

FEATURED PRODUCT - SERIES HSF



RA 19-4B — Two 350W and two 150W HSF plug-ins

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 forced current sharing and or-ing diodes are provided for this purpose. HSF may also be used independently as a multi-output power supply.

There are plug-in HSF modules in four sizes ranging from 50 watts to 350 watts. They mount in various combinations using the rack adapters described on page 65.

The 50W and 100W models are available in a "1U" configuration mounted sideways so that up to 4 units may be mounted in the RA 19-1U housing. See page 66.

The front panel of each plug-in HSF module contains an on-off switch and a "V d-c on" light. When HSF modules are paralleled, the module with the highest voltage setting automatically becomes the "master" (indicated by the front panel "master on" light). The other units are slaves, track the voltage setting of the master and equally share the load current. The front panel voltage adjustment trimmer provides adjustment of the output voltage. A pair of test points provide access at the front panel to measure the voltage.



HSF MODEL TABLE

MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OVP SETTING (VOLTS)	OUTPUT CURRENT AMPS 0-40°C	CURRENT ⁽¹⁾ LIMIT (AMPS)	SW RIPPLE mV typ	SW RIPPLE mV max	NOISE (spike) mV max
50 WATT MODELS								
HSF 5-10	5	4.5-5.5	6.5~7.5	0-10	10.5~12.0	30	60	<120
HSF 12-4.2	12	11.4-12.6	13.7~15.7	0-4.2	4.4~5.1	35	70	<190
HSF 15-3.4	15	13.5-16.5	17.0~19.0	0-3.4	3.6~4.1	45	90	<220
HSF 24-2.1	24	22.5-25.5	27.0~30.5	0-2.1	2.2~2.6	50	100	<310
HSF 48-1	48	45.0-51.0	53.5~60.0	0-1	1.1~1.3	60	150	<350
100 WATT MODELS								
HSF 5-20	5	4.5-5.5	6.5~7.5	0-20	21.0~24.0	30	65	<120
HSF 12-8.3	12	11.4-12.6	13.7~15.7	0-8.3	8.7~10.0	35	70	<190
HSF 15-6.6	15	13.5-16.5	17.0~19.0	0-6.6	7.0~8.0	40	80	<220
HSF 24-4.2	24	22.5-25.5	27.0~30.5	0-4.2	4.4~5.2	50	110	<310
HSF 28-3.5	28	26.5-29.5	32.0~35.0	0-3.5	3.7~4.2	60	140	<330
HSF 48-2	48	45.0-51.0	53.5~60.0	0-2	2.1~2.4	80	220	<530
150 WATT MODELS								
HSF 5-30	5	4.5-5.5	6.5~7.5	0-30	32.0~36.0	30	60	<120
HSF 12-12	12	11.4-12.6	13.7~15.7	0-12	13.0~15.0	35	70	<190
HSF 15-10	15	13.5-16.5	17.0~19.0	0-10	11.0~13.0	40	80	<220
HSF 24-6	24	22.5-25.5	27.0~30.5	0-6	6.3~7.5	50	110	<310
HSF 28-5	28	26.5-29.5	32.0~35.0	0-5	5.3~6.1	60	140	<330
HSF 48-2.8	48	45.0-51.0	53.5~60.0	0-2.8	3.0~3.5	80	220	<530
350 WATT MODELS								
HSF 3.3-70	3.3	2.65-3.5	4.0~30.0 ⁽²⁾	0-70	73.0~84.0	30	50	<100
HSF 5-70	5	4.0-5.5	4.0~30.0 ⁽²⁾	0-70	73.0~84.0	30	50	<100
HSF 12-30	12	9.6-13.2	4.0~30.0 ⁽²⁾	0-30	31.5~36.0	40	70	<150
HSF 15-24	15	12.0-16.5	4.0~30.0 ⁽²⁾	0-24	25.2~28.8	40	70	<175
HSF 24-16	24	19.2-26.5	4.0~30.0 ⁽²⁾	0-16	16.8~19.2	60	100	<200
HSF 28-13	28	22.4-30.8	4.0~30.0 ⁽²⁾	0-13	13.6~15.6	60	100	<200
HSF 48-7.5	48	38.4-52.8	4.0~30.0 ⁽²⁾	0-7.5	7.8~9.0	60	100	<300

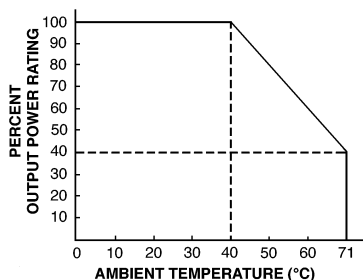
(1) Current limit is a rectangular type, not foldback.

(2) OVP Setting = % tracking above output.

HSF GENERAL SPECIFICATIONS

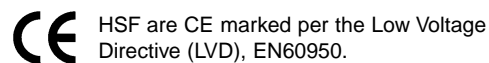
SPECIFICATION	RATING/DESCRIPTION			CONDITION
	50W	100W, 150W	350W	
Temperature	0 to 71°C See Figure 1			Operating
	-40°C to +85°C		-30°C to +75°C	Storage
Humidity	Up to 95% RH			Non-condensing Operating & storage
Shock	20g, 3 axes (11 msec ±5msec pulse duration)			Non-operating 3 shocks each axis
Vibration	6-10Hz: 10mm amplitude 3 axes			Non-operating 1 hour each axis
	10-55Hz: 2g, 3 axes			
Isolation Output-Case	500V d-c, 100M Ohm			25°C, 65% RH
Type of Construction	Plug-in			
Cooling	Convection		Forced air flow (fan)	
Withstand Voltage 50W	Input-Output	3.75KV a-c for 1 minute	3KV a-c for 1 minute	25°C, 65% RH Y caps removed
	Input-Case	2KV a-c for 1 minute		
Safety	UL 1950, EN60950, CSA 222 No. 950-5		UL 1950, EN60950, CSA 222 No. 234, Level 5	
Bellcore Requirements	NEBS GR-63-CORE			Designed to meet

FIGURE 1
Output Power Rating vs. Ambient Temperature



FEATURES

- Plug-in construction. Easy mount and dismount.
- User configurable combinations of 50, 100, 150 and 350 watt plug-in modules. See page 65.
- Parallel for N+1 redundancy.
- Or-ing diodes built in.
- 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.
- Built-in EMI filter attenuates the conducted noise below the requirements of both FCC and VDE 0871 for Class B computing devices.
- All HSF provide separate remote error sense terminals: 0.25V drop/wire.
- Forced 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.
- Reset button (350W only). Restores output after an overvoltage or overcurrent or thermal overload induced shutdown.
- **Safety:** designed to meet UL 1950, CSA C22.2 No. 234 (M90) level 3 and EN60950 (a-c input only).
- **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).





Model HSF 5-10 50W



Model HSF 15-6.6 100W



Model HSF 24-6 150W



Model HSF 24-16 350W

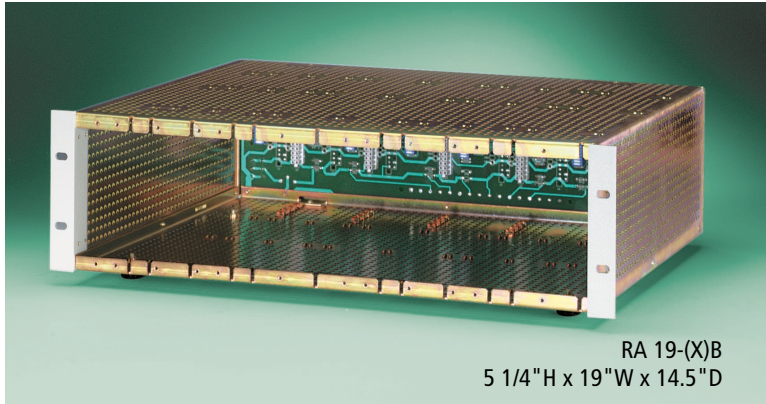
HSF INPUT CHARACTERISTICS

SPECIFICATION	RATING			CONDITION		
	50W, 100W, 150W	350W	50W, 100W, 150W	350W		
a-c Voltage	rated nominal	100/120/220/240V a-c			Single Phase	
	min-max range	95-264V a-c	85-264V a-c			
Power Factor	—	0.99 typ		—	EN61000-3-2	
d-c Voltage	min-max range	125-370V d-c ⁽¹⁾	110-370V d-c ⁽¹⁾		Polarity insensitive	
Brown-out Voltage	min	85V a-c 110V d-c	80V a-c 110V d-c		Ripple, source & load effect increase	Ripple, stabilization increase
Frequency		50-60Hz			Single Phase	
		47-440Hz ⁽²⁾				
EMI		FCC and VDE 0871	FCC		Conducted Class B	Conducted Class A
Soft-start Circuit		Thermistor or thyristor limiter	Resistor and thyristor limiter			
Leakage Current	max	0.5mA UL method	1.0mA UL method		120V a-c 50-60Hz	
	max	07.5mA VDE method	2.0mA VDE method		240V a-c 50-60Hz	
Start-up Time	max	50W < 500ms 100W & 150W < 200ms	900ms (500ms typ)		From turn-on until d-c output reaches nominal	
Holdup Time	typ	20msec	30msec		120V a-c	
	min	15msec	20msec		100V a-c	120V a-c
INPUT CURRENT (Amperes)		50W	100W	150W	350W	
					3.3 model	All other models
a-c Current	typ	1.0	2.0	3.0	3.0	4.0
	max	1.2	2.4	3.5	4.0	5.6
	typ	0.5	1.0	1.5	1.5	2.0
	max	0.7	1.6	2.0	2.0	2.8
Fuse Value		3.0A	5.0A	6.3A	10A	
Initial Turn-on Surge, First Half Cycle		45A		20A		120V a-c rms
		90A		40A		240V a-c rms
Efficiency	typ %	76		65	72	Max load, nominal output
Switching Frequency	typ	120KHz		150KHz		Main converter, forward
		—		120KHz		PFC converter

(1) Note: Safety agency approvals are valid only for a-c input because of the fuse rating.
 (2) At 440Hz the leakage current exceeds the UL safety specification.

HSF OUTPUT CHARACTERISTICS

SPECIFICATION	RATING			CONDITION	
	50W, 100W, 150W	350W	50W, 100W, 150W	350W	
Source Effect	typ	1.0%	0.05%	Single Phase	
	max	2.0%	0.1%	95-132V a-c or 190-264V a-c	
Load Effect	typ	1.0%	0.2%	10% to 100% load	0 to 100% load
	max	2.0%	0.3%		
Temperature Effect	typ	1.0%	0.5%	Nominal input, rated load 0 to 40°C	Nominal input, rated load -10° to 40°C
	max	2.0%	1.0%		
Combined Effect	typ	2.0%	0.7%	Includes source, load and temperature	
	max	4.0%	1.5%		
Time Effect (drift)	typ	0.1%	0.2%	0.5-8.5 hr. max load, 25°C	
	max	0.5%	0.5%		
Recovery Characteristic	excursion	<±4%	<±1%	Step load, 50-100% rise time>50µs	Step load, 50-100% rise time>10µs
	recovery	2ms	1ms	To within 4%	To within 1%



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

Accessories for HSF Models

Kepeco Series RA 19-(X)B rack adapters are specifically designed for the installation of Kepeco HSF Series power supplies into 19-inch EIA equipment racks. There are six standard models:

RA 19-3B - 350 Watt HSF (1/3 rack)

RA 19-6B - 150 Watt HSF (1/6 rack)

RA 19-8B - 50 Watt or 100 Watt HSF (1/8 rack)

RA 19-4B - mix of the 1/3 (two), 1/6 and 1/8 rack sizes

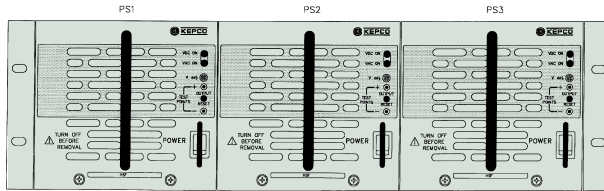
RA 19-5B - mix of the 1/3 (one), 1/6 and 1/8 rack sizes

RA 19-7B - mix of the 1/6 and 1/8 rack sizes

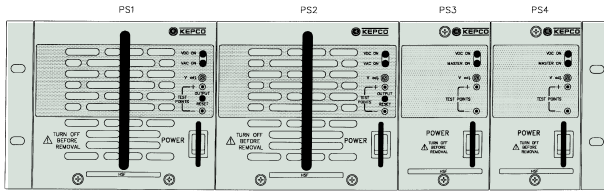
The HSF power supplies each provide a normally closed (NC) and normally open (NO) line referenced to common (COM) for use as an alarm at the user's discretion. The alarm circuit is isolated and independent of the power configuration (series, parallel or independent). The NC line opens upon failure, the NO line closes upon failure.

HSF 150W series power modules and the RA 19-6B rack adapter have been tested and deemed compliant with the requirements for physical protection of Network Equipment-Building System (NEBS) for earthquake zone 4 per GR-63-CORE, including both damage resistance and functional performance requirements. This means that the power assembly suffered no physical damage as a result of the testing and provided full specified performance both during and after exposure to the test environment.

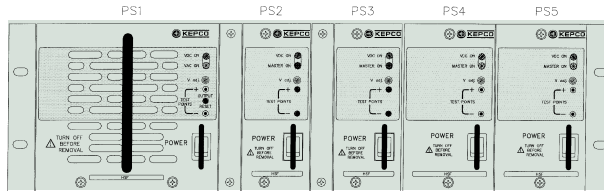
RA 19-3B
Rack Adapter
with (3) 350W
HSF Installed



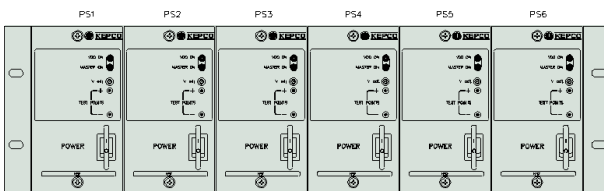
RA 19-4B
Rack Adapter
with (2) 350W
and (2) 150W
HSF Installed



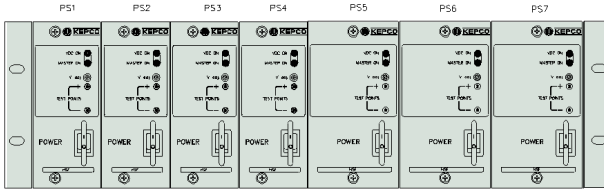
RA 19-5B
Rack Adapter
with (1) 350W,
(2) 50W,
(2) 150W HSF
and (2) Filler
Panels Installed



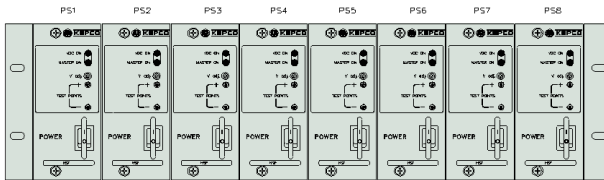
RA 19-6B
Rack Adapter
with (6) 150W
HSF Installed



RA 19-7B
Rack Adapter
with (4) 100W
and (3) 150W
HSF Installed



RA 19-8B
Rack Adapter
with (8) 100W
HSF Installed



Weights

RA 19-(X)B
50W
100W

English

22 lbs
4 lbs
5 lbs

Metric

1.0Kg
1.8Kg
2.3Kg

Weights

150W
350W

English

5.5 lbs
7 lbs

Metric

2.5Kg
3.2Kg

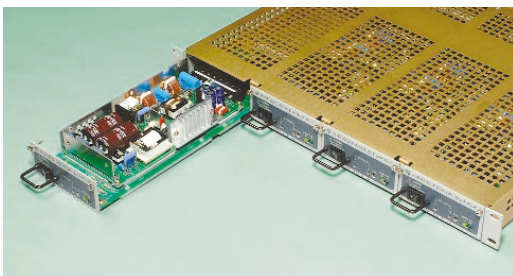
Accessory	Part Number	Use
Filler Panel 1/24 Rack RA 19-7B ONLY	RFP 19-24	Cover unused 1/24 rack space when 1/8 rack module plugged into 1/6 rack slot of RA 19-7B
Filler Panel 1/24 Rack RA 19-4B RA 19-5B ONLY	RFP 19-124	Cover unused 1/24 rack space when 1/8 rack module plugged into 1/6 rack slot of RA 19-4B or RA 19-5B
Filler Panel 1/12 Rack	RFP 19-12	Cover unused 1/12 rack space of adjacent slot when 1/6 rack module plugged into 1/8 rack slot
Filler Panel 1/8 Rack	RFP 19-18	Cover unused 1/8 rack slots
Filler Panel 1/6 Rack	RFP 19-16	Cover unused 1/6 rack slots
Filler Panel 2/8 Rack	RFP 19-28	Cover unused 2/8 rack slots
Filler Panel 2/6 Rack	RFP 19-26	Cover unused 2/6 rack slots
Filler Panel 3/8 Rack	RFP 19-38	Cover unused 3/8 rack slots
Filler Panel 1/2 Rack	RFP 19-48	Cover unused 1/2 rack slots



HSF 1U Rack Housing

The 1U high rack adapter will mount four of the HSF 50W-1U or HSF 100W-1U power supplies. Each plug-in power supply is equipped with a power on/off, indicator LEDs and voltage test points.

The RA 19-1U provides access to the 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.

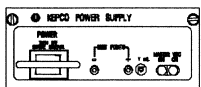


HSF 1U MODEL TABLE

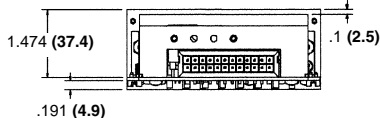
MODEL	OUTPUT VOLTS	ADJUSTMENT RANGE	OVP SETTING (VOLTS)	OUTPUT CURRENT AMPS 0-40°C	CURRENT ⁽¹⁾ LIMIT (AMPS)	SW RIPPLE mV typ	NOISE (spike) mV max
50 WATT MODELS							
HSF 5-10-1U	5	4.5-5.5	6.5~7.5	0-10.0	10.5~12.0	30	<120
HSF 12-4.2-1U	12	11.4-12.6	13.7~15.7	0-4.2	4.4~5.1	35	<190
HSF 15-3.4-1U	15	13.5-16.5	17.0~19.0	0-3.4	3.6~4.1	45	<220
HSF 24-2.1-1U	24	22.5-25.5	27.0~30.5	0-2.1	2.2~2.6	50	<310
HSF 48-1-1U	48	45.0-51.0	53.5~60.0	0-1	1.1~1.3	60	<350
100 WATT MODELS							
HSF 5-20-1U	5	4.5-5.5	6.5~7.5	0-20	21.0~24.0	30	<120
HSF 12-8.3-1U	12	11.4-12.6	13.7~15.7	0-8.3	8.7~10.0	35	<190
HSF 15-6.6-1U	15	13.5-16.5	17.0~19.0	0-6.6	7.0~8.0	40	<220
HSF 24-4.2-1U	24	22.5-25.5	27.0~30.5	0-4.2	4.4~5.2	50	<310
HSF 28-3.5-1U	28	26.5-29.5	32.0~35.0	0-3.5	3.7~4.2	60	<330
HSF 48-2-1U	48	45.0-51.0	53.5~60.0	0-2	2.1~2.4	80	<530

OUTLINE DIMENSIONAL DRAWINGS

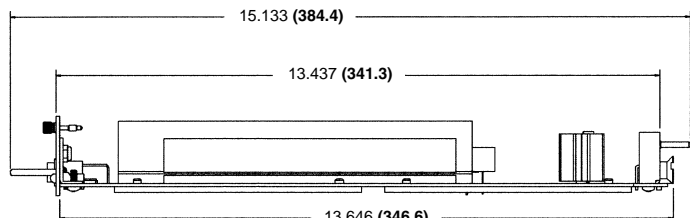
Fractional dimensions in light face type are in inches, **dimensions in bold face type are in millimeters.**
Tolerance: ± 1/64" (**0.4**) between mounting holes, ± 1/32" (**0.8**) other dimensions



FRONT VIEW



REAR VIEW



SIDE VIEW