

(Not Recommended For New Designs)



Applications

- Medical and dental equipment
- Test and measurement
- Chemical analysis equipment
- Drug infusion equipment
- Peripherals

Description

The ESM4 and ESM6 Series of modular AC-DC power supplies provide quick-turn-around, cost-effective power solutions for medical applications from 400 to 1000 watts. Low leakage currents, under 300 μ A (consult factory for leakage currents under 150 μ A), combined with conformance to IEC601-1 isolation and spacing requirements make these products ideal power sources for applications such as blood analyzers, DNA sequencers, and MRI and CAT scanners.

The ESM4 Series is available in 400 and 600 watt configurations, both providing up to eight outputs from 2.56" x 5" x 10.63" (65 x 127 x 270 mm) chassis. The ESM6 Series is available in 600 and 1000 watt versions, both providing up to twelve outputs from 2.56" x 7.36" x 10.63" (65 x 187 x 270 mm) packages. Five single-output and two dual-output modules can be configured in series or parallel to provide outputs from 1.45 to 58 VDC.

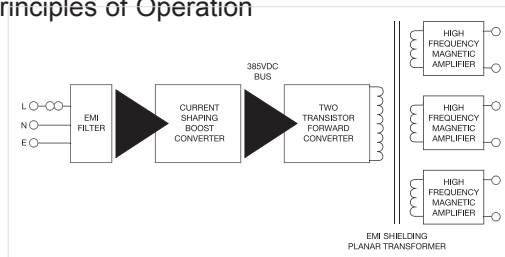
Single-Output Module Selection

Module	No. of Slots	Nominal Voltage	Range	I _{max}
Module 1	1	5 V	3 to 5.6 V	30 A
Module 2	1	12 V	5 to 13 V	20 A
Module 3	1	18 V	8 to 20 V	15 A
Module 4	1	24 V	12 to 28 V	12 A
Module 70	2	5 V	1.45 to 5.6 V	80 A

Dual-Output Module Selection

Module	No. of Slots	Nominal Voltage	Range	I _{max}
Module 5	1	24 V	10 to 28 V	3 A
		24 V	10 to 28 V	3 A
Module 6	1	5 V	3 to 5.6 V	10 A
		24 V	10 to 28 V	3 A

Principles of Operation



Specification All specifications are typical at nominal input, full load at 25°C unless otherwise stated.

Output Specifications

Maximum power	Input module B (for 4 slot only) Input module C (for 4 & 6 slot) Input module D (for 6 slot only)	400 W 600 W 1000 W ⁽¹⁾
Output adjustment	(Note 2)	Multi-turn potentiometer
Line regulation		±0.1%
Load regulation	50% load change	±0.2%
Cross regulation		±0.2% typ.
Transient response	(Note 3)	<10%, <0.5ms
Temperature coefficient		±0.02%/°C
Ripple and noise	(Note 4)	1.0% or 100mV pk-pk
Overvoltage protection		Standard on all outputs
Overcurrent protection	(Note 5)	Individual current limit
Thermal protection		Standard
Mains failure signal	Option 06 or 07	5 ms warning
Output isolation	(Note 6)	Each single and dual output fully floating
Margin	See application note for individual module margin capabilities	
Minimum load	(Note 7)	Zero
Turn-on delay	90 VAC, full load	900 ms max.
Remote sense	Single output modules only	0.5 V drop

Input Specifications

Input voltage range	Universal input	88 to 264 VAC 125 to 370 VDC
Input frequency range	(Note 8)	47Hz to 63 Hz
Inrush current	230 VAC @ 25°C	85A max.
Harmonic distortion	(Power factor)	EN61000-3-2

NOTES

- 1000 W peak power for 10 ms at low line. 800 W average power for input voltage less than 180 VAC.
- Outputs are user-adjustable or factory set to your requested voltage.
- 25% to 75% load change.
- Whichever is greater. 20 MHz bandwidth. (See application note for specification below 0°C).
- Straight line on all outputs. On Module 70 current limit adjustable from 50% to 110%. Optional foldback on Module 70 or contact factory for details see application note.

EMC Characteristics

Emissions: Conducted	EN55022, FCC ESM4B & ESM4C ESM6C & ESM6D	Level A Level B
Immunity: Electrostatic discharge	EN61000-4-2	Level 4
Radiated RFI	EN61000-4-3	Level 3
Fast transients - burst	EN61000-4-4	Level 3
Input line surges	EN61000-4-5	Class 3
Conducted RFI	EN61000-4-6	Level 3
Voltage dips	EN61000-4-11	Compliant

General Specifications

Hold-up time	(Note 9)	20ms typ after loss of AC power
Efficiency		82% typ.
Isolation voltage	Input/output Input/chassis	4000 VAC 1500 VAC
Switching frequency		200 kHz
Approvals and standards	(Note 11)	IEC601-1, UL60601-1 CAN/CSA-C22.2 No. 601-1-M90
Leakage current		<300 µA, 250 VAC, 60 Hz
Weight	ESM4B, ESM4C ESM6C, ESM6D	2.5 kg 3.5 kg
Size		See mechanical specifications
MTBF	See application note	400,000 hours

Environmental Specifications

Operating temperature (See derating curve)	See application note	-20°C to +50°C Derate 2.5% per °C up to +70°C
Storage temperature		-40°C to +85°C
Relative humidity	Non-condensing	5% to 95% RH
Shock		3000 bumps, 10 G (16 ms) half sine
Vibration		10-200 Hz, 1.5 G

- 100V isolation between each output and 500 V to chassis.
- All outputs except Module 70, which has 5.0% minimum load for full specification.
- Contact factory for 400 Hz operation.
- For nominal output voltages and full load.
- The specifications contained in this data sheet are believed to be correct at time of publication. Specifications are subject to change without notice.
- This product is not intended for use as a standalone unit and must be installed by authorized personnel in order to maintain approvals.

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28 V	3 A		24 V	10 to
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Output Signals

Output control signals are available on all output modules. (see application note)

Modules 1 to 6

- Power good signal
- Output inhibit signal

- Remote adjust (margin)

Module 70 Additional Features

- Adjustable Current Limit
- Foldback or Straight Line Current Limiting
- Bias Voltage
- Selectable Output Inhibit or Enable

Dual output modules:
Output signals available on first [top] output only.

Production Configuration:

Units are shipped with nominal output voltages unless special configuration is specified. Power-One can configure to your exact requirements through use of appropriate series and parallel busbars, and voltage adjustment to specific set points.

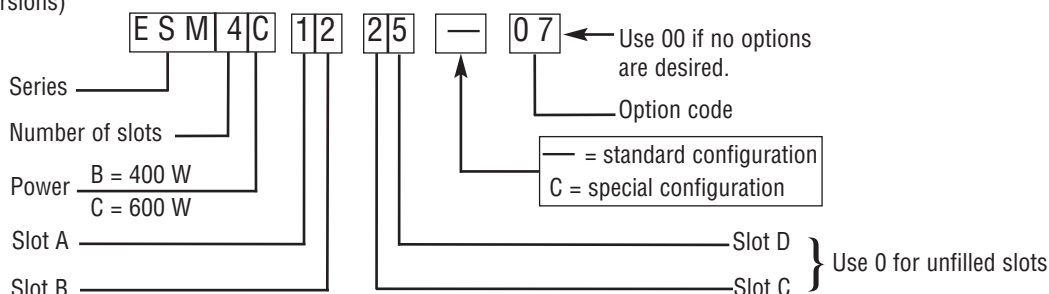
ESP/ESM Standard Options

- 06 Mains Power Fail + Global Enable + Bias Supply Voltage
- 07 Mains Power Fail + Global Inhibit + Bias Supply Voltage

How to Order ESM4

(Available in 400/600 Watt Versions)

Note: Calculate power requirements by summing output powers calculated at application output voltages.



Specification of power supply detailed above:

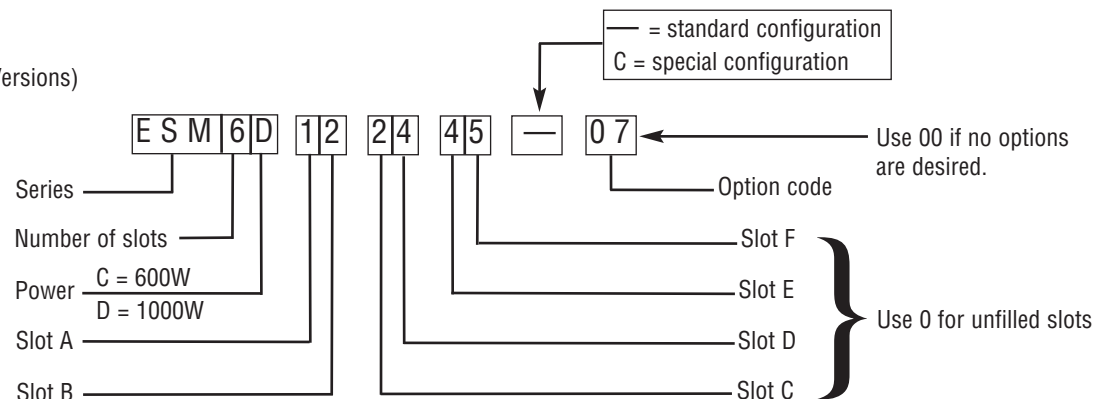
- 4-slot series
- Maximum output power: 600 W
- 5 V @ 30 A; 12 V @ 20 A; 24 V @ 3 A; 24 V @ 3 A
- Mains Power Fail signal + Logic Inhibit + Bias Supply Voltage

How to Order ESM6

(Available in 600/1000 Watt Versions)

Note: Calculate power requirements by summing output powers calculated at application output voltages.

For ESM6D:
Limit total power from slots A-C and D-F to 550W each.

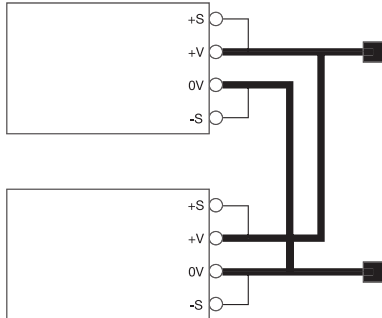


Specification of power supply detailed above:

- 6-slot series
- Maximum output power: 1000W
- 5V @ 30A; 12V @ 20A; 12V @ 20A; 24V @ 12A; 24V @ 12A; 24V @ 3A; 24V @ 3A
- Mains Power Fail signal + Logic Inhibit + Bias Supply Voltage

ESM Flexibility

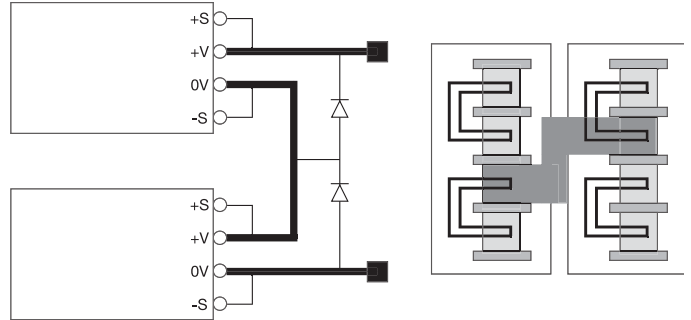
Using Modules in Parallel



Notes:

Maximum current = $(I_1 + I_2) \times .9$
Use two parallel links

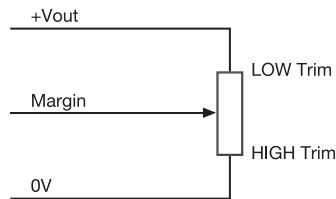
Using Modules in Series



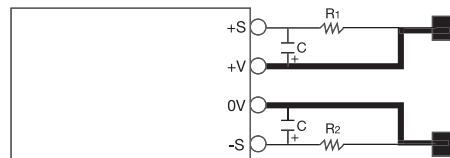
Notes:

Maximum voltage to chassis is 500V
Use series link
Reverse bias diodes may be required for certain applications, eg. large capacitive loads

Remote Adjustment



Remote Sensing

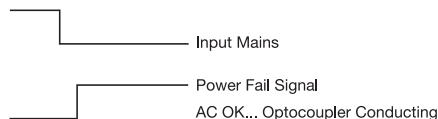


Notes:

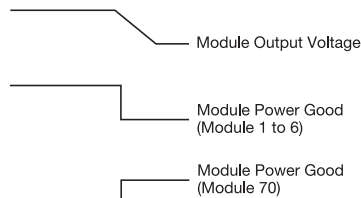
Where the sensing point is remote from the output of the power supply, to avoid spurious noise pick-up it may be necessary to:

- 1 Use twisted pair sense wires.
- 2 Use R C as shown ($R_1 = 100\Omega$) ($R_2 = 10\Omega$) ($C = 22\mu F$).

Mains Power Fail Signal



Output Power Good Signal



Notes:

See application note for full details.

Global Inhibit (Reverse Logic for Global Enable)



Module Inhibit



NUCLEAR AND MEDICAL APPLICATIONS - Power-One products are not designed, intended for use in, or authorized for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems without the express written consent of the respective divisional president of Power-One, Inc.

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