



power supplies for medical  
 open frame PSU single OP 115W/24VDC  
 TYPE MNR MS 105  
 NR. 21105



# Features

- 100W with convection-cooled single output power supply
- High efficiency up to 91%
- No-load power consumption < 0.5W
- Class II design, additional class I functional ground connected
- Compact size 2 x 4 inch and low profile
- Medical standard EN / UL 60601-1 3<sup>rd</sup> Edition approved
- Meets EMI CISPR/FCC class B
- Optional cover kit
- Designed to meet IEC 60601-1-2 4th ed. EMC

## 1. Description

Model No. <small>(Note 3)</small>	Output Voltage	Mini. Output Current	Rated Output Current	Max. Output Current	Line Regulation	Load Regulation	Ripple & Noise p-p <small>(Note 1)</small>	Initial Setting
								Accuracy <small>(Note 2)</small>
<b>MNR MS 105</b>	<b>+24V</b>	0 A	4.2 A	4.8A	±1%	±1%	±1%	23.7 V~ 24.3 V

**Total Output Power:** Max. 100W convection cooled, above 101~115W with 7 CFM forced air-cooling at 50°C environment temperature (Note 4).

Note: 1) Measured by a 20MHz bandwidth limited oscilloscope and the each output is connected with a 10µF Electrolytic Capacitor and a 0.1µF Ceramic Capacitor.

2) Initial setting accuracy is adjusted at input 115VAC and output at 60% rated load.

3) See the detail model no. coding in paragraph 5.

4) Please see detail performance curves in paragraph 6.

## 2. Input Specification

Parameter	Conditions/Description	Min.	Nom.	Max.	Units
Input Voltage	Universal input range.	85	115 / 230	264	VAC
Label Voltage		100		240	VAC
Input Frequency	AC input.	47	50 / 60	63	Hz
Input Current	Nominal AC Input Voltage (115VAC/230VAC), rated load.			2 / 1.2	A
Inrush Current	Nominal AC Input Voltage (115VAC/230VAC), one cycle at 25°C cold start.			30 / 60	A
Input Protect	Dual non-user serviceable internally located AC input line fuse.				
No-load power consumption	Nominal AC Input Voltage (115VAC/230VAC).			<0.5	W

### 3. Output Specification

Parameter	Conditions/Description	Min.	Nom.	Max.	Units
Efficiency	At input 230VAC, rated load <sup>(Note 1)</sup>		90		%
Minimum load		See Chart of Description			
Ripple & Noise	Rated load, 20MHz bandwidth	See Chart of Description			
Output Current	Continuous output.	See Chart of Description			
Line Regulation	Less than $\pm 1\%$ at rated load with $\pm 10\%$ changing in input voltage.	See Chart of Description			
Load Regulation	Measured from 60% to 100% rated load and from 60% to 20% rated load (60% $\pm 40\%$ rated load).	See Chart of Description			
Hold Up Time	Nominal AC Input Voltage (115VAC/230VAC), rated load.	12 / 20			ms
Turn-on Delay	Nominal AC Input Voltage (115VAC/230VAC), rated load at 25 °C Time required for initial output voltage stabilization.		0.7		Sec

Note: 1) Measured after 0.5 hr warm up.

### 4. Interface Signals and Internal Protection

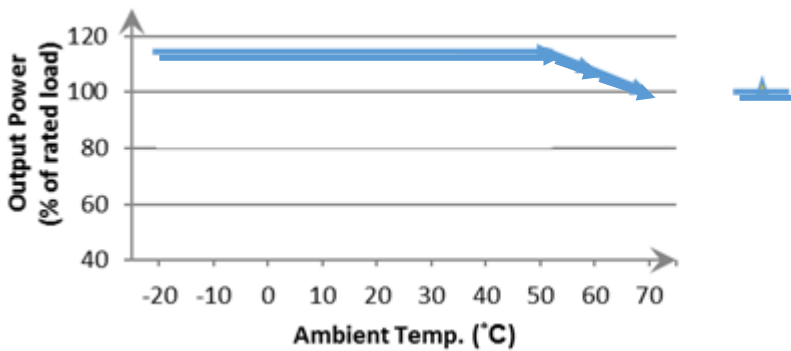
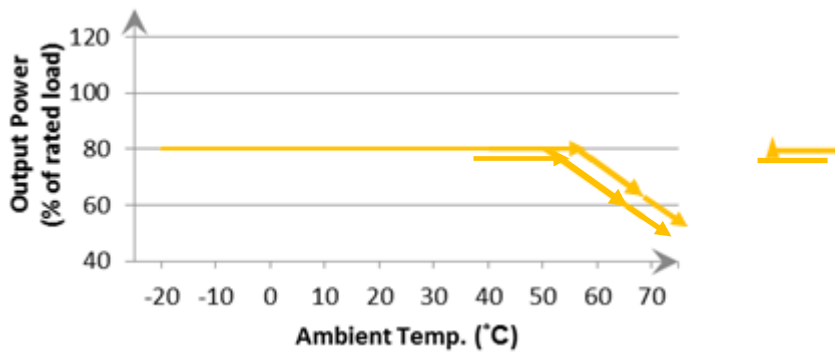
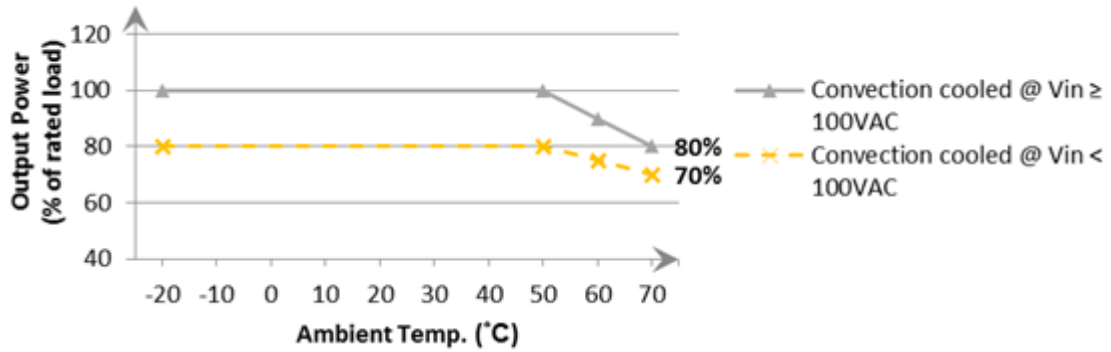
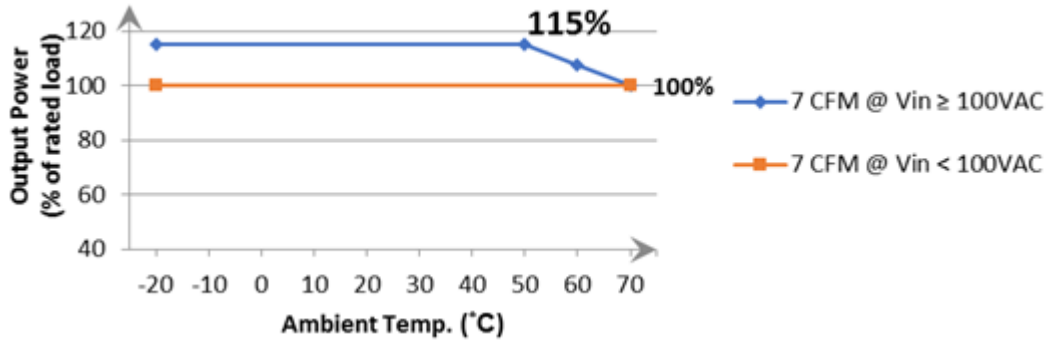
Parameter	Conditions/Description
Short Circuit Protection	Fully protected against output overload and short circuit. Automatic recovery upon of overload condition.
Over Voltage Protection	For some reason the power supply fails to control itself, the build-in over voltage protection circuit will auto recovery the outputs to prevent damaging external circuits.

### 5. Environment Specification

Parameter	Conditions/Description	Min.	Nom.	Max.	Units
Operating Temperature	Derate linearly above 50°C, please refer to the following performance curves.	-20		+70	°C
Low temperature start up	Some specification parameters maybe exceeded until after 20 minutes warm up period. <sup>(Note 1)</sup>	-40			°C
Storage Temperature		-40		+85	°C
Relative Humidity	Non-condensing.	5		95	%RH
Altitude	Operating Non-operating			3K 4K	Meter

Note: 1) To start up unit, the output power should be derated to 20% rated load @  $V_{in} < 115VAC$ , or derated to 40% rated load @  $V_{in} < 230VAC$ , and don't need derated @  $V_{in} \geq 230VAC$ .

Performance curve



## 6. Safety Approvals, EMI and EMS Specification

Parameter	Conditions/Description	Min.	Nom.	Max.	Units
Approvals	IEC 60601-1: 2005, 3 <sup>rd</sup> Edition			UL approved	
	EN 60601-1: 2006, 3 <sup>rd</sup> Edition			TUV approved	
	ANSI/AAMI ES60601-1:2005, 3 <sup>rd</sup> ed.			UL approved	
	CAN/CSA-C22.2 No. 60601-1 (2008)			cUL approved	
Hi-Pot	Reinforce or Double insulation (Primary to Secondary)	4000			VAC
	Basic insulation (Primary, or Secondary, to Protective earth)	1500			
Leakage Current	Patient Leakage Current at 264Vac, 63Hz normal condition	BF			TYPE
	Primary to Secondary				
	Normal Condition / Single Fault Condition			100/300	μA
	Primary to Earth GND <sup>(Note 1.)</sup>				
EMI <sup>(Note 2-4.)</sup>	EN 60601-1-2	B			Class
	EN 55011 / CISPR 11 & FCC Part 18	B			
	EN 61000-3-2	A			
	EN 61000-3-3				
EMS <sup>(Note 4.)</sup>	IEC 61000-4-2 ±8KV air discharge, ±6KV contact discharge	A			Criteria
	IEC 61000-4-3 10V/m	A			
	IEC 61000-4-4 ±2KV Line & PE	A			
	IEC 61000-4-5 L-N:±1KV, L/N-PE:±2KV	A			
	IEC 61000-4-6 10Vrms	A			
	IEC 61000-4-8 10A/m	A			
	IEC 61000-4-11 Voltage dips >95%, 0.5 cycle	A			
	Voltage dips 30%, 25 cycles <sup>(Note 5.)</sup>	A / B			
	Voltage dips 60%, 5 cycles <sup>(Note 5.)</sup>	A / B			
Voltage interruptions >95%, 250 cycles	C				

Note: 1) Only exist when earth ground was connecting.

- 2) As a build-in type power supply, the power supply needs to be installed in a suitable enclosure to pass the EMI/EMC tests. The final assembly has to comply with the valid EMI/EMC and safety.
- 3) The mounting holes should be connected to each other to conforming the EMI limit.
- 4) Apply to output equal or below 100W, for higher output power, please re-confirm with us.
- 5) The test result of input 240Vac / 100Vac is criteria A / B.

## 7. Mechanical Specification

### Parameter Conditions/Description

Dimension 101.6 (L) x 50.8 (W) x 33.0 (H) mm, Tolerance +/- 0.4mm.

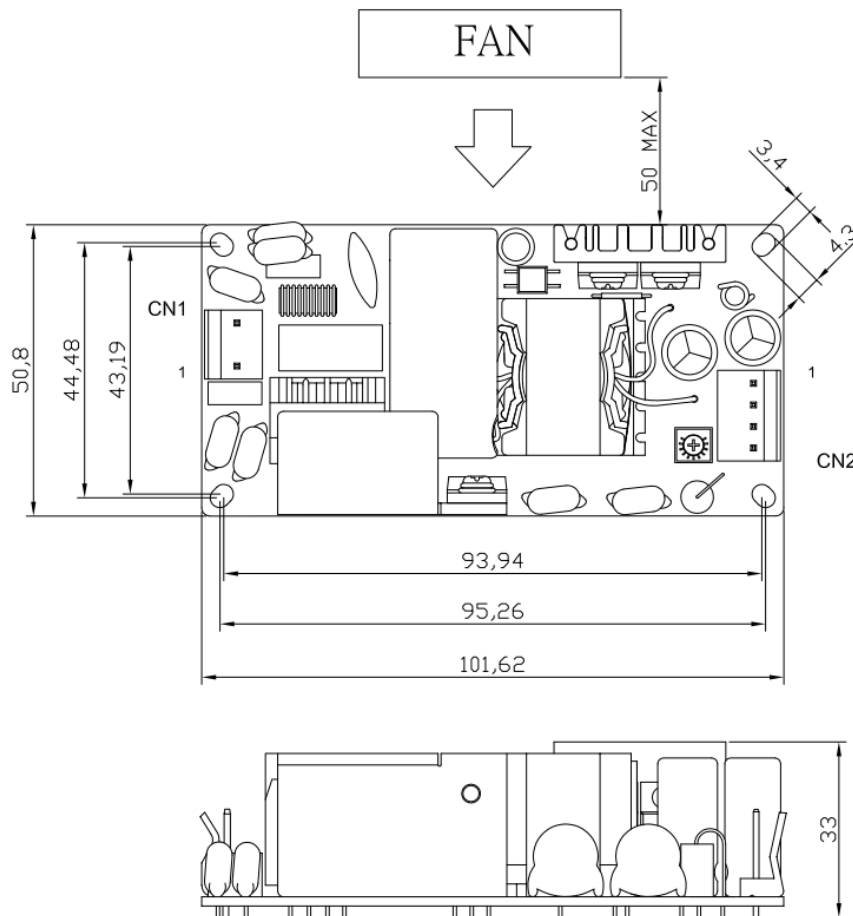
Connector & Pin Assignment	Location	Pin	Assignment	Proposed Housing	Proposed Terminals
CN1 (Input)		1	AC in (L)	MOLEX: 09-50-1031 (5195-03) or 09-52-4034 (5239-03) or equivalent; JST: VHR-3N (Note 1) or equivalent	MOLEX: 5194 or 5225 2478, 2578, 5167 or 5168 or equivalent; JST: SVH-21T-P1.1 or equivalent
		2	AC in (N)		
CN2 (Output)		1	0 V	MOLEX: 09-50-1041 (5195-04) or 09-52-4044 (5239-04) or equivalent; JST: VHR-4N (Note 1) or equivalent	MOLEX: 5194 or 5225 2478, 2578, 5167 or 5168 or equivalent; JST: SVH-21T-P1.1 or equivalent
		2	0 V		
		3	+ V		
		4	+ V		

Note: 1) Exist with model no. suffixed -J, please see the comparison in paragraph 5.

### Mechanical drawing:

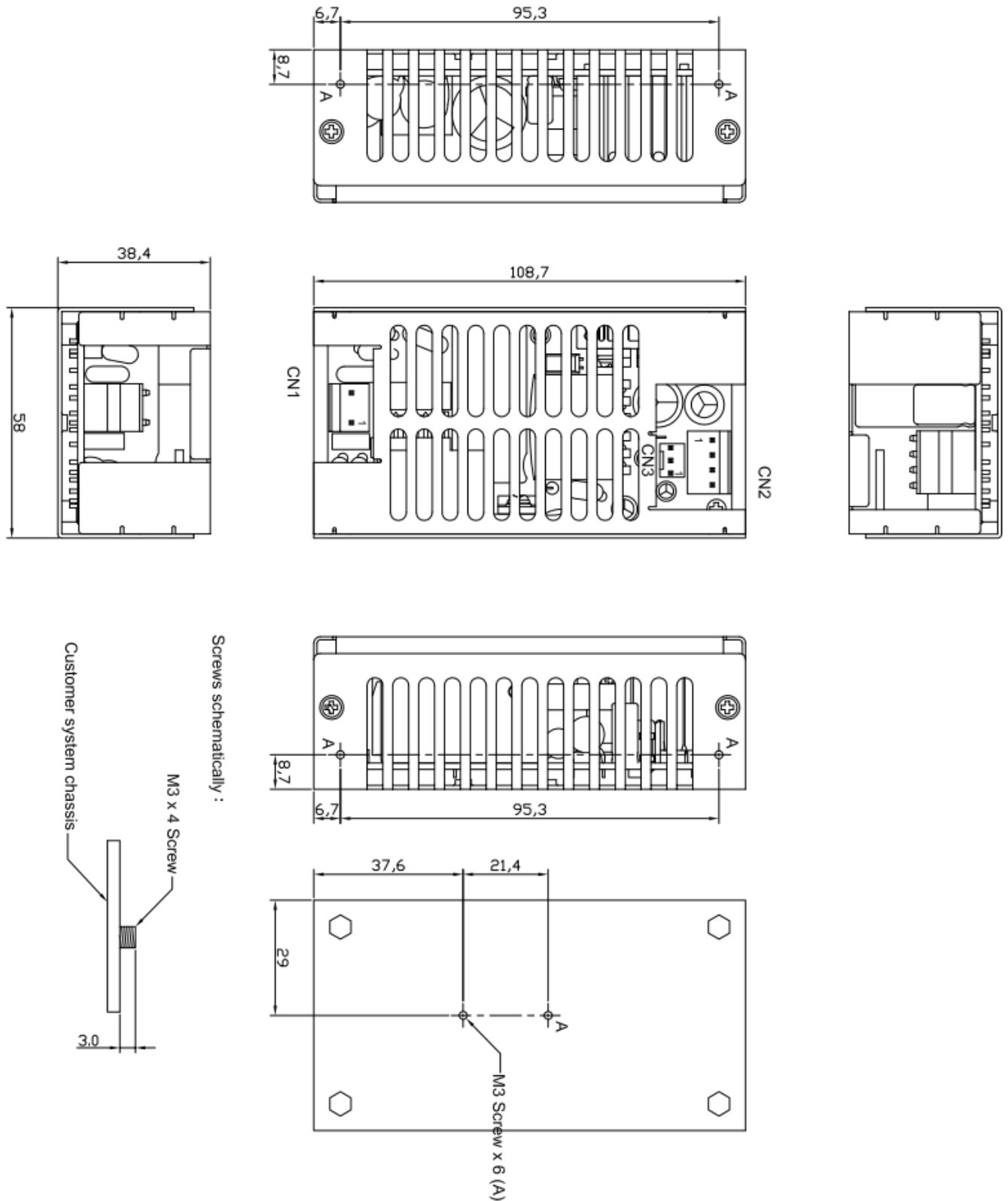
#### MNR MS 105

101.6 (L) x 50.8 (W) x 33.0 (H) mm, Tolerance +/- 0.4mm.



**MNR MS 105**

**108.7 (L) x 58.0 (W) x 38.4 (H) mm, Tolerance +/- 0.4mm.**



**8. Vibration Test**

**Parameter Conditions/Description**

Ambiance Condition Temperature : 20~35°C  
Humidity : 50~75 %RH

Test Standard IEC 60068-2-6

Test Condition Frequency Type : Sweep Frequency  
Frequency Range : 10~55 Hz  
Sweep Rate : 60 minute / cycle  
Number of cycle : 1 cycle / axis  
Direction : X , Y and Z axis

**SPECIFICATION**

For

SWITCHING POWER SUPPLY

MNR MS 105

## Revision history

REV.	Aug. 13 <sup>th</sup> 2012	Established.
REV.	Aug. 31 <sup>th</sup> 2012	Revised.
REV.	Oct. 11 <sup>th</sup> 2012	Added new model: MNR MS 105 which is +48V output.
REV.	Dec. 6 <sup>th</sup> 2012	a) Derating curve b) Dip Voltage dips 30%, 25 cycles from A to A/B.
REV.	Sep. 25 <sup>th</sup> 2013	a) Add mechanical drawing b) Added max. output current c) Efficiency up to 91%
REV.	Oct. 16 <sup>th</sup> 2013	Change derating curve.
REV.	Nov. 7 <sup>th</sup> 2013	Change derating curve for MNR MS 105
REV.	Feb. 18 <sup>th</sup> 2014	Added optional cover kit drawing and its derating curve.
REV.	Jul. 1 <sup>st</sup> 2015	Added TUV logo.
REV.	Jul. 22 <sup>th</sup> 2015	Changed Molex Housing part no.
REV.	Aug. 27 <sup>th</sup> 2015	Changed Safety Approvals for UL approved.
REV.	Sep. 10 <sup>th</sup> 2015	Changed IEC 60601-1: 2005 3rd Edition for UL approved.
REV.	Nov. 25 <sup>th</sup> 2015	a) Added "or equivalent" after "Molex" and "JST" b) Changed Molex Proposed Terminals from 5176 to 5167 c) Added vibration test
REV.	May. 23 <sup>th</sup> 2016	Added Performance Curves of MNR MS 105 convection cooled
REV.	Jan. 23 <sup>th</sup> 2017	a) Added "Designed to meet IEC 60601-1-2 4th ed. EMC" b) Changed IEC 61000-4-11 Voltage interruptions >95%, 250 cycles to C





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