MA512-X-V2 / Converter

438W / Wide Range

RECOM
AC/DC Converter

FEATURES

- Fully compliant with EN 60601-1, protection class I, MOOP
- CSA listed for Canadian and U.S. market
- 8 isolated outputs (see electrical data), with reinforced galvanic isolation
- From 5 to 40°C operating temperature
- Efficiency up to 91% at nominal load
- User interface signals for easy failure detection (see user interface characteristics)
- Input and output connectors for easy mate n lock connection
- Wide input range from 90 to 264Vrms
- Up to 20ms hold-up time



Dimensions 337.0 x 212.0 x 57.1 mm (13.27 x 8.35 x 2.25inch)

APPLICATION

MEDICAL

SAFETY & EMC

RoHS² compliant 10 from 10

Reach compliant

- The charger follows LVD Directive 2014/35/EU and EMC Directive 2014/30/EU.
- The converter is CE compliant. EMC radiation must be evaluated and tested in the complete system since mounting and wiring have a large influence on radiation behaviour.

DESCRIPTION

MA512-X is a custom 500W AC/DC converter designed for the ACL Elite laboratory medical device. It features full compliance with EN 60601-1 (protection class I, MOOP), CSA listing for Canada and the U.S., 8 isolated outputs with reinforced galvanic isolation, operation from 5°C to 40°C, up to 91% efficiency at nominal load, user interface signals for failure detection, easy mate-n-lock connectors, a wide input range (90–264 Vrms), and up to 20ms hold-up time.

MODELS

Part Number	Input Voltage nom. [VAC]	Input Current Max. [A]	Output Voltage nom. [VDC]	Output Current Max. [A]	Output Power Max [W]
MA512-X-V2	100/230	6	+5.2	12A	62
			+12	4A	48
			+15	0.7A	10.5
			-15	-0.7A	10.5
			+6	3.2A	19.2
			+9	9.8A	88
			+12	17.5A	210
			+68.5	3.2A	178

MA512-X-V2

Converter type
Nominal power
Converter revision
Custom version

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BASIC CHARACTERISTICS				
Parameter	**Conditions**	**Min.**	**Typ.**	**Max.**
INPUT				
Rated Input Voltage		100VAC		230VAC
Input Voltage Range		90VAC		264VAC
Input Frequency		47Hz	50/60Hz	63Hz
Rated Input Current	@230VAC/100VAC	2.3A		5.3A
Max. Input Current	@90VAC			6A
Power Factor		0.96		
PFHC – Power Factor Harmonic Correction	Compliant with EN 61000-3-2 Class A			
Efficiency		90%		
Inrush Current				12.5A
OUTPUT				
Nominal Output Voltage	+5DGT		5.2V	
Adjustable (with Internal Trimmer)			Yes	
Nominal Output Current			10A	
Output Current Range		1A		12A
Output Voltage Accuracy			2%	
Maximum Ripple & Noise				100mVpp
Line Regulation				0.1%
Load Regulation				1.5%
Nominal Output Voltage	+12DGT		12V	
Adjustable (with Internal Trimmer)			Yes	
Nominal Output Current			3A	
Output Current Range		0A		4A
Output Voltage Accuracy			0.5%	
Maximum Ripple & Noise				100mVpp
Line Regulation				0.1%
Load Regulation				1%
Nominal Output Voltage	+15AN		15V	
Adjustable (with Internal Trimmer)			Yes	
Nominal Output Current			0.5A	
Output Current Range		0A		0.7A
Output Voltage Accuracy			0.5%	
Maximum Ripple & Noise				100mVpp
Line Regulation				0.1%
Load Regulation				1%
Nominal Output Voltage	-15AN		-15V	
Adjustable (with Internal Trimmer)			Yes	
Nominal Output Current			-0.5A	
Output Current Range		0A		-0.7A
Output Voltage Accuracy			0.5%	
Maximum Ripple & Noise				100mVpp
Line Regulation				0.1%
Load Regulation				1%
Nominal Output Voltage	+6VLAMP		6V	
Adjustable (with Internal Trimmer)			Yes	
Nominal Output Current			2.5A	
Output Current Range		0.5A		3.2A
Output Voltage Accuracy			0.2%	
Maximum Ripple & Noise PARD				100mVpp
Line Regulation				0.1%
Load Regulation				0.7%

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BASIC CHARACTERISTICS				
Parameter	**Conditions**	**Min.**	**Typ.**	**Max.**
Nominal Output Voltage	+9PWR		9V	
Adjustable (with Internal Trimmer)			No	
Nominal Output Current			7.5A	
Output Current Range		0.5A		9.8A
Output Voltage Accuracy			5%	
Maximum Ripple & Noise				300mVpp
Line Regulation				0.1%
Load Regulation				0.2%
Nominal Output Voltage	+12PWR		12V	
Adjustable (with Internal Trimmer)			No	
Nominal Output Current			13.5A	
Output Current Range		1A		17.5A
Output Voltage Accuracy			5%	
Maximum Ripple & Noise				300mVpp
Line Regulation				0.1%
Load Regulation				1%
Nominal Output Voltage	+70PWR		68.5V	
Adjustable (with Internal Trimmer)			No	
Nominal Output Current			2A	
Output Current Range		0A		2.6A
Output Voltage Accuracy			5%	
Maximum Ripple & Noise				300mVpp
Line Regulation				0.1%
Load Regulation				0.2%
Max. Output Power			438W	486W
Hold-Up Time	Nominal Load		20ms	

ENVIRONMENTAL CONDITIONS				
Parameter	**Conditions**	**Min.**	**Typ.**	**Max.**
Operating Temperature Range		+5°C		+40°C
Transportation and Storage Temperature Range		-10°C		+50°C
Operating Humidity	No Dew	5%		95%
Transportation and Storage Humidity		5%		95%
Operating Altitude				2000m
Storage Altitude				3000m
Cooling	Natural convection			
Vibration	EN IEC 60721-3-3		Class 3M12	
Shock	EN IEC 60721-3-3		Class 3M12	
Protection Degree	IEC 60529		IP20	
Pollution Degree			II	

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SAFETY AND PROTECTIVE FUNCTIONS				
Parameter	**Conditions**	**Min.**	**Typ.**	**Max.**
Dielectric withstand voltage	Input – P.E.		1.5kVAC	
	Output – P.E.		0.3kVAC	
	Input - Output		4kVAC	
	Input - Signals		4kVAC	
Isolation		10MΩ		
Safety I/P Fuse – System	Externally present fuse		6.3A	
Safety I/P Leakage Current				0.3mA
Reliability IEC 61709	Failures per million hours		1.2fpmh	
Overcurrent Protection (OCP) (*1)	+5DGT		12.5A	
Overvoltage Protection (OVP) (*1)		6.2V		
Undervoltage Protection (UVP) (*1)				4V
Overcurrent Protection (OCP)	+12DGT		4.2A	
Overvoltage Protection (OVP)			--	
Undervoltage Protection (UVP)			--	
Overcurrent Protection (OCP)	+15AN		2.1A	
Overvoltage Protection (OVP)			--	
Undervoltage Protection (UVP) (*1)				13.75V
Overcurrent Protection (OCP)	-15AN		1.6A	
Overvoltage Protection (OVP)			--	
Undervoltage Protection (UVP) (*1)		-13.75V		
Overcurrent Protection (OCP)	+6VLAMP		4.3A	
Overvoltage Protection (OVP)			--	
Undervoltage Protection (UVP)			--	
Overcurrent Protection (OCP) (*2)	+9PWR		10.4A	
Overvoltage Protection (OVP) (*1)		12V		
Undervoltage Protection (UVP)			--	
Overcurrent Protection (OCP) (*2)	+12PWR		17.5A	
Overvoltage Protection (OVP) (*1)		15V		
Undervoltage Protection (UVP)			--	
Overcurrent Protection (OCP) (*2)	+70PWR		2.45A	
Overvoltage Protection (OVP) (*1)		76V		
Undervoltage Protection (UVP)			--	

(*1) PSU Switch-Off

(*2) Switch-Off of all power outputs after three attempts

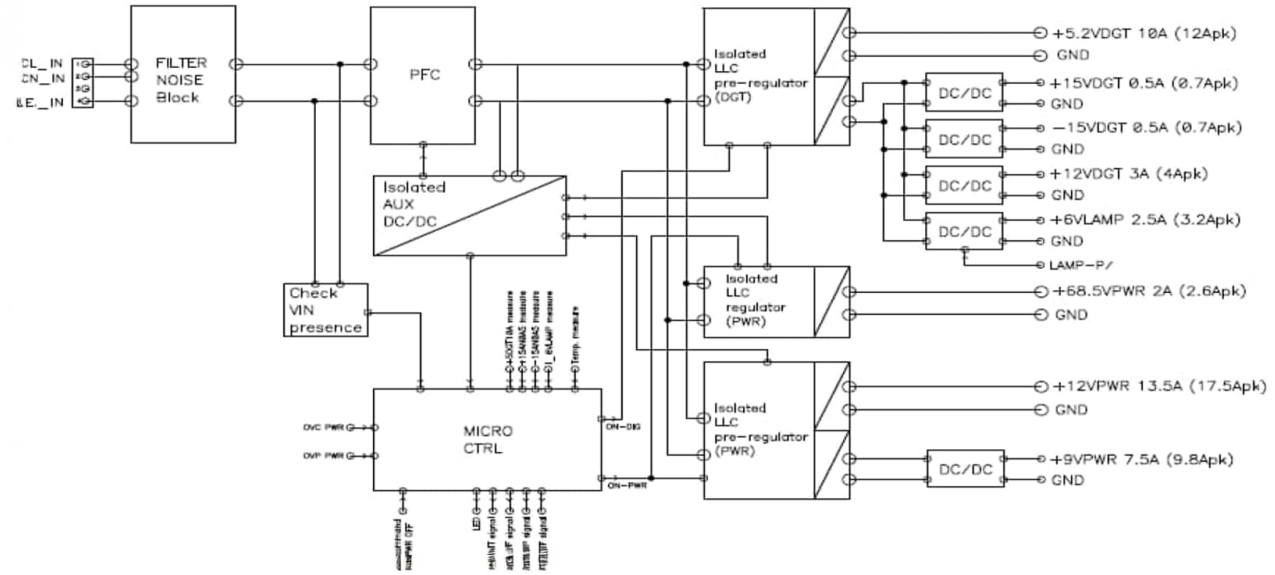
CERTIFICATIONS		
Safety		
Compliance	**Parameter**	**Standard / Criterion**
Safety	MOOP (Means of operator protection)	EN 60601-1
Safety Protection Class		I
CE Mark 2014/35/EU		Y Declaration
RoHS – 2015/863/EU		Y Declaration
CSA Mark		
RoHS2		RoHS 2011/65/EU + AM2015/863

CERTIFICATIONS		
EMC Compliance		
Compliance	**Parameter**	**Standard / Criterion**
Immunity	Indoor	IEC 60601-1-2
Emission(*)		EN55032 – CISPR32 Class A

*Tested with external ferrites on output cables; contact RECOM Power Systems for details.

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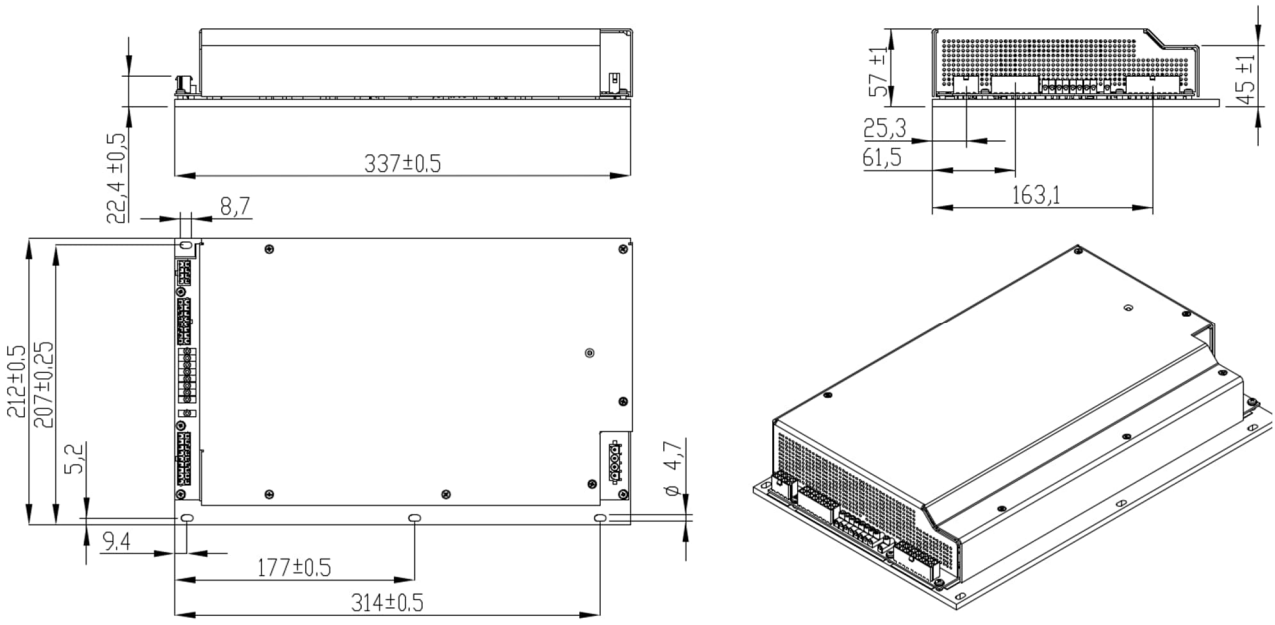
BLOCK DIAGRAM



MECHANICAL DATA

Parameter	Conditions	Min.	Typ.	Max.
Weight				3 kg 6.61lbs
Fixing	Flange			
Cover	Aluminum with a natural anodized finish		---	
IP Protection Class			IP20	
Height			337.0mm 13.27inch	
Width			212.0mm 8.35inch	
Length			57.1mm 2.25inch	
Connectors	Terminal Blocks Barriers			

DIMENSIONS



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DIMENSIONS AND INSTALLATION INFORMATION

For the installation of the converter, the following must be adhered to:

- The converter must be installed at a secure location out of reach of the user. This is to prevent dangers such as accidental touching of HV components or skin burns on the hot housing.
- The tightness of the converter can only be guaranteed if all signal wires to the signal connectors are assembled and connected to a tight unit on both sides. If this is not the case for a cable or wire, it must be sealed separately.
- The mechanical fixture is to be designed in such a way that the device is installed in a fixed position and with as little vibration as possible.
- All cable connections must be secured with strain relief elements near the device (not included in the scope of delivery).
- Cable connections must have sufficient play and must not meet sharp-edged components.
- The enclosure should be sufficiently ventilated (no heat accumulation).

CONNECTORS

Type	Port	Manufacturer	Manufacturer PN
K1	I/P	TYCO EL	350430-1
K3	O/P	MOLEX	39-28-1183
K4	O/P	MOLEX	39-28-1163
K5	O/P	MOLEX	39-28-1083

K1

Pin	Configuration	Function
1	L	
2	N	
3	Not Connected	
4	PE	

K3

POS.		POS.	
1	+15V	10	-15V
2	GND	11	GND
3	+5V	12	+5V
4	+5V	13	GND
5	GND	14	GND
6	GND	15	+12V
7	INHIBIT	16	POW-OFF
8	P.F.	17	LAMP-P
9	T.F.	18	M-LAMP

K4

POS.		POS.	
1	+12V	9	+12V
2	+12V	10	+12V
3	+12V	11	GND
4	GND	12	GND
5	GND	13	GND
6	GND	14	+12V
7	GND	15	+9V
8	+9V	16	+9V

K5

POS.		POS.	
1	+68V	5	GND
2	+68V	6	GND
3	+64V	7	GND
4	+6V	8	GND

K3 MINI-FIT

Pin	Configuration	Pin	Configuration
1	+15AN	10	-15AN
2	GND	11	GND
3	+5DGT	12	+5DGT
4	+5DGT	13	GND
5	GND	14	GND
6	GND	15	+12DGT
7	INIT	16	PWR OFF
8	PF	17	LAMP P
9	TF	18	M LAMP

K4 MINI-FIT

Pin	Configuration	Pin	Configuration
1	+12PWR	9	+12PWR
2	+12PWR	10	+12PWR
3	+12PWR	11	GND
4	GND	12	GND
5	GND	13	GND
6	GND	14	GND
7	GND	15	+9PWR
8	+9PWR	16	+9PWR

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K5 MINI-FIT

Pin	Configuration	Pin	Configuration
1	+70PWR	5	GND
2	+70PWR	6	GND
3	+70PWR	7	GND
4	+6VALAMP	8	GND

USER INTERFACE CHARACTERISTICS

Description	Unit	Configuration	
INIT	TTL-H	ACTIVE-HIGH (O/P)	After about 200 ms in which +5DGT>4.75V, the signal goes high. After a further 400 ms all PWR o/p go high. When +5DGT<4.75V the signal goes low.
THERMAL FAIL	TTL-H	ACTIVE-HIGH (O/P)	When Temperature is 105°C (approx.) the signal goes high. Another temperature alarm level at 117°C (approx.) shuts down the Power Supply
MISSING LAMP	TTL-L	ACTIVE-LOW(O/P)	The signal is generated when output +6VLAMP is in a no-load or short-circuit condition
LAMP POWER	TTL-L	ACTIVE-LOW (I/P)	This signal turns off the output +6VLAMP.
POWER-OFF	TTL-L	ACTIVE-LOW (I/P)	Inhibit input to turn off all the PWR outputs
POWER FAIL	TTL-H	ACTIVE-HIGH (O/P)	This signal activates when power mains power is switched off; it is activated at least 10ms before output +5DGT falls below 4.75 VDC

WARRANTY AND GUARANTEE

The warranty corresponds to the regulations in our currently valid general terms and conditions.

INSTRUCTIONS REGARDING DISPOSAL

A basic requirement for the re-use and recycling of used electronic devices is the correct disposal. With the implementation of the electric and electronic device regulation, electronic devices may no longer be disposed of along with ordinary household waste but must be separately collected and recorded by a specialist service.
Disposal through a specialist service significantly helps to avoid dangers to people and nature. Therefore, in the case of disposal, we recommend contacting a recognized specialist disposal service.

REQUIREMENTS FOR OPERATING PERSONNEL

All work on the converter may only be carried out by a qualified electrician.
Specialist staff are defined as electricians who have received specific professional training, have knowledge and experience in the field of electronics, and have knowledge of the relevant provisions and hazards. They must be able to provide evidence of these qualifications.

The product information and specifications may be subject to changes even without prior written notice. The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

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