TECHNICAL DATASHEET

MDS Medical AC-DC Adapter

24 Volt, 90 Watt / MDS-090AAS24 ☐



090AAS24

Highlights & Features

- Meet DOE Level VI
- Safety Approvals to IEC 60601-1 & IEC 62368-1
- Compliant with IEC 60601-1-2 4th Ed. Requirements
- Low touch current (<0.1mA Normal & <0.3 mA single fault)
- Over-Voltage/Load/Temperature & Short Circuit protections
- 1 Million Hours MTBF
- 2 × MOPP isolation
- 3 years warranty

Safety Standards

E356265

CB Certified for worldwide use

Model Number: MDS-090AAS24 F/B
Unit Weight: 450 grams (16.2 ounces)
Dimensions (W x L x H): 60.0 x 150.0 x 35.0 mm
2.4 x 5.9 x 1.4 in

General Description

The MDS series of external power supply come with universal AC input at 90 Vac to 264 Vac. Other features include low touch current, risk management report available and the electric shock protection comply with 2 x MOPP. The MDS series is certified for EMC standards according to EN/BS EN 55011 for industrial, scientific and medical (ISM) radio-frequency equipment and EN/BS EN 55032 for Information Technology Equipment (ITE) radio-frequency equipment.

The MDS series come with both medical and ITE safety approvals including UL/cUL/CCC/CE and CB certification and are fully compliant with RoHS Directive for environmental protection.

Model Information

Medical AC-DC Adapter

Model Number	Input Voltage Range	Output Voltage	Output Current
MDS-090AAS24 FA	90-264 Vac	24 Vdc	3.75 A
MDS-090AAS24 FE			
MDS-090AAS24 BA			
MDS-090AAS24 BE			

Model Numbering

					CC Code	
MDS –	**090**	**AAS**	**24**	☐	☐	☐
Delta Medical Desktop Adapter	Max wattage in the product series	Family Code	Output Voltage 24 – 24 V	Blank	Protection Against Shock F: Class I B: Class II with functional Earth	Plug, Molding type and others A: 4 Pin Din E: Tuning Fork 5.5 x 2.5 x 10
					Refer to Page 7.	

All parameters are specified at 25°C ambient unless otherwise noted.
PSU.deltaww.com (November 2023, Rev. 10)

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24 Volt, 90 Watt / MDS-090AAS24 ☐

Specifications

Input Ratings / Characteristics

Nominal Input Voltage	100-240 Vac
Input Voltage Range	90-264 Vac
Nominal Input Frequency	50-60 Hz
Input Frequency Range	47-63 Hz
Input Current (max.)	2 A @ 115 Vac, 1 A @ 230 Vac
Efficiency (typ.)	90.3%, Reference Fig. 1
Average Efficiency (min)	88% @ 115 Vac
Standby Power (max.)	0.21 W @ 115 Vac
Inrush Current (typ.)	50 A @ 115 Vac, 100 A @ 230 Vac
Touch Current (max.)	0.1 mA @ 264 Vac NC[1)], 0.3 mA @ 264 Vac SFC[2)]
Earth Leakage Current (max.)	0.1 mA @ 264 Vac NC[1)], 0.3 mA @ 264 Vac SFC[2)]

1) NC: normal condition
2) SFC: single fault condition

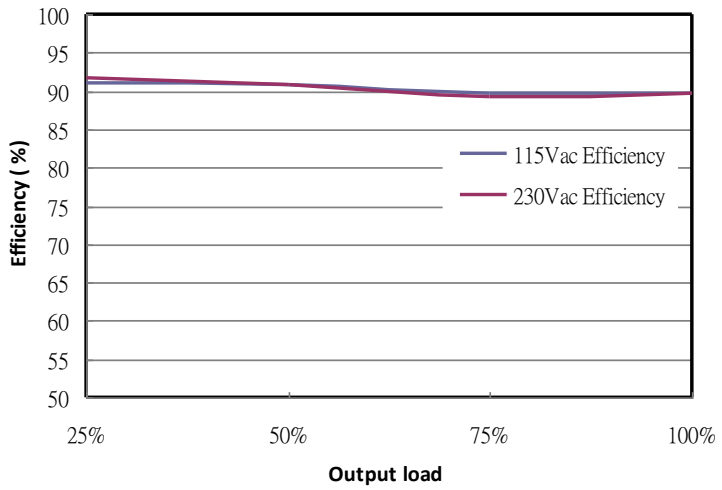


Fig. 1 Efficiency versus output load

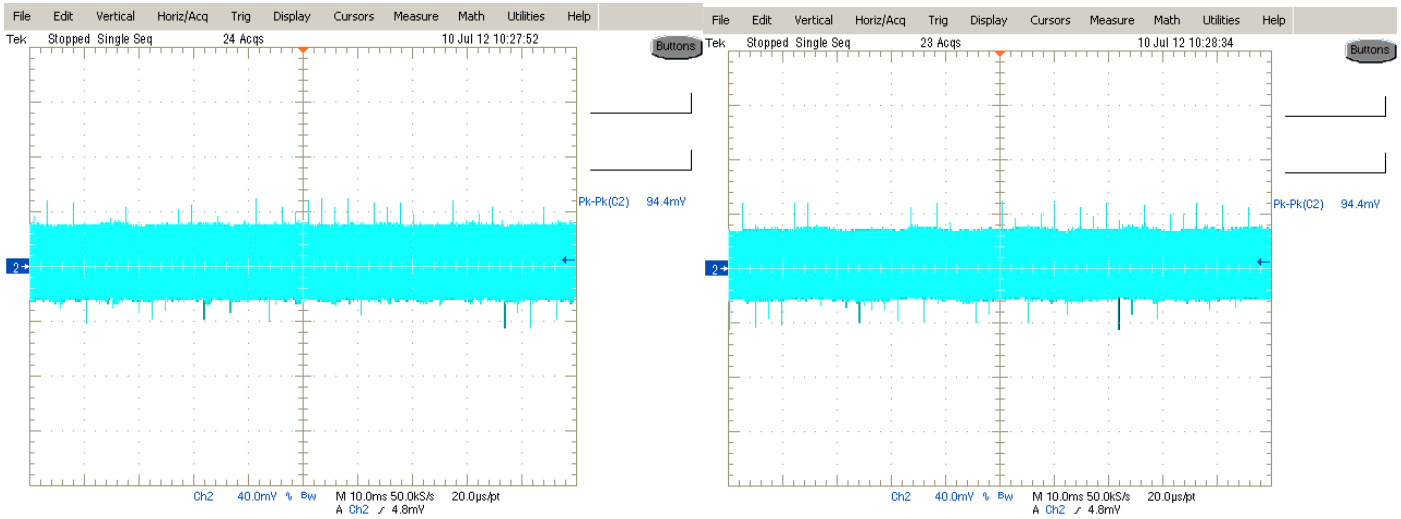
Output Ratings / Characteristics

Nominal Output Voltage	24 Vdc
Total Regulation	± 5%
Output Current	3.75 A
Output Power	90 W
Line Regulation (max)	± 0.5%
Load Regulation (max)	± 4.5%
Ripple & Noise (typ.)	94.4 mV pk-pk @ Full load, Reference Fig. 2
Start-up Time (max)	3000 ms
Hold-up Time (min)	20 ms @ 115 Vac & 230 Vac
Dynamic Response (Overshoot & Undershoot O/P Voltage)	± 5% @ 50-100% load

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MDS Medical AC-DC Adapter

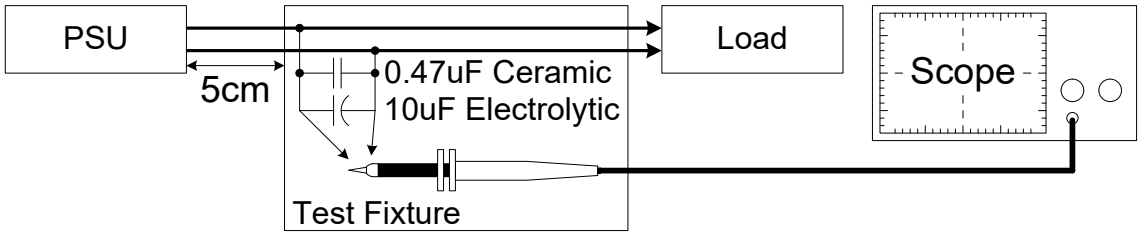
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(a) 115 V (b) 230 V

Fig. 2 Ripple & Noise example, 20 MHz BW

Ripple & Noise measurement circuit



Mechanical

Case Chassis		PC
Case Cover		PC
Dimensions (W x L x H)		60.0 x 150.0 x 35.0 mm (2.4 x 5.9 x 1.4 in)
Unit Weight		450 grams (16.2 ounces)
Indicator		NA
Cooling System		NA
Terminal	Input	C14 socket
	Output	4 pin Din / Tuning fork type

Environment

Surrounding Air Temperature	Operating	0°C to +40°C
	Storage	-40°C to +85°C
Operating Humidity		10-95% RH (Non-Condensing)
Operating Altitude		3,000 meters (9842.52 feet)
Shock Test (Non-Operating)		50 G, 11ms, 3 shocks for each direction
Vibration (Non-Operating)		5-500 Hz, 2.09 Grms, 20 minute for each three axis

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24 Volt, 90 Watt / MDS-090AAS24 ☐

Protections

Overvoltage (max.)	150%, Latch Mode
Over load / Over current (max.)	130% of rated load current, Hiccup Mode, (Non-Latching, Auto-Recovery)
Over Temperature	Hiccup Mode, (Non-Latching, Auto-Recovery)
Short Circuit	Hiccup Mode, (Non-Latching, Auto-Recovery)
Protection Against Shock	Class I for F series
	Class II with functional earth for B series

Reliability Data

MTBF (typ.)	1 Million based on Telecordia SR-332

Safety Standards / Directives

Medical Safety		IEC60601-1 CB report, EN 60601-1, CAN/CSA-C22.2 No. 60601-1, ANSI/AAMI ES 60601-1
ITE Safety		IEC 60950-1, IEC 62368-1, GB 4943.1, GB 9254, GB 17625.1
CE		In conformance with EN 60601-1 & EN 60601-1-2
UKCA		Medical Devices Regulations 2002 (UK MDR 2002)
Galvanic Isolation	Input to Output	4000 Vac
	Input to Ground	1500 Vac
	Output to Ground	500 Vac

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24 Volt, 90 Watt / MDS-090AAS24 ☐

EMC (Compliant with IEC 60601-1-2 4th Ed. Requirements)

EMC / Emissions		EN/BS EN 55011, EN/BS EN 55032, FCC Title 47: Class B
Harmonic Current Emissions	IEC 61000-3-2	Meet Class A limit
Voltage Flicker	IEC 61000-3-3	
Immunity to		
Electrostatic Discharge	IEC 61000-4-2	Level 4 Criteria A[1)] Air Discharge: 15 kV Contact Discharge: 8 kV
Radiated Field	IEC 61000-4-3	Criteria B[2)] 80 MHz-2700 MHz, 10 V/m AM modulation 385 MHz-5785 MHz, 28 V/m Pulse mode and other modulation
Electrical Fast Transient / Burst	IEC 61000-4-4	Level 3 Criteria A[1)]: 2 kV
Surge	IEC 61000-4-5	Level 3 Criteria A[1)] Common Mode[3)]: 2 kV Differential Mode[4)]: 1 kV
Conducted	IEC 61000-4-6	Level 2 Criteria A[1)] 150 kHz-80 MHz, 3 Vrms, 6 Vrms at ISM bands and Amateur radio bands
Power Frequency Magnetic Fields	IEC 61000-4-8	Criteria A[1)] Magnetic field strength 30 A/m
Voltage Dips	IEC 61000-4-11	Criteria A[1)] 0% U_T, 0.5 cycle (10 ms), 0°/45°/90°/135°/180°/225°/270°/315°/360° Criteria A[1)] 0% U_T, 1 cycle (20 ms), 0° Criteria B[2)] 70% U_T, 25 cycle (500 ms), 0° Criteria B[2)] 0% U_T, 250 cycle (5000 ms), 0°

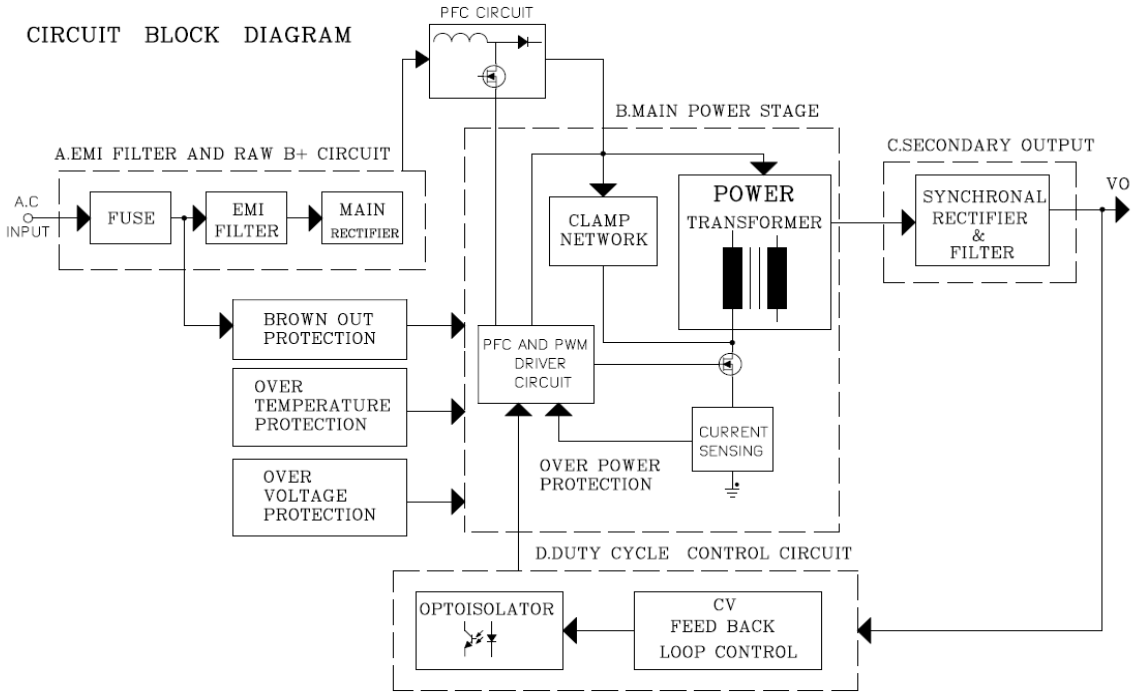
1) Criteria A: Normal performance within the specification limits
2) Criteria B: Output out of regulation, or shuts down during test. Automatically restore to normal operation after test.
3) Asymmetrical: Common mode (Line to earth)
4) Symmetrical: Differential mode (Line to line)

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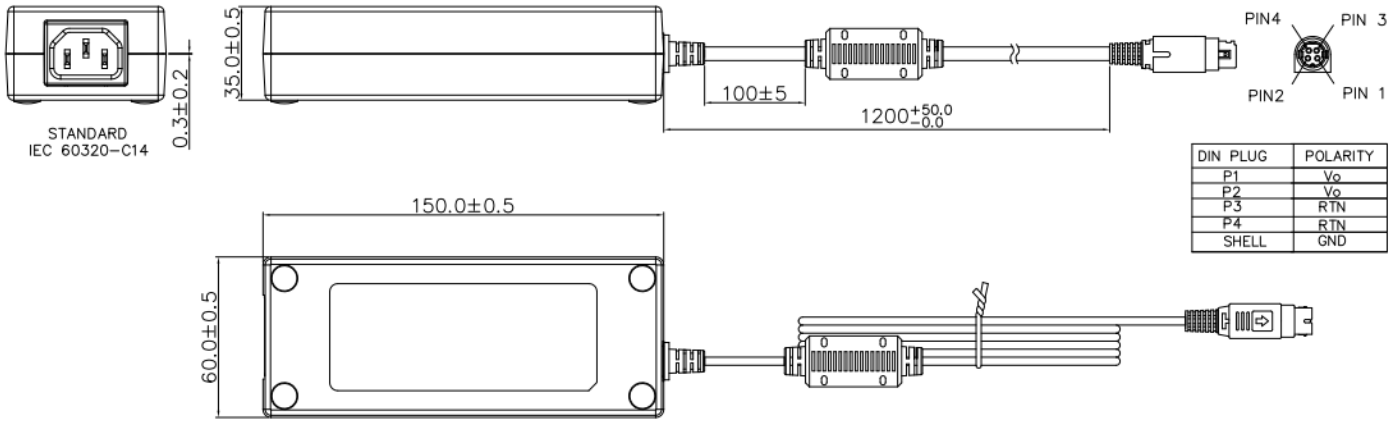
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Block Diagram



Dimensions:

W x L x H: 60.0 x 150.0 x 35.0 mm



Notes:
Dimension are in mm

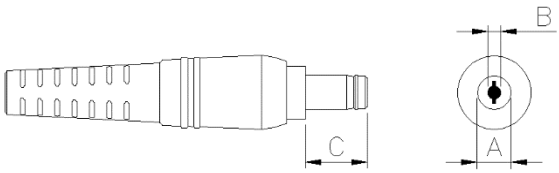
Item	Device Description
1	Cover
2	Chassis
3	Power Cord
4	Socket

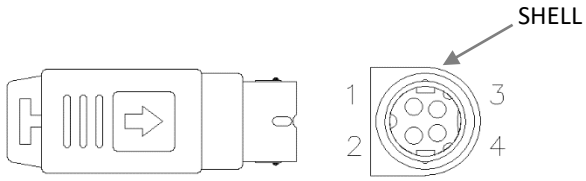
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24 Volt, 90 Watt / MDS-090AAS24 ☐

DC Output Plug:

Tuning Fork	CC Code	Cable Length	A OD	B ID	C L
	BE	1.2 m	5.5	2.5	10
	FE	1.2 m	5.5	2.5	10

Mini DIN 4 Pins with Lock (Male)	CC Code	Cable Length	Pin Assignment	
 KYCON KPPX-4P Equivalent	BA	1.2 m	1	+Vo
			2	+Vo
			3	-Vo
			4	-Vo
			Shell	-
	FA	1.2 m	1	+Vo
			2	+Vo
			3	-Vo
			4	-Vo
			Shell	-

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MDS Medical AC-DC Adapter
24 Volt, 90 Watt / MDS-090AAS24 ☐

Functions

Start-up Time

The time required for the output voltage (Vo) to reach 90% of its set value, after the input AC voltage is applied.

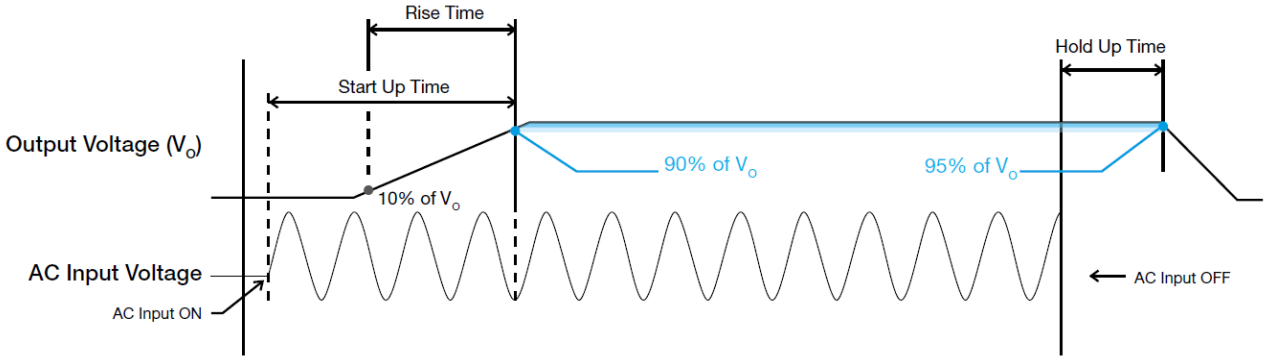
Rise Time

The time required for the output voltage (Vo) to change from 10% to 90% of its steady state value.

Hold-up Time

Hold up time is the time when the AC input collapses and output voltage retains regulation for a certain period of time. The time required for the output to reach 95% of its set value, after the input voltage is removed.

■ **Graph illustrating the Start-up Time, Rise Time, and Hold-up Time**



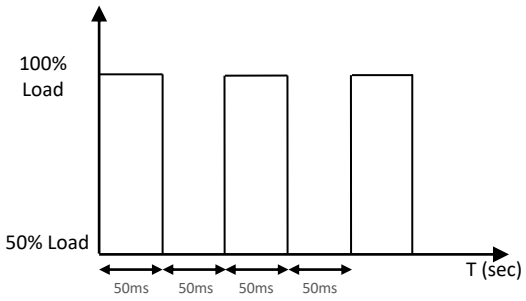
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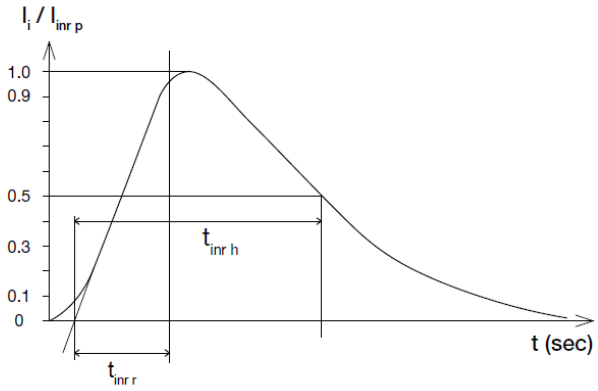
Dynamic Response

The power supply output voltage will remain within ±5% of its steady state value, when subjected to a dynamic load change from 50 to 100% of its rated current.



Inrush Current

Inrush current is the input current that occurs when the input voltage is first applied. For AC input voltages, the maximum peak value of inrush current will occur during the first half cycle of the applied AC voltage. This peak value decreases exponentially during subsequent cycles of AC voltage.



Overvoltage Protection

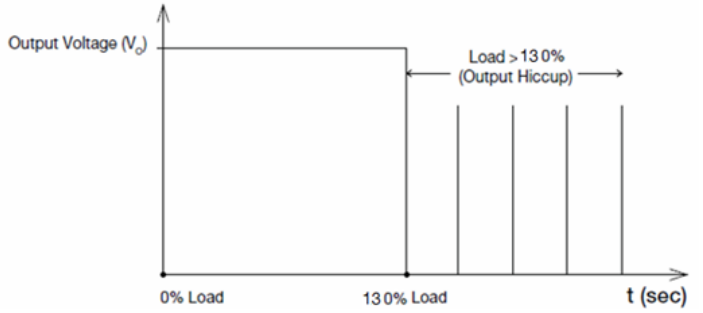
The power supply's overvoltage circuit will be activated when its internal feedback circuit fails. The output voltage shall not exceed its specifications defined on Page 4 under "Protections". Power supply will latch off, and require removal/re-application of input AC voltage in order to restart.

Short Circuit Protection

The power supply's output OLP/OCP function also provides protection against short circuits. When a short circuit is applied, the output current will operate in "Hiccup mode", as shown in the illustration in the OLP/OCP section on this page. The power supply will return to normal operation after the short circuit is removed.

Overload & Over current Protections

The power supply's Overload (OLP) and Over current (OCP) Protections will be activated when output current is between 110% and 130% of I_O (Max load). Upon such an occurrence, V_O will start to drop. Once the power supply has reached its maximum power limit, the protection will be activated. and the power supply will go into "Hiccup mode" (Auto-Recovery). The power supply will recover once the fault condition causing the OLP and OCP is removed and I_O is back within the specified limit.



Additionally, if the I_O is <130% but >110% for a prolong period of time (depending on the load), the Over Temperature Protection (OTP) will be activated due to high temperature on critical components. The power supply will then go into hiccup mode until the fault is removed; and, the input voltage is removed, then reapplied.

Over Temperature Protection

As mentioned above, the power supply also has Over Temperature Protection (OTP). This is activated when the overload condition persists for an extended duration and the output current is below the overload trigger point but >100% load. In the event of a higher operating condition at 100% load, the power supply will run into OTP when the surrounding air temperature is higher than the operating temperature. When activated, the output voltage will go into hiccup mode until the input voltage is removed; then, reapplied, and the surrounding air temperature drops to its normal operating temperature.

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Certificate

Delta has been certified as meeting the requirement of ISO 13485: 2016 and EN ISO 13485:2016 for the design and manufacture of switching power supply and adaptor for medical device.

E356265

In addition to a UL Total Certification Program (TCP) approved client laboratory for IEC62368-1. Delta also has participated UL Client Test Data Program (CDTP) for IEC 60601

VI 115

Meet DOE Level VI Efficiency Requirement

Attention

Delta provides all information in the datasheets on an “AS IS” basis and does not offer any kind of warranty through the information for using the product. In the event of any discrepancy between the information in the catalog and datasheets, the datasheets shall prevail (please refer to PSU.deltaww.com for the latest datasheets information). Delta shall have no liability of indemnification for any claim or action arising from any error for the provided information in the datasheets. Customer shall take its responsibility for evaluation of using the product before placing an order with Delta.

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