TECHNICAL DATASHEET

Medical AC-DC Adapter

MDS-030AAC Series / MDS-030AAC☐



030AAC

Highlights & Features

- MDS-030AAC05, 12, 15, 24 Meet Efficiency Level VI
- Safety Approvals to IEC 60601-1 & IEC 62368-1
- Compliant with IEC 60601-1-2 4th Ed. Requirements
- Meets Limited Power Source (LPS) requirements
- Low touch current. Suitable for type BF applications
- Detachable AC plug with multiple country options
- IP22 ingress protection rating
- 2 × MOPP isolation
- 500K hours MTBF

Safety Standards

CB Certified for worldwide use

Model Number: MDS-030AAC☐ ☐☐
Unit Weight: 150 grams
Dimensions (W × L × H): 53.5 × 88.0 × 27.5 mm
2.11 × 3.46 × 1.08 inch

General Description

The MDS series of external power supply comes with universal AC input at 85 Vac to 264 Vac. Other features include low touch current, risk management report available and the electric shock protection comply with 2 × 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 and IEC 60950-1 CB certification as a Limited Power Source (LPS), and CCC approval. Designs are fully compliant with RoHS Directive for environmental protection.

Model Information

Medical AC-DC Adapter

Model Number	Input Voltage Range	Efficiency Level	Rated Output Voltage	Rated Output Current
MDS-030AAC05	85-264Vac	Level VI	5 Vdc	3 A
MDS-030AAC12		Level VI	12 Vdc	2 A
MDS-030AAC15		Level VI	15 Vdc	2 A
MDS-030AAC24		Level VI	24 Vdc	1.25 A

Model Numbering

MDS –	030	AAC	☐	☐	☐	☐
Delta Medical Power Supply	Max wattage in the product series	Family Code	Output Voltage (Single Output) - 05 for 5 V - 12 for 12 V - 15 for 15 V - 24 for 24 V	Blank	Revision Code DC plug type and output cable length A: 2.1 x 5.5 x10mm DC plug	Revision Code Country duck-head type A: China B: United States/JP C: European D*: United Kingdom
			- 12 for 12 V - 15 for 15 V		B: 2.1 x 5.5 x12mm DC plug	B*: United States C: European D*: United Kingdom

* The United Kingdom duck-head is only available for MDS-030AAC15 BD model; MDS-030AAC15 BB is not applicable.

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Specifications

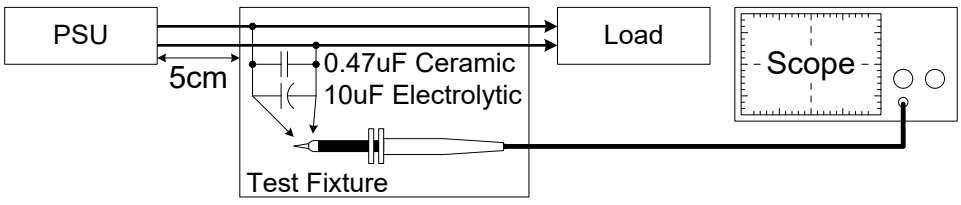
Model Number		MDS-030AAC05	MDS-030AAC12	MDS-030AAC15	MDS-030AAC24
Input Ratings / Characteristics					
Nominal Input Voltage		100-240 Vac			
Input Voltage Range		85-264 Vac			
Nominal Input Frequency		50-60 Hz			
Input Frequency Range		47-63 Hz			
Input Current (max)	115 Vac	0.5 A	0.6 A	0.8 A	0.8 A
	230 Vac	0.3 A	0.4 A	0.6 A	0.6A
Average Efficiency (min)	115 Vac	81.4%	86.21%	87.0%	87.0%
	230 Vac				
Standby Power (max)	115 Vac	0.1W	0.1 W	0.1 W	0.1 W
	230 Vac				
Inrush Current (typ.)		60 A @ 115 Vac and 100 A @ 230 Vac			
Touch Current (max)		0.1 mA @ 264 Vac NC[1], 0.3 mA @ 264 Vac SFC[2]			
Output-PE (protective earth) leakage current for Type BF application (max)		0.1 mA @ 264 Vac NC[1], 0.5 mA @ 264 Vac SFC[2]			

1) NC: Normal condition
2) SFC: Single fault condition

Model Number	MDS-030AAC05	MDS-030AAC12	MDS-030AAC15	MDS-030AAC24
Output Ratings / Characteristics				
Nominal Output Voltage	5 Vdc	12 Vdc	15 Vdc	24 Vdc
Output Total Regulation	±6%			
Output Current	3 A	2 A	2 A	1.25 A
Output Power	15 W	24 W	30 W	30 W
Line Regulation	±1%			
Load Regulation	±5%			
Ripple & Noise (max)	100 mVpk-pk @ Rated load	150 mVpk-pk @ Rated load	200 mVpk-pk @ Rated load	200 mVpk-pk @ Rated load
Start-up Time (max)	3000 ms @ 115 Vac			
Hold-up Time (min)	10 ms @ 115 Vac			
Dynamic Response (Overshoot & Undershoot O/P Voltage)	±10% @ 50-100% load			
Capacitive load (max)	4700 uF			

*Periodic and Random Deviation.

Ripple & Noise measurement circuit with 20 MHz BW



All parameters are specified at 25°C ambient unless otherwise indicated.

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Model Number	MDS-030AAC05	MDS-030AAC12	MDS-030AAC15	MDS-030AAC24

Mechanical

Case Chassis		PC
Case Cover		PC
Dimensions (W × L × H)		53.5 × 88.0 × 27.5 mm (2.11 × 3.46 × 1.08 in)
Unit Weight		150 grams (5.3 ounces)
Indicator		NA
Cooling System		NA
Terminal	Input	Detachable type AC plug
	Output	Barrel type. Dimensions 2.1 × 5.5 × 10 mm (see page 5)

Environment

Surrounding Air Temperature	Operating	0°C to +40°C
	Storage	-40°C to +85°C
Operating Humidity		5 - 95% RH (Non-Condensing)
Operating Altitude		5,000 meters (16400 feet)
Shock Test (Non-Operating)		50 G, 11 ms, 3 shocks for each direction
Vibration (Non-Operating)		5-500 Hz, 2.09 Grms, 20 minute for each three axis

Protections

Overvoltage (max)	150%, Latch Mode
Overload / Overcurrent (max)	250% 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)
Degree of Protection	IP22
Protection Against Shock	Class II

Reliability Data

MTBF (min)	500 K Hours based on Telecordia SR-332 (at 100 Vac, Max. load and 25°C Ambient)

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Model Number	MDS-030AAC05	MDS-030AAC12	MDS-030AAC15	MDS-030AAC24

Safety Standards / Directives

Medical Safety		IEC 60601-1, EN 60601-1, CAN/CSA-C22.2 No. 60601-1, ANSI/AAMI ES 60601-1 UL 60601-1
ITE Safety		IEC 60950-1, IEC 62368-1, GB4943.1, GB 9254, GB 17625.1 UL 60950-1, LPS (Limited Power Source)
CE		In conformance with EMC Directive 2014/30/EU and Low Voltage Directive 2014/35/EU EN 60601-1: 2006 + A11: 2011 + A1: 2013 + A12: 2014 & EN 60601-1-2: 2015
UKCA		In conformance with Electrical Equipment (Safety) Regulations 2016 and Electromagnetic Compatibility Regulations 2016, Medical Devices Regulations 2002(UK MDR 2002)
Galvanic Isolation	Input to Output	4000 Vac

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	
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 A[1)] 80MHz-2700MHz, 10 V/m AM modulation 385MHz-5785MHz, 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)] Differential Mode[3)]: 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 B[2)] 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) Symmetrical: Differential mode (Line to line)

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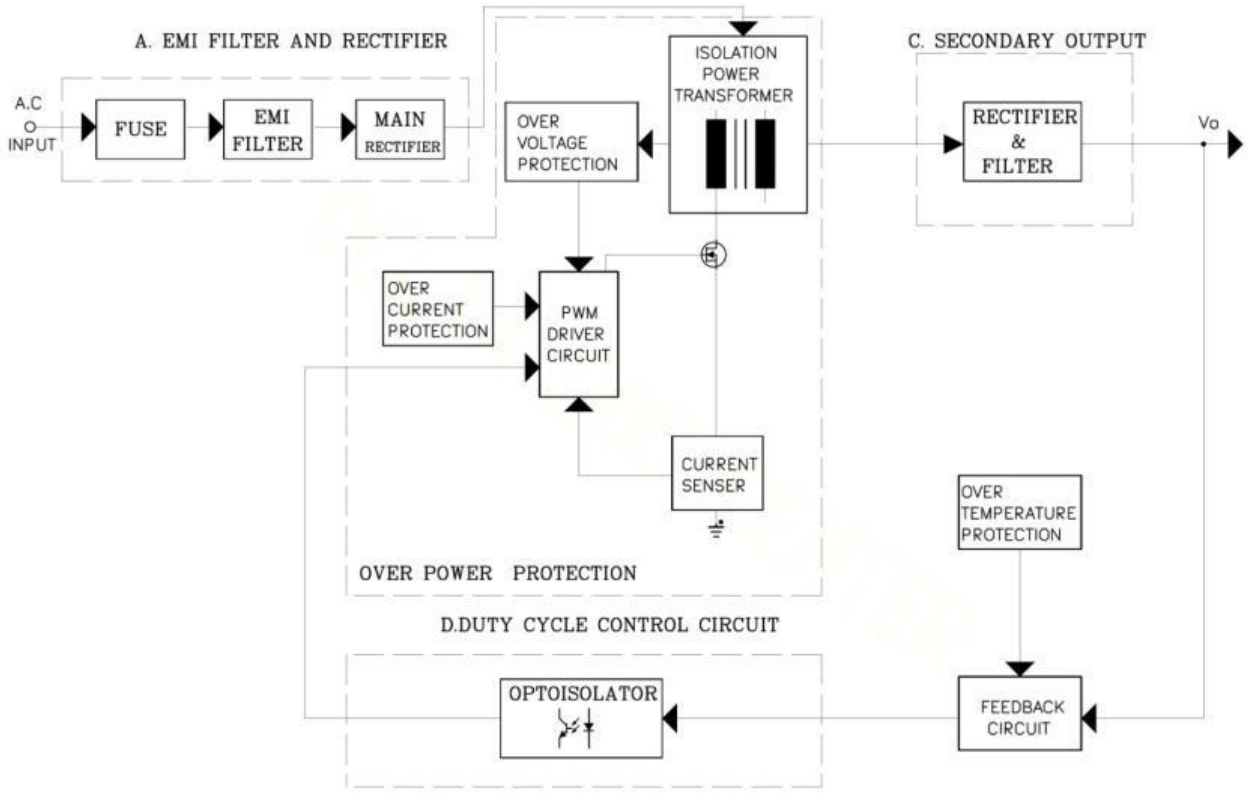
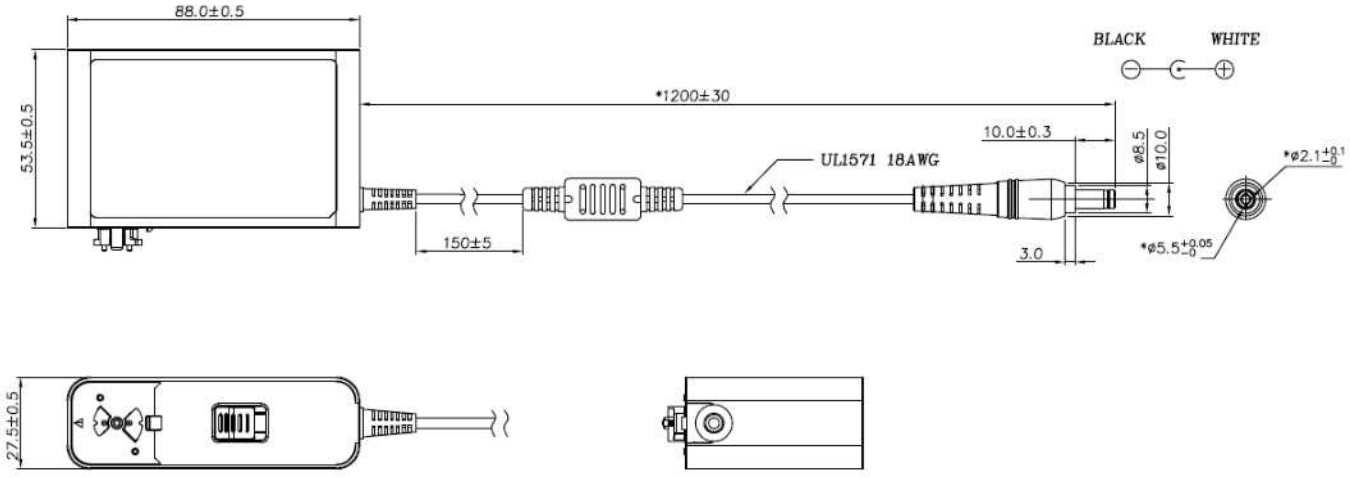
Block Diagram



Dimensions

W × L × H: 53.5 × 88.0 × 27.5 mm



Note:
The plug's polarity is

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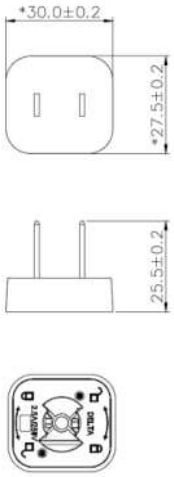
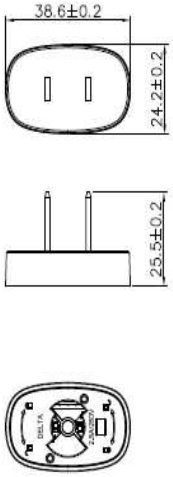
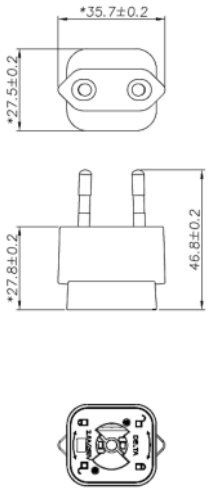
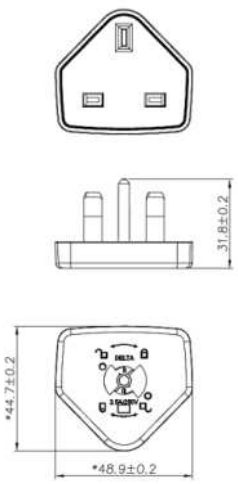
Duck Head Type:

CN type	US/JP type	EU type	UK type
			

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.

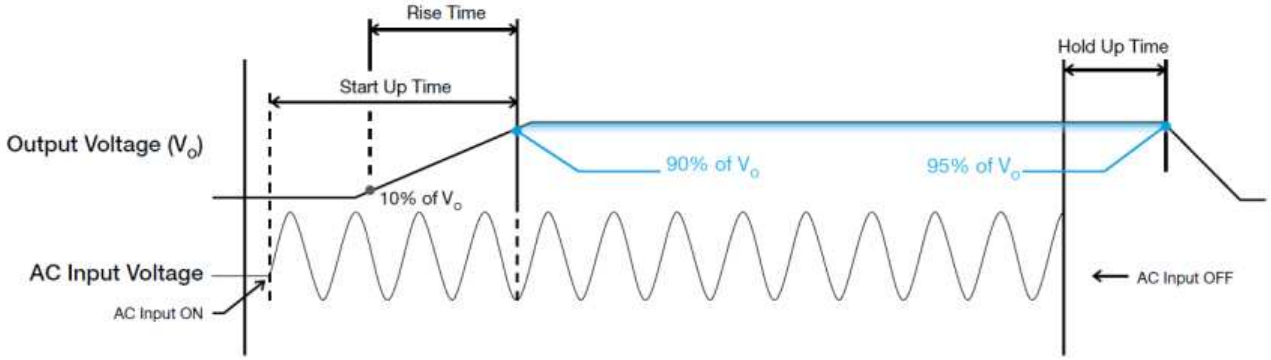
Rise Time

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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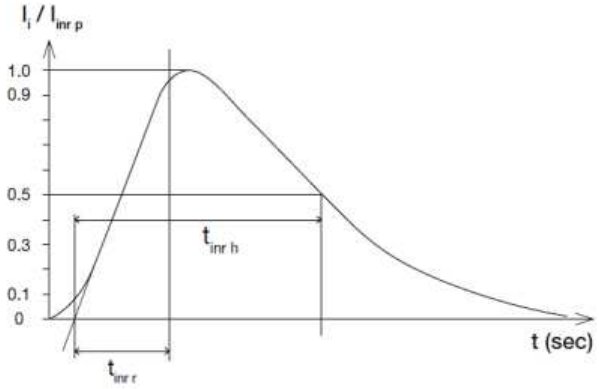
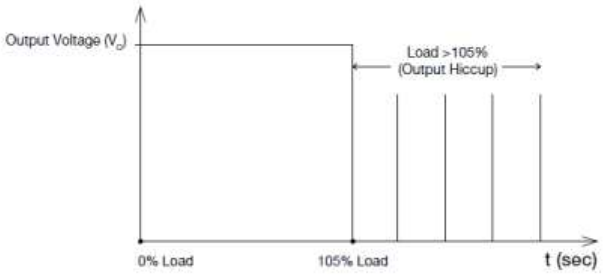
Inrush Current

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.



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 250% 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.



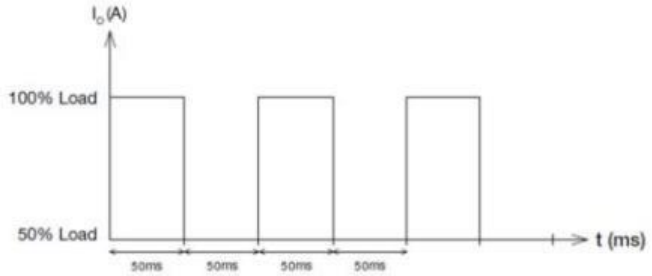
Additionally, if the I_O is <250% but >110% for a prolong period of time (depending on the load), the Over Temperature Protection (OTP) will be activated due to high temperature on critical components. The power supply will then go into hiccup mode until the fault is removed; and, the input voltage is removed, then reapplied.

Short Circuit Protection (Auto-Recovery)

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.

Dynamic Response

The power supply output voltage will remain within ±3% of its steady state value, when subjected to a dynamic load change from 50 to 100% of its rated current.



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 3 under "Protections". Power supply will latch off, and require removal/re-application of input AC voltage in order to restart.

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

Typically, the input current waveform is not sinusoidal due to the periodical peak charging of the input capacitor. In industrial environment, complying with EN 61000-3-2 is only necessary under special conditions. Complying to this standard can have some technical drawbacks, such as lower efficiency as well as some commercial aspects such as higher purchasing costs. Frequently, the user does not profit from fulfilling this standard, therefore, it is important to know whether it is mandatory to meet this standard for a specific application.

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.

Meet Level V Efficiency Requirement for MDS-030AAC07

Meet Level VI Efficiency Requirement for MDS-030AAC05, 12, 15, 24

Meets Limited Power Source (LPS) 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.

Delta reserves the right to make changes to the information described in the datasheets without notice.

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