TE60

60W Single Output External Power
Test & Measurement/Industrial Series

Features

- Meets DoE Efficiency Level VI Requirements
  - No load input power
  - Average Efficiency
- Up to 60W of AC-DC Power
- Universal Input 90-264Vac Input Range
- IP22 Rated Enclosure
- Meets "Heavy Industrial" Levels of EN61000 EMC Requirements
- Meets EN55011/CISPR11, FCC Part 15.109 Class B Conducted & Radiated Emissions, with 6db margin
- Approved to EN/IEC/UL60950-1, 2nd Edition, Am. 2
- E-cap life of >8 years
- >900,000 hours MTBF
- 3 Year Warranty
- IP22 Rated Enclosure

Description

A high performance AC to DC external power supply family designed for test & measurement and industrial applications. Fully compliant with Efficiency Level VI requirements per U.S. Dept. of Energy, and also compliant to the Heavy Industrial levels of various EN61000-4-x standards for EMC. The TE60A series models also meet Class B conducted and radiated EMI per FCC Part 15, EN55022, CISPR22. Designed to allow easy integration with test and measurement equipment and other industrial applications.

Model Selection

Model Number	Volts	Output Current	Output Power	Ripple & Noise[1]	Line Regulation	Load Regulation	Output Cable & Connector	Input Configuration
TE60A0551F01	5.0V	7.00A	35W	75mV pk-pk	±1%	±5%	6 pin Molex Type[2]	Class I Desktop, IEC60320 C14 Receptacle
TE60A0903F01	9.0V	6.00A	54W	90mV pk-pk	±1%	±5%	1150mm long, UL2464, 18AWG, 4 conductors; 2.5 x 5.5 x 9.5mm Straight Barrel Type, center positive	
TE60A1203F01	12.0V	5.00A	60W	120mV pk-pk	±1%	±5%		
TE60A1503F01	15.0V	4.00A	60W	150mV pk-pk	±1%	±5%		
TE60A1803F01	18.0V	3.40A	60W	180mV pk-pk	±1%	±5%		
TE60A2403F01	24.0V	2.70A	60W	240mV pk-pk	±1%	±5%		
TE60A4803F01	48.0V	1.35A	60W	480mV pk-pk	±1%	±5%		
TE60A0551N01	5.0V	7.00A	35W	75mV pk-pk	±1%	±5%	6 pin Molex Type[2]	Class II Desktop, IEC60320 C8 Receptacle
TE60A0903N01	9.0V	6.00A	54W	90mV pk-pk	±1%	±5%	1150mm long, UL2464, 18AWG, 4 conductors; 2.5 x 5.5 x 9.5mm Straight Barrel Type, center positive	
TE60A1203N01	12.0V	5.00A	60W	120mV pk-pk	±1%	±5%		
TE60A1503N01	15.0V	4.00A	60W	150mV pk-pk	±1%	±5%		
TE60A1803N01	18.0V	3.40A	60W	180mV pk-pk	±1%	±5%		
TE60A2403N01	24.0V	2.70A	60W	240mV pk-pk	±1%	±5%		
TE60A4803N01	48.0V	1.35A	60W	480mV pk-pk	±1%	±5%		
TE60A0551Q01	5.0V	7.00A	60W	75mV pk-pk	±1%	±5%	6 pin Molex Type[2]	Class II Desktop, IEC60320 C18 Receptacle
TE60A0903Q01	9.0V	6.00A	54W	90mV pk-pk	±1%	±5%	1150mm long, UL2464, 18AWG, 4 conductors; 2.5 x 5.5 x 9.5mm Straight Barrel Type, center positive	
TE60A1203Q01	12.0V	5.00A	60W	120mV pk-pk	±1%	±5%		
TE60A1503Q01	15.0V	4.00A	60W	150mV pk-pk	±1%	±5%		
TE60A1803Q01	18.0V	3.40A	60W	180mV pk-pk	±1%	±5%		
TE60A2403Q01	24.0V	2.70A	60W	240mV pk-pk	±1%	±5%		
TE60A4803Q01	48.0V	1.35A	60W	480mV pk-pk	±1%	±5%		

Notes:
1. Measured at the output connector, with noise probe directly across output and load, terminated with 0.1µF ceramic and 47µF low ESR capacitors. For 5V and 6V models, values listed are typical, 100mV pk-pk maximum.
2. Molex p/n 39-01-2060 or equivalent. See outline drawing for pinout information.
3. For Input Class I models: For AC GND connected to output common (-), insert a "B" in the part number where the "A" is located (TE60B1203F01).
4. All specifications are typical at nominal input, full load, at 25°C ambient unless noted.

General Specifications

AC Input	100-240Vac, ±10%, 47-63Hz, 1∅	**Turn On Time**	Less than 1 sec @115Vac, full load
Input Current	115Vac: 1.5A, 230Vac: 0.75A	**Hold-up Time**	20mS min., at full Load, 100Vac input
Inrush Current	264Vac, cold start: will not exceed 40A	**Overtemperature Protection**	Will shutdown upon an over-temperature condition, auto-recovery.
Input Fuses	F1, F2: 2A, 250Vac fuses (line & neutral lines) provided on all models	**Overload Protection**	130 to 180% of rating, Hiccup Mode
Earth Leakage Current	Input-GND: <500µA@264Vac, 60Hz, NC Output-GND: <4mA@264Vac, 60Hz, NC	**Short Circuit Protection**	Hiccup Mode, auto recovery.
Efficiency	Meets US DoE Efficiency Level VI average efficiency levels	**Overvoltage Protection**	130 to 150% of output voltage (max. 60V on 48V model), hiccup mode
Output Power	60W continuous – See models chart for specific voltage model ratings.	**Isolation**	Input-Output: 4000Vac Input-Ground: 1500Vac Output-Ground: 1500Vac
No Load Input Power	<0.210W per DoE Efficiency Level VI Requirements	**Safety Standards**	EN/CSA/UL/IEC 60950-1, 2nd Edition, Am 2
Ripple and Noise	See models chart on pg 1.	**Operating Temperature**	-20°C to +70°C. Derate above 40°C. Start Up at -40°C, full load, (warmup period before all parameters are within published specifications).
Output Voltage	See models chart on pg 1.	**Case Temperature**	Case Temperatures are within regulatory guidelines. Care should be taken to avoid prolonged contact with skin or other heat sensitive surfaces.
Transient Response	500µs response time for return to within 0.5% of final value for any 50% load step over the range of 5% to 100% of rated load, $\Delta i/\Delta t <$ 0.2A/µs. Max. voltage deviation is +/-3.5%.	**Temperature Derating**	See derating curve below.
E-Cap Life	>7 year life based on calculations at 115Vac/60Hz & 230Vac/50Hz, ambient 25°C at 24 hrs per day, 365 days/year, 6 power up cycles per day. (80% load on 12V model)	**MTBF**	>250,000 hours, full load, 110 & 220Vac input, 25°C amb., per Telcordia 332 Issue 6.
Weight	400g	**Storage Temperature**	-40°C to +85°C
Safety Drop Test	1.4m from table top to wooden platform, 6 faces.	**Altitude**	Operating: to 5000m Non-operating: -500 to 40,000 ft.
Dimensions	W: 2.67" x L: 4.25" x H: 1.29" W: 67.9mm x L: 108mm x H: 32.7mm	**Relative Humidity**	5% to 95%, non-condensing
Vibration	Operating: 0.003g/Hz, 1.5grms overall, 3 axes, 10 min/axis, 1-500Hz. Non-Oper.: random waveform, 3 minutes per axis, 3 axes and Sine waveform, Vib. frequency/acceleration: 10-500Hz/1g, sweep rate of 1 octave / minutes, Vibration time of 10 sweeps / axes, 3 axes	**Shock**	Operating: Half-sine, 20gpk, 10mS, 3 axes, 6 shocks total Non-Operating: Half-sine waveform, impact acceleration of 100G, Pulse duration of 6 mS, Number of shocks: 3 for each of the three axis

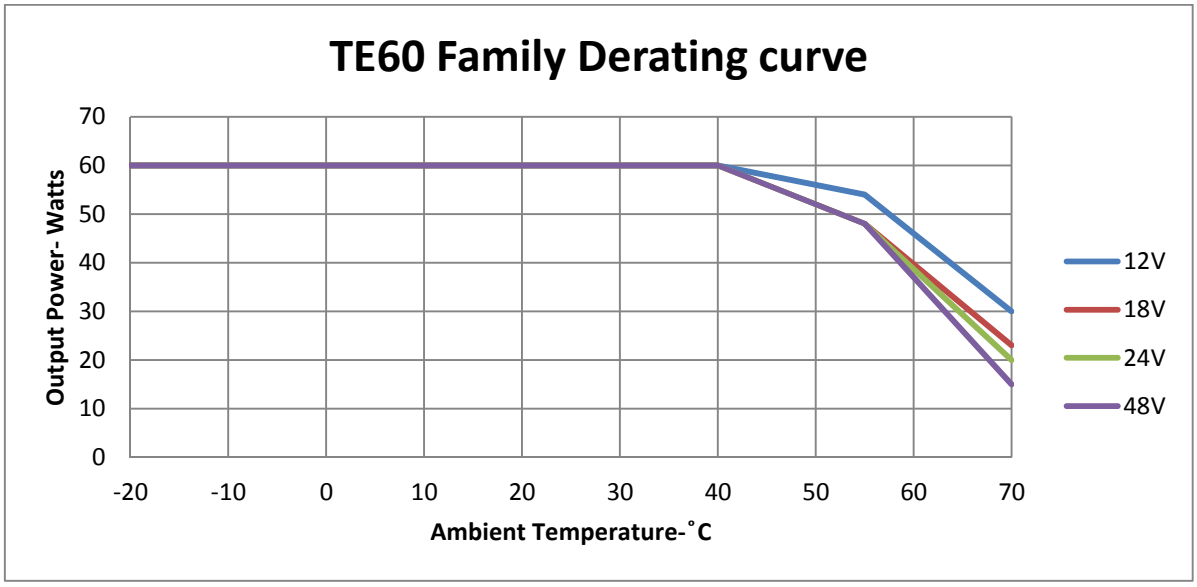
All specifications are typical at nominal input, full load, at 25°C ambient unless noted.

EMI/EMC Compliance

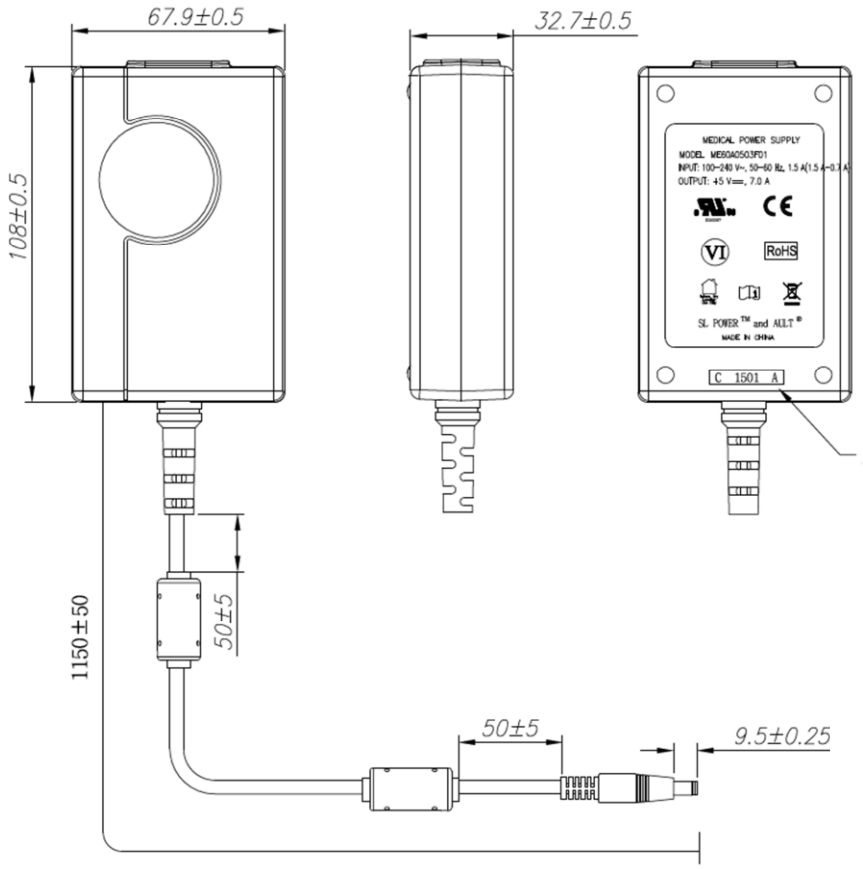
Conducted Emissions:	EN55011/CISPR22 Class B, FCC Part 15.107, Class B: 6db margin typ, at 115 and 230Vac
Radiated Emissions:	EN55022/CISPR22 Class B, FCC Part 15.109, Class B: 3db margin typ, at 115 and 230Vac
Common Mode Noise:	High Frequency (100kHz-20MHz): <40mA pk-pk
Electro-Static Discharge (ESD) Immunity on Power ports:	EN55024/IEC61000-4-2, Level 4: +/- 8kV contact, +/- 15kV air, Criteria A
Radiated RF EM Fields Susceptibility	EN55022/EN61000-4-3, 10V/m, 80MHz-2.7GHz, 80% AM at 1kHz
Electrical Fast Transients (EFT) /Bursts:	EN55024/IEC61000-4-4, Level 4, +/- 4kV, 100Khz rep rate, 40A, Criteria A
Surges, Line to Line (Diff Mode) and Line to GND (CMN Mode)	EN55024/IEC61000-4-5, Level 4, +/-1kV DM, +/-4kV CM, Criteria A
Conducted Disturbances induced by RF Fields	EN55022/IEC61000-4-6, 10Vrms – Level 4, in ISM and amateur radio bands between 0.15Mhz and 80Mhz, 80% AM at 1KHz
Rated Power frequency magnetic fields	EN55024/IEC1000-4-8, Level 4: 30 A/m, 50/60 Hz
Voltage Interruptions, Dips, Sags & Surges	EN55024/IECEN61000-4-11: --100% dip for 20mS, Criteria A --100% dip for 5000mS (250/300 cycles), Criteria B --60% dip for 100mS, Criteria B --30% dip for 500mS, Criteria A
Harmonic Current Emissions	EN55011/EN61000-3-2, Class A
Flicker Test	EN61000-3-3

All specifications are typical at nominal input, full load, at 25°C ambient unless noted.

MTE60 Series Output Power Derating Curve:



Mechanical Drawing:



Notes: 1) All dimensions in (mm).
2) 2.5mm barrel connector shown, other options are available.
3) The unit should not be covered or enclosed to protect against excessive case temperature rise.

Connector Information

Standard models include a 2.5 x 5.5 x 9.5mm straight barrel type connector (Ault #3), center positive. Other standard options are listed below. The "03" in the standard model number is replaced by the applicable digits below:

Connector No.	Description	Connector No.	Description
02	2.1 x 5.5 x 9.5mm straight barrel plug - Center Positive	44	2.1 x 5.5 x 9.5mm straight barrel plug, locking - Center Positive
03	2.5 x 5.5 x 9.5mm straight barrel plug - Center Positive (Standard Models)	45	2.5 x 5.5 x 9.5mm straight barrel plug, locking - Center Positive
12	5 pin DIN-180 male connector (Pins 3, 5 = (+), pins 1, 2, 4 = (-))	48	3 pin Snap n Lock, Kycon Kpp-3P or equivalent(Pin 1 = (+), pin 2 = (-))
22	6 pin DIN male connector(Pins 1, 2 = (+), pins 4, 5 = (-))	49	4 pin Snap n Lock, Kycon Kpp-4P or equivalent(Pins 1, 3 = (+), pins 2, 4 = (-))
23	8 pin DIN male connector(Pins 3, 7 = (+), pins 1, 4, 6, 8 = (-), shell = FG))	51	6 pin Minifit - Molex 39-01-2060 or equivalent (Pins 1, 4 = (+), pins 3, 6 = (-))
32	9 pin "D" type, female (Pin 8 = (+), pin 5 = (-), all others = NC)	65	Stripped and Tinned Leads
33	2.5 x 5.5 x 12.5mm straight barrel plug - Center Positive	70	2.1 x 5.5 x 11mm right angle barrel plug (high retention) - Center Positive
40	2.1 x 5.5 x 9.5mm right angle barrel plug (high retention) - Center Positive	71	2.5 x 5.5 x 11mm right angle barrel plug (high retention) - Center Positive
41	2.5 x 5.5 x 9.5mm right angle barrel plug (high retention) - Center Positive	72	2.1 x 5.5 x 9.5mm straight barrel plug (high retention, no spark) - Center Positive
42	2.1 x 5.5 x 11mm straight barrel plug (high retention) - Center Positive	73	2.5 x 5.5 x 9.5mm straight barrel plug (high retention, no spark) - Center Positive
43	2.5 x 5.5 x 11mm straight barrel plug (high retention) - Center Positive	74	EIAJ#5 style connector - Center Positive

Efficiency Level VI Information:

Single-Voltage External AC-DC Power Supply, Basic-Voltage		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
$P_{out} \leq 1$ W	$\geq 0.5 \times P_{out} + 0.16$	≤ 0.100
1 W < $P_{out} \leq 49$ W	$\geq 0.071 \times \ln(P_{out}) - 0.0014 \times P_{out} + 0.67$	≤ 0.100
49 W < $P_{out} \leq 250$ W	≥ 0.880	≤ 0.210
$P_{out} > 250$ W	≥ 0.875	≤ 0.500
Single-Voltage External AC-DC Power Supply, Low-Voltage		
Nameplate Output Power (P_{out})	**Minimum Average Efficiency in Active Mode** *(expressed as a decimal)*	**Maximum Power in No-Load Mode [W]**
$P_{out} \leq 1$ W	$\geq 0.517 \times P_{out} + 0.087$	≤ 0.100
1 W < $P_{out} \leq 49$ W	$\geq 0.0834 \times \ln(P_{out}) - 0.0014 \times P_{out} + 0.609$	≤ 0.100
49 W < $P_{out} \leq 250$ W	≥ 0.870	≤ 0.210
$P_{out} > 250$ W	≥ 0.875	≤ 0.500

TE60A 12V-48V

TE60A 5V

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