Selecting or Developing the Right Power Supply for Medical Device: An In-depth Guide

Standard, or custom? That is the question for many of Delta's medical device customers. The good news is that Delta offers solutions across the entire spectrum, ranging from readily available standard power supplies to semi-custom, user-configurable options, and even innovation of the entire power supply. This article aims to outline the key considerations when choosing power supplies for various medical devices and introduce Delta's customization capabilities to assist developers in finding the best power solutions for their systems.

The most chosen standard medical power supplies by our customers, the reasons why, and their proven applications

Delta's standard medical power supply portfolio primarily targets mid to high-end applications. Customers often opt for Delta due to the higher power density, low leakage current, and Class B conducted and radiated EMI interference.

	IMA Series	MEB Series	MEU Series	MEP Series	MEA Series	MEG Series
						
Output power	400 W~2000 W	500 W~2500 W*	600 W, 650 W	120 W, 200 W	65 W~250 W	16.5 W~3000 W
Number of output	Single output with 5 V standby	Single output with 5 V standby	Single output with 5 V standby and 12 V for fan	Single output	Single output	Up to 18 configurable
Earth and isolation	Type BF, 2 x MOPP					
Format	Enclosed	Enclosed	Open frame	Open frame	Adapter	Enclosed
Cooling	Fan	Fan	Convection	Convection	N/A	Fan
EMI	Class B					
Current sharing	Yes	Yes	Yes	-	-	Single output module supports current sharing
Proven applications	Robotic surgery systems, radiology machines, lab machines, aesthetic machines, hematology analyzers, operation tables.	Therapy machines, MRI, aesthetic machines, blood analyzers, ultrasound machines.	Dialysis machines, dentist equipment, IVD equipment, anesthesia machines, ultrasound.	Oxygen concentrators, aesthetic machines.	Handheld ultrasound machines, CPAPs, endoscopy machines, medical displays.	Laparoscopy surgical systems, microscopy / sequencers, medical laser, imaging systems, spectroscopy instruments.
	Learn more	Learn more	Learn more	Learn more	Learn more	Learn more

*2500 W coming soon

For high-end medical equipment, critical requirements include low-noise variable speed fans, adjustable output voltage, active current sharing, low leakage current, and Class B conducted and radiated EMI compliance.

The IMA Series and MEB Series stand out as some of the most high-end single-output medical power supplies available in the market. With an output power capacity of 1000 W and higher, they incorporate up to two variable-speed fans that effectively manage power supply temperature without producing unbearable noise. These power supplies offer adjustable output voltage and active current sharing, providing greater flexibility for end system design and development. Their low leakage current and adherence to conducted and radiated EMI Class B standards contribute to enhanced safety and EMC at the system level. The IMA-S2000 PLUS and MEB-1K5W48V also excels with high peak power to support the start-up of electromechanical components like fans and motors.

Medical power supplies for high-end applications	IMA-S2000 PLUS	MEB-1K5	MEB-2K5
			
Output power	2000 W (coming soon)	1500 W	2500 W (coming soon)
Adjustable output range	±20%	±10%	-11%~+16%
Dimensions	309.6 x 127 x 40.6 mm	127 x 204 x 40.5 mm	127 x 259 x 40.6 mm
Acoustic noise level	< 39 dB(A) @ 50% load, 30 ˚C	30 dB(A) @ 30% load, 25˚C 45 dB(A) @ 80% load, 25˚C	< 45 dB(A) @ 2000W, 30˚C
Leakage current (264Vac/63Hz, normal condition)	Input-earth < 300 µA Output-earth < 230 µA	Input-earth < 500 µA Output-earth < 100 µA	Input-earth < 306 µA Output-earth < 64 µA
PMbus	Yes	-	Yes
Special highlights	Remote on/off, power good, AC good, peak power 3000 W for 5 sec	Remote on/off, peak power 2200 W @ 48 V, no load power consumption 1 W	Up to 29.5 W/inch^3 power density, remote on/off, power good

When it comes to small to mid-sized medical devices, the most significant considerations often revolve around compact size, noiseless convection cooling, peak power, and derating performance.

The MEU and MEP Series have been purposefully designed and engineered for small to mid-sized, typically portable medical devices, where acoustic noise levels and power density are paramount concerns. These power supplies rank among the most compact options available at their respective output levels, preserving internal system space for other functionalities. Their convection cooling design ensures a noiseless operation. Additionally, they outperform competitors with up to a 20% better derating performance, assuring reliable system operation under extreme conditions.

Medical power supplies for small to mid-size applications	MEU-650W	MEP-120A	MEP-200A
			
Output power	650 W	120 W	200 W
Dimensions	152.4 x 101.6 x 40 mm	76.2 x 50.8 x 31 mm	101.6 x 50.8 x 28.5 mm
Power density	17.25 W/inch^3	16.67 W/inch^3	22.3 W/inch^3
Energy efficiency	Up to 96%	Up to 94%	Up to 95.4%
Peak power	N/A	150 W @ 15 V for 10 spec	N/A
Derating	53.3% load @ 70˚C	50% load @ 70˚C	50% load @ 70˚C

MEG-A Configurable Power Supplies have been designed with flexibility in mind, offering a compact size, a wide range of output selections, PMbus capability, lower leakage current, and reversible fans. These qualities make it the ideal power solution for the most advanced medical systems.

For developers working on the most advanced medical machines, the flexibility to achieve cutting-edge design is of utmost concern. That's why Delta launched MEG-A Series configurable standard power supplies.

The MEG-A series distinguishes itself as one of the most compact configurable power supplies available in the market, boasting a power density up to 2.6 times that of its configurable counterparts. This empowers system designers with the flexibility to optimize limited internal space. The series offers an adjustable output voltage range from 2V to 60V through various modules and current configurations, ensuring a wide array of options.

Recognizing the significance of communication and integration with medical IoT in advanced medical systems, MEG-A supports not only PMbus but also offers a selection of multiple communication modules. It operates efficiently over a broader temperature range when compared to alternative solutions, and its reversible fans provide diverse thermal solutions at the system level.

Furthermore, the user-friendly graphic interface allows users to adjust the output voltage of each module, monitor input voltage, fan speed, and ambient temperature.

4 types of cases and max. output

MEG-700A3
700W
3 slots
88.9 x 215.9 x 41.5 mm

MEG-1K2A4
1200W
4 slots
88.9 x 254 x 40.5 mm

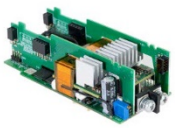
MEG-2K1A6
2100W
6 slots
127 x 254 x 40.5 mm

MEG-3K0A9
3000W
9 slots
181 x 254 x 40.5 mm

3 types of output modules

Single slot module
300W

Single slot dual-output module
240W



Triple slot module
1200W

3 types of communication modules

RS-232 communication module

RS-485 communication module

USB communication module

2V~60V
Adjustable Output Voltage

Up to 2.6X
Power Density

Up to 93%
Energy Efficiency

-20~70°C
Operatable

3000 W
Max. Output

- ☑ **Adjustable output voltage**
- ☑ **Monitor input voltage**
- ☑ **Monitor fan speed**
- ☑ **Monitor ambient temperature**

Sometimes the right power supply doesn’t exist until you meet Delta.

Delta has been developing and engineering power supplies for the world's best-known brands for over 50 years. Customers entrust Delta with some of the most challenging power supply design missions to create their next big innovations. Here are two success stories:

Customer requirement: A 2-in-1 power supply and onboard charger with both AC and DC outputs and extremely low ripple for an ultrasound machine.

A customer wanted to build a high-end portable ultrasound machine that generates crystal-clear, high-resolution ultrasound images. The power supply needed to provide multiple AC and DC outputs and charge batteries simultaneously. Additionally, the ripple from the power supply needed to be further reduced to achieve the desired imaging results. Delta owns several related patents and has extensive experience in reducing ripples. Our first sample met most of the customer's requirements.

“Delta is far ahead of the other power supply vendors we work with in Ultrasound.” – Customer feedback

Customer requirement: A fanless power supply with 2 x MOPP isolation, microcontroller-controlled battery management, and durability against extreme shocks and vibrations for an artificial respiration machine.

A customer wanted to build a portable artificial respiration machine that can withstand extreme shocks and vibrations in an ambulance. Since the machine is used in near-patient scenarios, it requires a power supply compliant with the most stringent standard – 2 x MOPP isolation. Battery backup and microcontroller-controlled management are also critical as it is a life-saving device. Delta offered a design incorporating digital interaction with analog power train control methods and an intelligent charging function to protect LiFePo4 batteries. Project management and documentation processes also adhered to the IEC 13485 and IEC 62304 certifications for software and hardware, as required.

“Delta’s R&D did a great job by identifying issues in the customer specs and provide innovative solutions to end up with exactly what we need. Great job done!” – Customer feedback

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Delta Electronics has been developing and engineering power supplies for the world‘s best-known brands since 1971, serving the consumer electronics, appliances, industrial, and medical fields. Thanks to the trust of our customers, in 2022, Delta was ranked as **the largest manufacturer of merchant power supplies globally for the third consecutive year***. Recognizing the fierce market competition, we offer top-of-the-line standard products and high-quality customization services to assist medical device brands in entering the market smoothly and confidently.

*Source: Micro-Tech Consultants