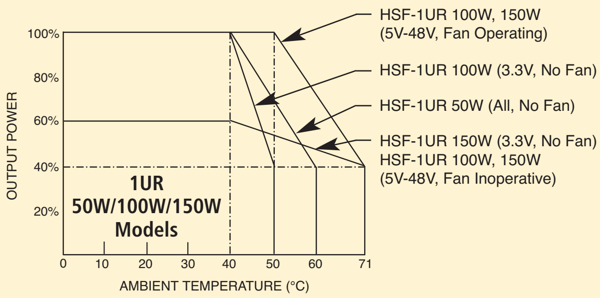
FIGURE 1
HSF-1UR Output Power vs. Ambient Temperature



HSF-1UR MODEL TABLE: 50W / 100W / 150W

MODEL	OUTPUT VOLTS(1)	ADJUSTMENT RANGE	OVP SETTING (VOLTS)	OUTPUT CURRENT AMPS(1) 0-40°C	OVERCURRENT LIMIT (2) (AMPS)	SW RIPPLE mV typ	NOISE (SPIKE) mV max
50 WATT MODELS							
HSF 3.3-10-1UR(3)	3.3	2.8-3.4	3.9~5.1	0-10	10.5	80	<120
HSF 5-10-1UR	5	4.3-5.3	5.7~6.4	0-10	10.5	80	<120
HSF 12-4.3-1UR	12	11.4-12.6	13.5~15.5	0-4.3	4.5	100	<150
HSF 15-3.5-1UR	15	13.5-16.5	16.8~18.8	0-3.5	3.6	100	<150
HSF 24-2.2-1UR	24	22.5-25.5	26.8~30.3	0-2.2(5)	3.3(6)	100	<150
HSF 28-1.8-1UR(4)	28	22.4-30.2	32.0~35.0	0-1.8	1.9	150	<200
HSF 48-1.1-1UR	48	45.0-51.0	54.8~59.9	0-1.1	1.15	130	<200
100 WATT MODELS							
HSF 3.3-25-1UR(3)	3.3	2.8-3.5	3.75~4.7	0-25	26.0	80	<120
HSF 5-20-1UR	5	4.3-5.3	5.6~6.4	0-20	20.7	80	<120
HSF 12-8.4-1UR	12	11.4-12.6	13.3~15.4	0-8.4	8.65	100	<150
HSF 15-6.7-1UR	15	13.5-16.5	16.8~18.8	0-6.7	6.8	100	<150
HSFI24-4.2-1UR	24	19.2-26.0	26.5~30.0	0-4.2	4.5	150	<200
HSFI28-3.5-1UR	28	26.5-29.5	29.7~34.7	0-3.5	3.6	150	<200
HSFI48-2-1UR	48I	44.0-52.0	54.5~59.5	0-2I	2.05	200	<300
150 WATT MODELS							
HSF 3.3-30-1UR(3)	3.3	2.8-3.4	3.75~5.0	0-30	38.5	80	<120
HSF 5-30-1UR	5	4.3-5.53	5.6~6.7	0-30	33.0	80	<120
HSF 12-12-1UR	12	9.8-13.0	13.3~15.5	0-12	13.7	100	<150
HSF 15-10-1UR	15	12.3-16.5	16.8~18.8	0-10	11.0	100	<150
HSF 24-6.3-1UR	24	19.2-26.0	26.5~30.3	0-6.3(7)	10.5	150	<200
HSF 28-5.3-1UR	28	23.0-30.2	31.5~34.8	0-5.3	5.94	150	<200
HSFI48-3.1-1UR	48	40.2-52.2	54.5~59.8	0-3.1	3.52	200	<300

(1) See Temperature vs Output Power Curve, Figure 1.
Maximum Power Rating (W) = Nominal Output Volts (V) x Maximum Output Current (A). Reducing voltage allows operation without degradation at higher current as long as maximum power rating is not exceeded.
(2) Current Limit is square type (50W) or hiccup type (100W, 150W). After the overload is removed, output is automatically restored.
(3) Identical units may be paralleled, however forced current sharing is not available.
(4) T, C, X and Y suffix models only.
(5) 3.2A peak (peak current and thermal protection applicable to 24V standard (no options) and C suffix models only).
(6) 2.3A min for 24V, T, X and Y suffix models only.
(7) 10A peak (peak current and thermal protection applicable to 24V standard (no options) and C suffix models only).

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HSF FEATURES

- Plug-in construction. Easy mount and dismount.
- User configurable combinations of 50, 100, 150 watt plug-in modules in rack adapters RA 19-(X)B for 3U PFC and RA 19-1U for 1UR modules. Combinations of 300, 500 and 1200/1500 watt plug-in modules are accommodated by the RA 19-4C rack adapter.
- Parallel for N+1 redundancy with or-ing diodes built in.
- All models have active PFC (Power Factor Correction).
- NEBS TR-WWT-4063 qualified.
- Front panel voltage trimming.
- Keyed construction to prevent incorrect module placement. The HSF are keyed according to their voltage rating. When the corresponding rack adapter key (pin) is installed by a user, only an HSF of the correct voltage can be inserted into the keyed slot.
- All HSF models (except 1200W/1500W models) provide separate remote error voltage sense terminals: 0.25V drop/wire.
- Active current share is used to configure an N+1 system. When the current share bus of paralleled HSF are connected together, the load current divides equally. If one unit fails, the remaining units will divide the load equally among themselves and continue to supply uninterrupted current to a critical load. The failed unit is isolated by built-in or-ing diodes.
- A built-in relay provides either normally open (close on failure) or normally closed (open on failure) contacts that may be used to provide an external failure indication.
- The HSF obtain mains power and provide output via a 24 pin connector that mates with a corresponding connector in the rack adapter.
- Safety: HSF 1UR, 600W, 1200W/1500W units certified to UL 60950-1, 1st Edition, 2007-10-31 (Information Technology Equipment – Safety – Part 1: General Requirements). All other models are designed to meet the same standard.
- Bellcore requirements: designed to meet NEBS GR-63-CORE specifications. Certified for an RA 19-6B with six HSF 150W plug-ins tested per GR-63-CORE, level 4 (earthquake and office vibration).
- Redundant AC mains input is a design point in all HSF series rack adapters as an additional layer of system redundancy.

Model HSF 5-10PFC 50W

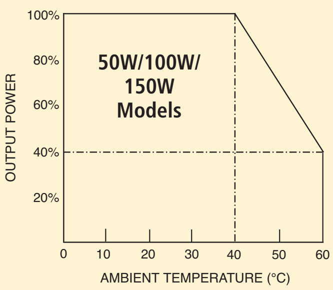
HSF 3U MODEL TABLE: 50W / 100W / 150W

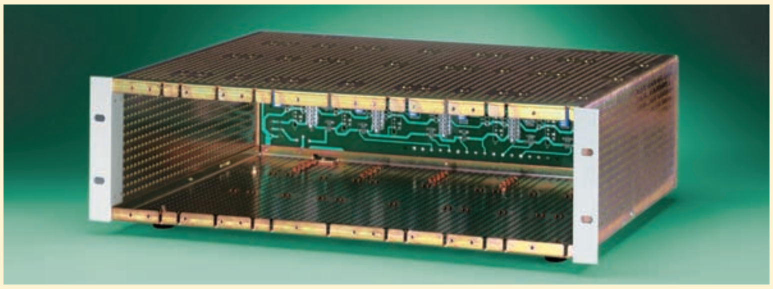
MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE VOLTS	OVP SETTING VOLTS	OUTPUT CURRENT(1) AMPS 0-40°C	CURRENT LIMIT (2) AMPS min	SW RIPPLE mV p-p typ	NOISE (spike) mV p-p max
50 WATT MODELS							
HSF 3.3-10PFC	3.3	2.8-3.4	3.9~5.1	10	13.1	80	120
HSF 5-10PFC	5	4.3-5.3	5.7~6.4	10	10.5	80	120
HSF 12-4.3PFC	12	11.4-12.6	13.5~15.5	4.3	4.5	100	150
HSF 15-3.5PFC	15	13.5-16.2	16.8~18.8	3.5	3.6	100	150
HSF 24-2.2PFC	24	22.5-25.5	26.8~30.3	2.2(4)	3.3(5)	100	150
HSF 28-1.8PFC(3)	28	22.4-30.2	32.0~35.0	1.8	1.9	150	150
HSF 48-1.1PFC	48	44.0-52.0	54.8~59.9	1.1	1.15	200	200
100 WATT MODELS							
HSF 3.3-20PFC	3.3	2.8-3.4	3.75~5.1	20	26.2	80	<120
HSF 5-20PFC	5	4.3-5.3	5.7~6.4	20	21	80	<120
HSF 12-8.5PFC	12	11.4-12.6	13.7~15.7	8.5	8.92	100	<150
HSF 15-7PFC	15	13.5-16.5	17.0~19.0	7.0	7.35	100	<150
HSF 24-4.5PFC	24	19.2-26.0	27.0~30.5	4.5(6)	6.82(7)	100	<150
HSF 28-3.8PFC	28	26.5-29.5	32.0~35.0	3.8	3.99	100	<150
HSF 48-2.1PFC	48	44.0-52.0	53.5~60.0	2.1	2.2	130	<200
150 WATT MODELS							
HSF 3.3-30PFC	3.3	2.8-3.4	3.75~5.1	30	36.7	80	120
HSF 5-30PFC	5	4.3-5.3	5.6~6.5	30	31.5	80	120
HSF 12-13PFC	12	9.6-13.2	13.7~15.7	13	13.65	100	150
HSF 15-10PFC	15	12.5-16.5	17.0~19.0	10	10.5	100	150
HSF 24-6.5PFC	24	19.2-26.4	27.0~30.5	6.5(8)	10.5	100	150
HSF 28-5.5PFC	28	22.4-30.8	32.0~35.0	5.5	5.78	100	150
HSF 48-3.3PFC	48	38.4-52.8	53.5~60.0	3.3	3.46	130	200

(1) See Temperature vs. Output Power curve, Figure 2.
(2) Current limit is square type or hiccup type (100W, 150W options T, C, X and Y). After the overload is removed, output is automatically restored.
(3) T, C, X and Y suffix models only.
(4) 3.2A peak (peak current and thermal protection applicable to 24V standard (no options) and C suffix models only.)
(5) 2.3A min. for 24V - T, C, X and Y suffix 50W models only.
(6) 6.5A peak (peak current and thermal protection applicable to 24V model only).
(7) 4.6A min. for 24V - T, C, X and Y suffix 100W models only.
(8) 10.6A peak (peak current and thermal protection applicable to 24V model only).

FIGURE 2

HSF-PFC Output Power vs. Ambient Temperature





RA 19-(X)B for HSF PFC Models 5 1/4"H x 19"W x 14.5"D

HSF 3U MODEL TABLE: 300W

MODEL	OUTPUT VOLTS	OVP SETTING[1] VOLTS V d-c	OUTPUT CURRENT[2] AMPS 0-40°C	OVERCURRENT SETTING[3] A d-c	RIPPLE[4] mV typ	SW NOISE[4] (spike) max
HSF 5-60	5	5.7~7.0	60	63-78	80	120
HSF 12-27	12	14.3~16.8	27	28.4-35.1	120	150
HSF 15-22	15	18.0~21.0	22	23.1-28.6	120	150
HSF 24-14	24	29.3~33.6	14	14.7-18.2	150	200
HSF 28-12	28	34.2~39.2	12	12.6-15.6	150	200
HSF 48-7	48	54.5~59.8	7	7.4-9.1	200	200

(1) When undervoltage or overvoltage is detected, output is shut OFF. Recovery is either by opening, then reconnecting short across ±RC terminals (no delay), or by removing, and after approximately 40 seconds, reapplying AC input power.
(2) See Power vs. Temperature, Figure 3, for power derating.
(3) Square type. If overcurrent condition continues beyond 30 seconds, the output is shut OFF. Recovery is the same as for undervoltage or overvoltage fault (see note 1 above).
(4) Ripple and noise specifications are 1.5 times indicated values for temperature range of -10 to 0°C. Ripple and noise levels above are satisfied when conditions are 0 to 100% load, 0 to 40°C (derated between 40 and 55°C per Power vs. Temperature, see Figure 2) and bandwidth ≤100MHz.

HSF 3U MODEL TABLE: 600W

MODEL	OUTPUT VOLTS	OVP SETTING[1] VOLTS V d-c	OUTPUT CURRENT[2] AMPS 0-40°C	OVERCURRENT SETTING[3] A d-c	RIPPLE[4] mV typ	SW NOISE[4] (spike) max
HSF 12-53	12	14.3~16.8	53	55.6-68.9	180	220
HSF 15-43	15	18.0~21.0	43	45.1-55.9	180	220
HSF 24-27	24	29.3~33.6	27	28.3-35.1	220	320
HSF 28-23	28	34.2~39.2	23	24.1-29.8	220	320
HSF 48-13	48	54.5~59.8	13	13.7-16.9	220	320

(1) When undervoltage or overvoltage is detected, output is shut OFF. Recovery is either by opening, then reconnecting short across ±RC terminals (no delay), or by removing, and after approximately 40 seconds, reapplying AC input power.
(2) See Power vs. Temperature, Figure 3, for power derating.
(3) Square type. If overcurrent condition continues beyond 30 seconds, the output is shut OFF. Recovery is the same as for undervoltage or overvoltage fault (see note 1 above).
(4) Ripple and noise specifications are 1.5 times indicated values for temperature range of -10 to 0°C. Ripple and noise levels above are satisfied when conditions are 0 to 100% load, 0 to 40°C (derated between 40 and 55°C per Power vs. Temperature, see Figure 2) and bandwidth ≤100MHz.

HSF 3U ADJUSTMENT RANGE TABLE: 300W

ADJUSTMENT RANGE[1]	HSF 5-60			HSF 12-27			HSF 15-22			HSF 24-14			HSF 28-12			HSF 48-7		
		M	MZ		M	MZ		M	MZ		M	MZ		M	MZ		M	MZ
External Trimpot or Voltage (V d-c)	0[2] to 5.5	0 to 5.5	0 to 5.5	0[2] to 13.8	0[2] to 13.8	0 to 13.8	0[2] to 17.4	0[2] to 17.4	0 to 17.4	0[2] to 28.2	0[2] to 28.2	0 to 28.2	0[2] to 33	0[2] to 33	0 to 33	0[2] to 52.2	0[2] to 52.2	0 to 52.2
Front Panel Trimpot (V d-c)	1.8 to 5.5	0 to 5.5	0 to 5.5	0 to 13.8	5.5 to 13.8	0 to 13.8	6.5 to 17.4	7 to 17.4	0 to 17.4	6.5 to 28.2	7 to 28.2	0 to 28.2	6.5 to 33	7 to 33	0 to 33	6.5 to 52.2	7 to 52.2	0 to 52.2
Minimum[2] Adjustment (V d-c)	1.8	0	0	5.5	5.5	0	6.5	7	0	6.5	7	0	6.5	7	0	6.5	7	0

(1) Using trimpot to attain voltages outside the specified adjustment range may trigger undervoltage or overvoltage faults.
(2) Observe minimum for proper functioning of alarm relay, optional meter and LED.

HSF 3U ADJUSTMENT RANGE TABLE: 600W

ADJUSTMENT RANGE[1]	HSF 12-53				HSF 15-43				HSF 24-27				HSF 28-23				HSF 48-13			
		M	MZ	W		M	MZ	W		M	MZ	W		M	MZ	W		M	MZ	W
External Trimpot or Voltage (V d-c)	0[2] to 13.8	0[2] to 13.8	0 to 13.8	0[2] to 13.8	0[2] to 17.4	0[2] to 17.4	0 to 17.4	0[2] to 17.4	0[2] to 28.2	0[2] to 28.2	0 to 28.2	0[2] to 28.2	0[2] to 33	0[2] to 33	0 to 33	0[2] to 33	0[2] to 52.2	0[2] to 52.2	0 to 52.2	0[2] to 52.2
Front Panel Trimpot (V d-c)	0[2] to 13.8	9 to 13.8	0 to 13.8	5.5 to 13.8	0[2] to 17.4	11.5 to 17.4	0 to 17.4	6.5 to 17.4	0[2] to 28.2	17 to 28.2	0 to 28.2	6.5 to 28.2	0[2] to 33	21.5 to 33	0 to 33	6.5 to 33	0[2] to 52.2	35 to 52.2	0 to 52.2	6.5 to 52.2
Minimum[2] Adjustment (V d-c)	9	9	0	5.5	11.5	11.5	0	6.5	17	17	0	6.5	21.5	21.5	0	6.5	35	35	0	6.5

(1) Using trimpot to attain voltages outside the specified adjustment range may trigger undervoltage or overvoltage faults.
(2) Observe minimum for proper functioning of alarm relay, optional meter and LED. For W option, LED functions down to 0V.

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HSF 3U MODEL TABLE: 1200W / 1500W

MODEL (1)	OUTPUT VOLTS V d-c	ADJUSTMENT RANGE		OVP SETTING VOLTS(4) V d-c	OUTPUT POWER(5) A d-c/Watts 0-40°C			CURRENT LIMIT(8) A d-c			RIPPLE/ NOISE(11) mV p-p
		TRIMPOT(2) V d-c	VOLTAGE SOURCE(3) % E nominal		85-90V a-c Input(6)	90-170V a-c Input(7)	170-265V a-c Input	85-90V a-c Input	90-170V a-c Input	170-265V a-c Input	
HSF 24-50	24	16.8-30.5	75-125%	32-35	30-35/ 720-840	35/840	50/1200	31-57.5(9)	36-57.5(9)	52.5-57.5 (10)	250/350
HSF 36-42	36	6.1-54.0	17-150%	56-60	21-25.2/ 756-907	25.2/907	42/1512	22.3-36.8(9)	26-48.3(9)	44.1-48.3 (10)	350/450
HSF 48-32	48	33.6-54.0	70-115%	56-60	16-19.2/ 768-922	19.2/922	32/1536	17-36.8(9)	20-36.8(9)	33.6-36.8 (10)	350/450

(1) For metered version, add suffix "M".
(2) Either front panel trimpot or external 5K trimpot, except range for HSF 36-42 using front panel trimpot is 11.8-54.0V d-c.
(3) External voltage source range: 3.5 to 6.5 V d-c for HSF 24-50, 0-5.75V d-c for HSF 36-42, 3.5 to 5.75V d-c for HSF 48-32.
(4) When undervoltage or overvoltage is detected, output is shut OFF. Recovery is by removing power and reapplying power after approximately 30 seconds, or by opening and reclosing the RC terminals.
(5) See Power vs. Temperature, Figure 3, and Power vs. Input Voltage, Figure 4, for power derating.If output power (actual output voltage x output current) exceeds limits shown, output is shut OFF. Recovery is by removing power and reapplying power after approximately 30 seconds, or by opening and reclosing the RC terminals.
(6) 85-95V a-c input for HSF 36-42.
(7) 95-170V a-c input for HSF 36-42 and HSF 48-32.
(8) Current limit value determined by combination of input voltage and output voltage setting. For example: if HSF 48-32 with 120V a-c input is set to output 33.6V (adjustment range min.), current limit value is closer to 36.8A (max for 90-170V a-c input). If output is set to 54.0V, overcurrent value is closer to 20A (min. for range 90-170V a-c).
(9) Winker operation (85-170V a-c input, overcurrent characteristics may be square type, depending on input voltage) or square type (170-265V a-c input). After cause is removed, output voltage is restored automatically.
(10) Square type (170-265V a-c input). Unit first enters Current Limit; output voltage starts to drop (nearly square curve). If cause is removed while in Current Limit, output voltage restores automatically. If current continues to increase, Overcurrent is triggered. If Overcurrent is combined with an output voltage drop below 60% of rated output voltage (below 5V for 36V model), the unit shuts OFF. Recovery is either by opening, then reconnecting, short across ±RC pins at rack adapter (no delay), or by removing, and after approximately 30 seconds, reapplying a-c input power.
(11) 0 to 100% load, 0 to 40°C (from 40 to 55°C, see Power vs. Temperature, Figure 3), bandwidth ≤100MHz.

Metered Version HSF
(Add suffix "M" to the model number)

FIGURE 3

HSF 300W/600W/ 1200W/1500W Output Power vs. Ambient Temperature

THE POWER SUPPLY WILL START UP BETWEEN -20 TO -10°C BUT MAY NOT MEET PUBLISHED SPECIFICATIONS

NOTE: Safety agency approvals apply only to operation between -10°C and 40°C.

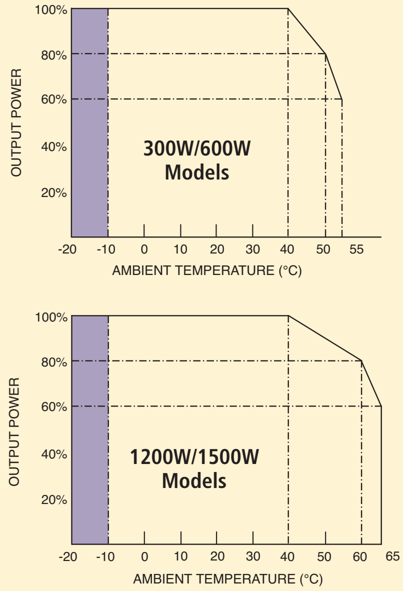
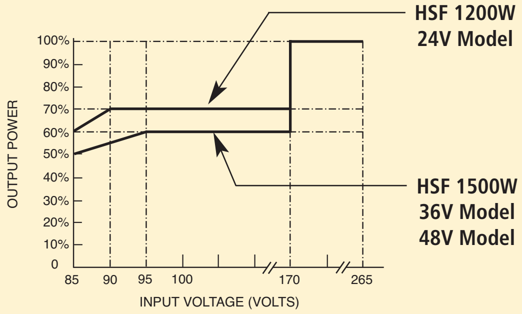


FIGURE 4

HSF 1200W/1500W Output Power vs. Input Voltage



For full product specs: www.kepcopower.com/hsf.htm

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