DATASHEET

MPE2000AC48_200AC24 medical power supply

90-264VAC Input; Outputs: 48V/2100W; 24V/100W; 5VSB/0.25W

The MPE2000AC48_200AC24 is a multiple output, medical grade power supply that is fan cooled and designed for stand-alone use. The power supply has special design considerations for medical requirements, as well as three output voltages and constant current charging ability at the supplies output current limit. The supply is also designed for ease of use with enables for the main and secondary output as well as a global enable for all outputs.

Applications

The MPE2000AC48 rectifier is designed and tested for deployment into embedded medical DC power applications where patient safety is of the utmost importance. Designed with a rugged power train to support high transient demand laser devices, the MPE2000 is ideal for Industrial medical applications. As a system DC rectifier the MPE2000 can be designed into parallel for higher power applications as well as into distributed power architectures for divers applications. The MPE2000 is generally applicable across Bio-science and life science applications where patient safety and support for highly demanding DC loads are critical success factors.

Features

- Form factor: 11.0” (L) x 5.0” (W) x 5.0” (H)
- Compliant to RoHS Directive 2011/65/EU and amended Directive (EU) 2015/863
- Wide operating temperature range
- Universal input range
- Meeting medical approval ratings
- Meeting medical creepage and clearance requirements
- Low leakage current rating
- Class B EMI performance
- Two main outputs & one auxiliary output
- PMBUS communication protocol
- High MTBF design
- Easy connectivity

Absolute Maximum Ratings

Stresses over the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions over those given in the operations sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect the device reliability.

Parameter	Device	Min	Max	Unit
Input Voltage: Continuous	VIN	90	264	V_{AC}
Operating Ambient Temperature	T_A	-20	70	°C
Storage Temperature	T_{STG}	-40	85	°C
Humidity (non-condensing)		5	95	%
Altitude			3000	m

Electrical Specifications

Parameter	Device	Min	Typ	Max	Unit
Operational Range	V_{IN}	90	115/230	264	V_{AC}
Frequency range (ETSI 300-132-1 recommendation)	F_{IN}	45	50/60	65	Hz
Main Output Turn OFF	V_{IN}			80	V_{AC}
Main Output Turn ON	V_{IN}	85			V_{AC}
Hysteresis between turn OFF and turn ON	V_{IN}	5			V_{AC}
Efficiency (T_a=25°C, V_{IN}= 230V_{AC}, V_1= 48V & V_2=24V, inc. fan) 20% load 50% load 100% load	 η η η		 90.0 93.5 92.0		 % % %
Maximum Input Current V_{IN}=100V_{AC} V_{IN}=180V_{AC}	 I_{IN} I_{IN}			 20 20	 A_{AC} A_{AC}
Cold Start Inrush Current	I_{IN}			40	A_{PEAK}
Turn on delay time				3	sec
Power factor (V_{AC}=115/230V_{AC}), I_{out}=50% I_{0_max} I_{out}=100% I_{0_max}	 PF PF		 0.96 0.99		
Holdup time (V_{out}≥ 40V, T_{amb}=25°C) V_{IN} =115V_{AC}, 1500W load V_{IN} =230V_{AC}, 2100W load	 T_{hold}	 15 15			 ms
Leakage current (V_{IN}=264V_{AC} , F=60Hz)	$I_{leakage}$			300	uA_{RMS}
Isolation Input/Output		4000			V_{AC}
Isolation Input/Frame		1500			V_{AC}
Isolation Output/Frame		1500			V_{DC}
Isolation 48V_{out}/24V_{out}, 48V_{out}/5VSB, 24V_{out}/5VSB (between each output)		2321			V_{DC}

Electrical Specifications

48VDC MAIN OUTPUT					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Output Power Low line 90-180V_{AC} High line 180-264V_{AC}	W		-	(8.88*V_{AC} + 501.6) 2100	W
Overall regulation (setpoint, line, load, temperature)	V_O	-1		+1	%
Ripple and noise (20MHz bandwidth, 0.1µF ceramic + 10µF aluminum connected)	V_O			480	mV_{P-P}
Turn-ON overshoot	V_O			+2	%
Turn-ON delay	T			3	sec
Remote ON/OFF delay time	T			30	ms
Turn-ON rise time (10 – 90% of V_{out})	T			30	ms
Transient response 50% step [25%-75%] (di/dt=0.1A/µs, recovery <2ms)	T	-2		2	$\%V_O$
Overvoltage protection, latched （recovery by recycling off/on via hardware or	V_O	110		125	$\%V_O$
Output current	I_O	0		43.75	A_{DC}
Output external capacitance	C		18000		µF
Current limit	I_O	105		110	%FL
24VDC MAIN OUTPUT					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Output Power	W	0	-	100	W
Overall Regulation (setpoint, line, load, temperature)	V_O	-1		+1	%
Ripple and noise (20MHz bandwidth, 0.1µF ceramic + 10µF aluminum connected)	V_O			240	mV_{P-P}
Turn-ON overshoot	V_O			+2	%
Turn-ON delay	T			3	sec
Remote ON/OFF delay time	T			30	ms
Turn-ON rise time (10 – 90% of V_{out})	T			10	ms
Transient response 50% step [25%-75%] (di/dt=0.1A/µs, recovery <2ms)	T	-2		+2	$\%V_O$
Overvoltage protection, latched (recovery by recycling off/on via hardware or PMBUs®)	V_O	110%		120%	%Vo
Output current	I_O	0		4.16	A_{DC}
Current limit	I_O	110		120	%FL

Electrical Specifications

STANDBY OUTPUT					
Parameter	**Symbol**	**Min**	**Typ**	**Max**	**Unit**
Set point			5		V_{DC}
Overall regulation (setpoint, line, load, temperature)	V_O	-5		5	%
Ripple and noise (20MHz bandwidth, 0.1µF ceramic+10µF aluminum connected)	V_O			100	mV_{P-P}
Output current	I_O	0		0.5	A_{DC}
Over-voltage Clamp				7	V
Current Limit		110		175	%FL

General Specifications

Parameter	Device	Symbol	Typ	Unit
Calculated Reliability based on Telcordia SR-332 Issue 3: Method 1 Case III (V_{IN}=230V_{AC}, full load, T_A = 25°C)	All	MTBF	450,000	Hours
Weight	All		3850 135.6	g oz.

Environmental Specifications

Parameter	Device	Specification
Conducted Emissions	All	CISPR11/EN55011, FCC part15 Subpart B, Class B with 6dB margin
Radiated Emissions	All	CISPR11/EN55011, FCC part15 Subpart B, Class B with 3dB margin
ESD	All	EN 61000-4-2, Level 4 Performance Criteria
Electric Fast Transient Common Mode	All	EN 61000-4-4, Level 3
Surge Immunity	All	EN 61000-4-5, Level 3
Conducted Immunity	All	EN 61000-4-6, Level 2
Radiated Immunity	All	EN 61000-4-3, Level 3, IEC 60601-1-2 Table9
Input Voltage Dips	All	EN 61000-4-11, Class 2
Input Harmonics	All	IEC61000-3-2, Class A
Shock and Vibration	All	Per IPC-9592B, Class II

Safety Specifications

Parameter	Device	Specification
Earth continuity	All	25A, max 0.1ohm, duration 3 sec
Safety Standards	All	EN60601-1, IEC 60601-1, ES 60601-1, CAN/CSA-C22.2 No.60601-1:14 approvals

Characteristic Curves

The following figures provide typical characteristics for the CMPE2000AC48 rectifier at 25°C

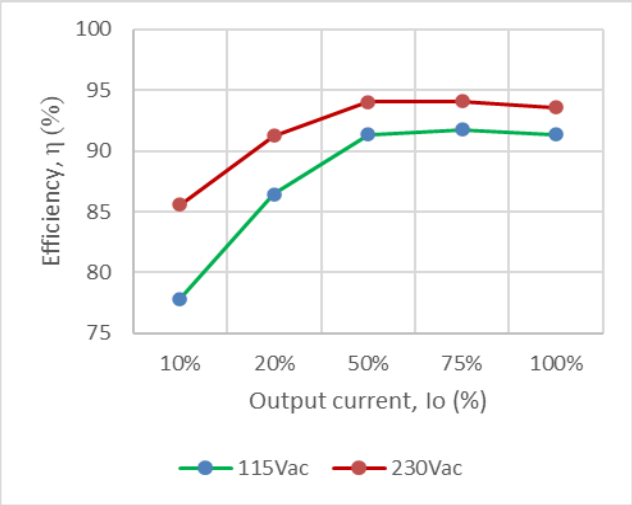


Figure 1. Rectifier Efficiency versus Output Current

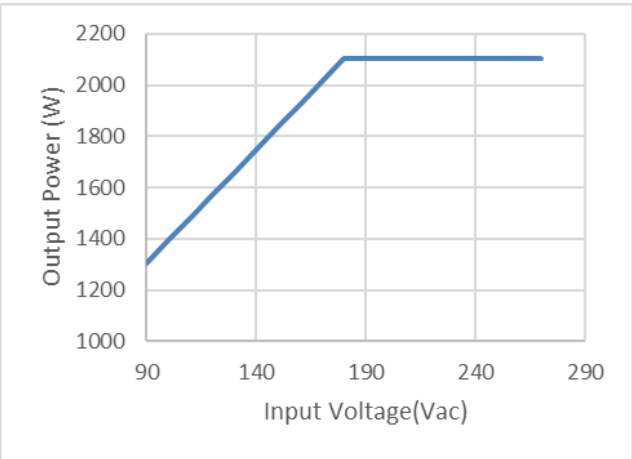


Figure 2. 48V_{DC} output power derating based on input voltage

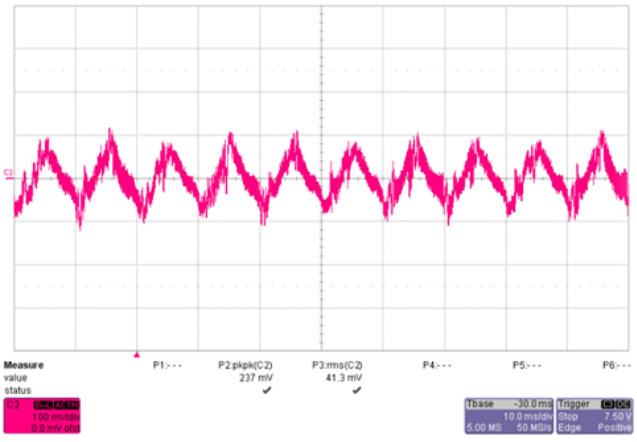


Figure 3. 48V_{DC} output ripple and noise, full load, V_{IN}=230V_{AC}, 20MHz bandwidth

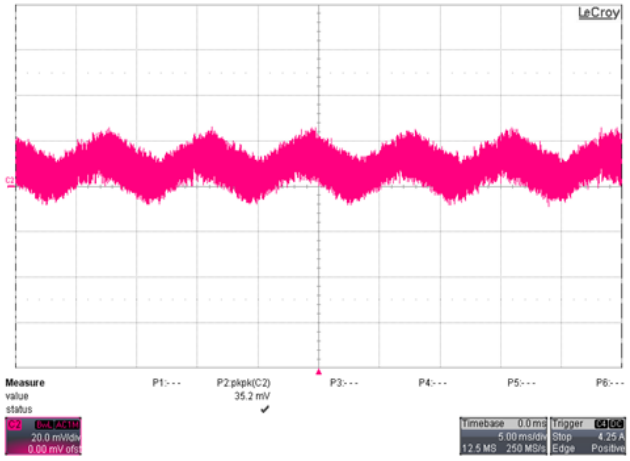


Figure 4. 24V_{DC} output ripple and noise, full load, V_{IN}=230V_{AC}, 20MHz bandwidth

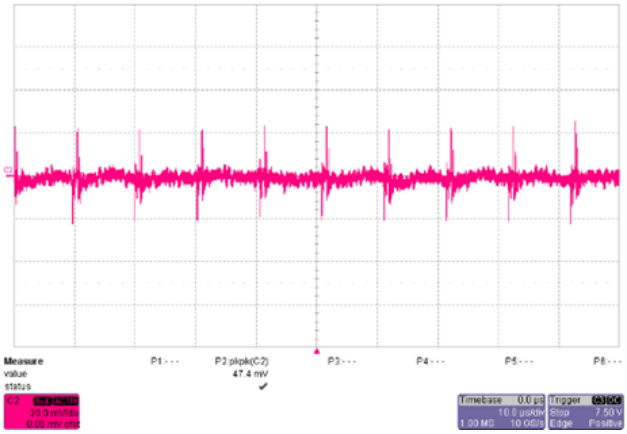


Figure 5. 5VSB output ripple and noise, full load, V_{IN}=230V_{AC}, 20MHz bandwidth

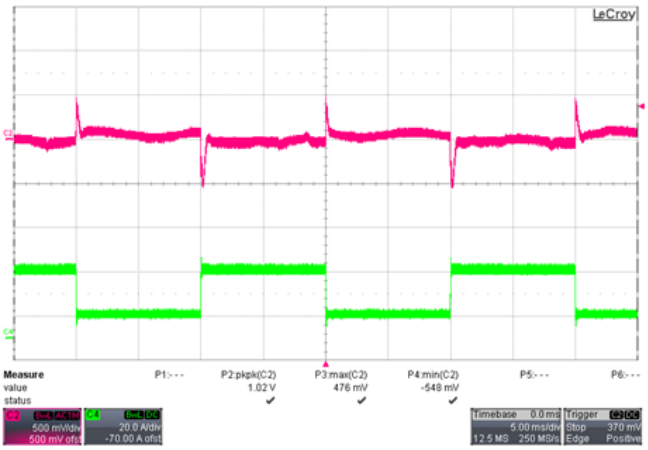


Figure 6. Transient response 48V_{DC} load step 25% – 75%, V_{IN} = 230V_{AC}

Characteristic Curves

The following figures provide typical characteristics for the CMPE2000AC48 rectifier at 25°C

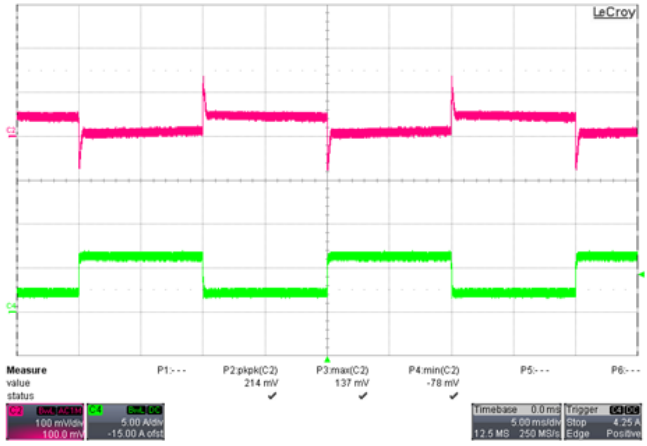


Figure 7. Transient response 24V$_{DC}$ load step 25% – 75%, V$_{IN}$ = 230V$_{AC}$

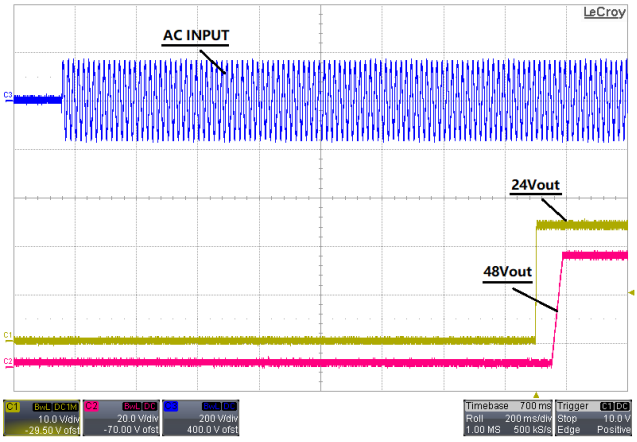


Figure 10. 24V$_{DC}$ & 48V$_{DC}$ turn on delay time, V$_{IN}$ = 115V$_{AC}$

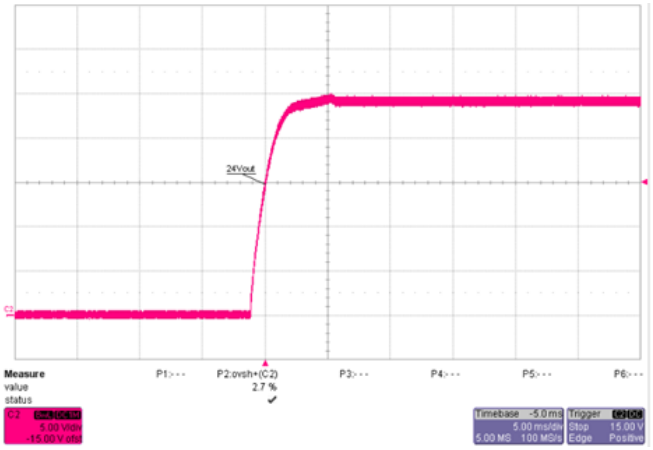


Figure 8. 24V$_{DC}$ soft start, full load, V$_{IN}$=230V$_{AC}$

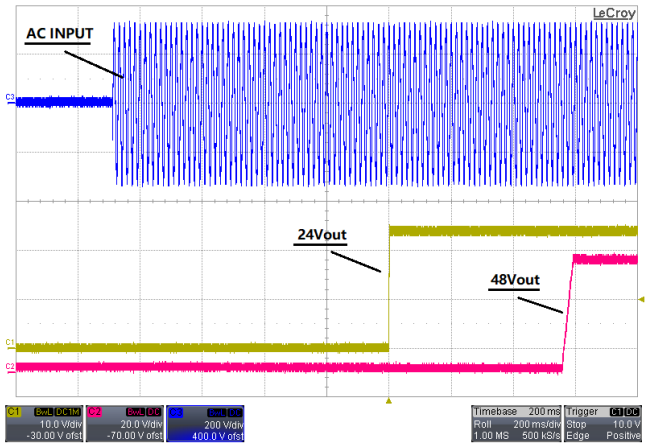


Figure 11. 24V$_{DC}$ & 48V$_{DC}$ turn on delay time, V$_{IN}$ = 230V$_{AC}$

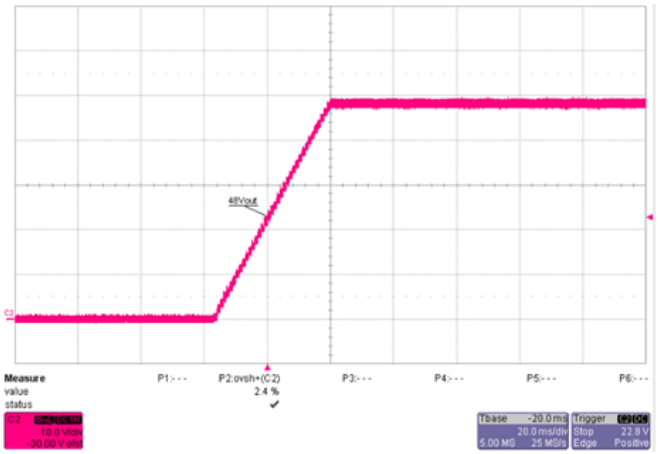


Figure 9. 48V$_{DC}$ soft start, full load, V$_{IN}$=230V$_{AC}$

Technical Specifications (continued)

Signal status

All signal status outputs are open-collector type signal that go low when the unit at normal operation condition, the detail status of each signal refer to below Table 1.

Normal operation

	Normal Operation	Out of Spec
	48V/24V in regulation	48V/24V out of regulation
48V PG	L	H
24V PG	L	H
	VAC in range	VAC out of range
AC fail	L	H
	fan good	fan fail
Fan fail	L	H
	OTP not triggered	OTP triggered
OTP	L	H

Table 1. Signal output status

Note:

Each signal status output is an open-collector type signal, and the max sink current is 4mA, and max collector voltage is 12V.

LED indicator

Three LEDs for 48V, 24V and AC input, Normal LED green, and off when failed, refer to Table 2.

LED		
	48V/24V in regulation	48V/24V out of regulation
48V LED	Green	dark (off)
24V LED	Green	dark (off)
	Vac in range	Vac out of range
AC LED	Green	dark (off)

Table 2. LED indicator

Enables (remote on/off)

- The PS has three enables: 48V_enable, 24V_enable and Global_enable.
- 48V_enable, (separate on/off) for 48V output, 24V_enable, (separate on/off) for 24V output, and Global_enable, (master on/off) for 48V and 24V outputs.
- The power supply feature a TTL-compatible enable (on/off) control input, each enable signal input has some logic, the power supply outputs turn on when the on/off input goes low, and turn off when the input goes high or floating.
- The specification of enable signals, refer to below Table 3.

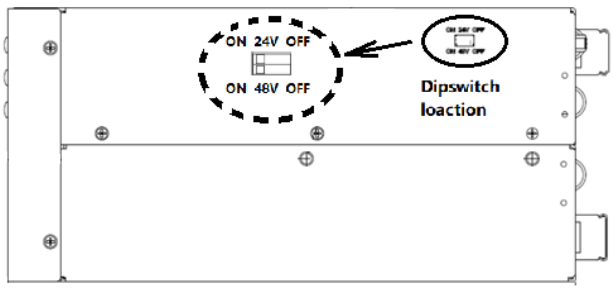
Parameter	Min	Typ	Max	Unit
On/Off Signal				
Logic Low (Power Supply ON)				
Input Low Current			0.2	mA
Input Low Voltage			0.5	V
Logic High (Power Supply OFF)				
Input High Current			1.1	mA
Input Voltage	2		5.5	V

Table 3. Enable signal logic spec

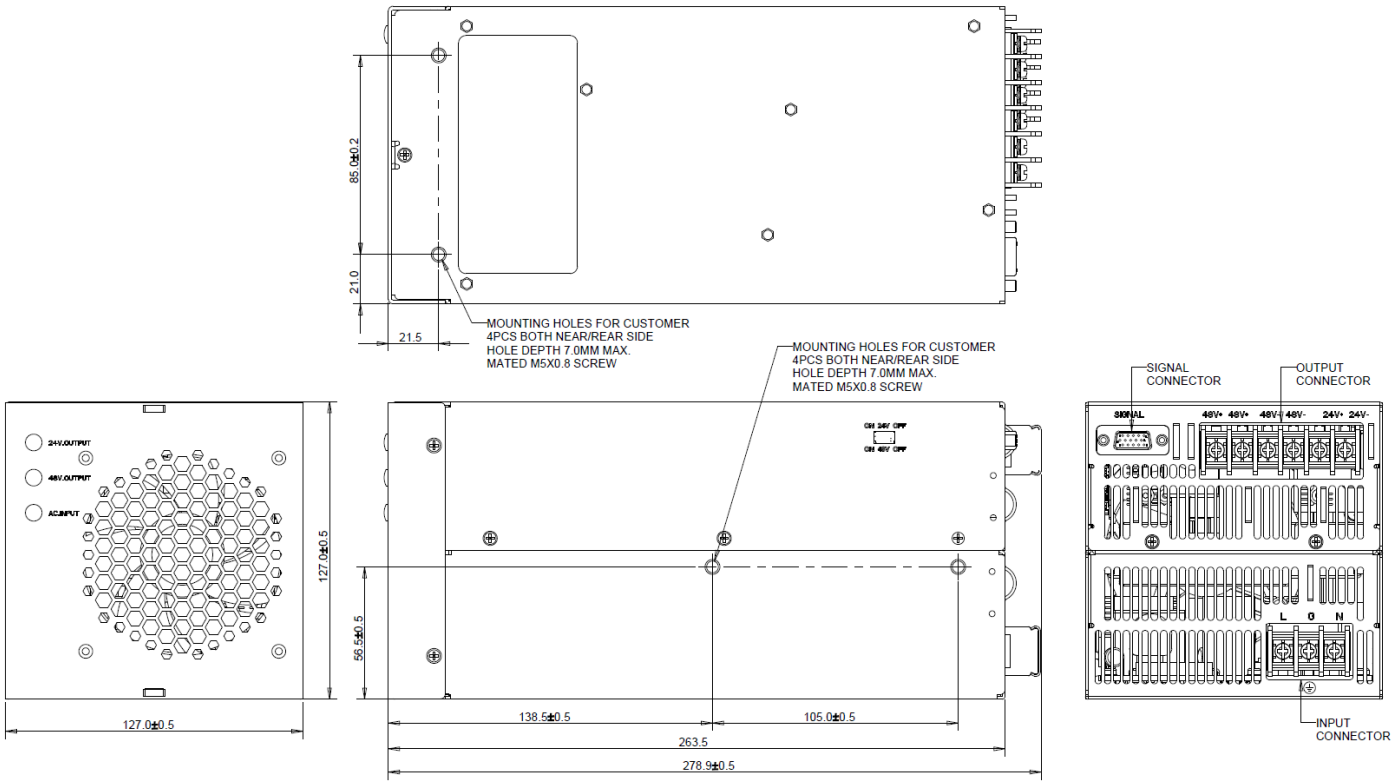
Two Dipswitches are added for the 24V and 48V outputs, and if the dipswitch is activated the output will turn on whenever the global enable is active to 'on' , the dipswitch location refer to below picture.

1=off, or Disabled 0=on, or Enabled			OUTPUT		
Global Enable	**48V enable or 48V Dipswitch**	**24V enable or 24V Dipswitch**	**48V**	**24V**	**5VSB**
1	X	X	0	0	5V
0	1	1	0	0	5V
0	1	0	0	24V	5V
0	0	1	48V	0	5V
0	0	0	48V	24V	5V

Table 4. Enable and Dipswitch VS Output



Mechanical Outline



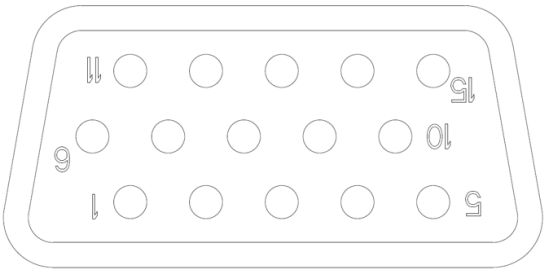
- There have 8pcs M5x0.8 type thread holes with thread depth 7.0mm for mounting, which locations as upon drawing showing. Recommended torque: 2.0Nm
- For input and output terminal to assembly cable, which is M4 type screw, Recommended torque: 1.2N

Connector Pin Assignments

Input Connector: DINKLE DT-66-C11W-03; M4, 300V, 40A; Wire UL/CUL: AWG #18~ #8

Output Connector: DINKLE DT-66-C11W-06; M4, 300V, 40A; Wire UL/CUL: AWG #18~ #8; (2POS for 24Vout , 4POS for 48Vout)

Signal Connector (D-Sub 15): TE Connectivity 1734530-3



11	FAN_FAIL	OTW	AC_FAIL	LGND	/	15
9	24V_ENABLE_IN	24V_DCOK	GLOBAL_ENABLE_IN	48V_DCOK	5VSB	10
1	I2C_SCL0	I2C_SDA0	LGND	48V_ENABLE_IN	ALERT#_0	5

Ordering Information

Please contact your OmniOn Sales Representative for pricing, availability and optional features (as PMbus information).

PRODUCT	OUTPUT	STANDBY	AIRFLOW	Ordering Code
MPE2000AC48_200AC24	2100W, +48Vout and 100W +24Vout AC Input front-end with 5Vsbaux	5V @0.5A	Standard (from Fan to AC in/DC out)	1600382394A

Change History (excludes grammar & clarifications)

Revision	Date	Description of the change
1.1	12/15/2021	Initial Release
1.2	10/31/2023	Updated as per OmniOn template

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