



# TR220M SERIES 220 WATT MEDICAL SWITCH ADAPTER

## Features

- Universal Input Range 80~264Vac
- High Efficiency up to 94%
- Class I (TR220MA), Class II (TR220MB)
- No Load Input Power Consumption < 150mW
- Approval IEC/EN/UL 60601-1 2 MOPP
- Approval IEC/EN 60601-1-11 (TR220MB)
- Approval EN55011 and CISPR/FCC Class B
- Approval IP22
- Operating Altitude 5000m
- Continuous Short Circuit Protection
- Over Voltage Protection
- Meets CoC Tier 2 and DOE Level VI



MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT	RIPPLE & NOISE NOTE1	VOLTAGE ACCURACY NOTE2	LINE REGULATION NOTE3	LOAD REGULATION NOTE4	%EFF. (Typ.) NOTE5
TR220MA120	12 V	16.67 A	120mV	±2%	±1%	±4%	91%
TR220MA240	24 V	9.17 A	200mV	±2%	±1%	±3%	93%
TR220MA360	36 V	6.11 A	200mV	±2%	±1%	±2%	93%
TR220MA480	48 V	4.58 A	200mV	±2%	±1%	±2%	94%
TR220MA560	56 V	3.93 A	200mV	±2%	±1%	±2%	94%
TR220MB120	12 V	16.67A	120mV	±2%	±1%	±4%	91%
TR220MB240	24 V	9.17 A	200mV	±2%	±1%	±3%	93%
TR220MB360	36 V	6.11 A	200mV	±2%	±1%	±2%	93%
TR220MB480	48 V	4.58 A	200mV	±2%	±1%	±2%	94%
TR220MB560	56 V	3.93 A	200mV	±2%	±1%	±2%	94%

Note:

1. Add a 0.1uF ceramic capacitor and a 10uF E.L. capacitor to output for ripple & noise measuring @20MHz BW.
2. Voltage accuracy is set at 60% full load.
3. Line regulation is measured from 100V<sub>ac</sub> to 240V<sub>ac</sub> with full load.
4. Load regulation measured from 60% to 100% full load and from 60% to 20% full load (60%±40% full load).
5. Typical efficiency at 230V<sub>ac</sub> and 75% full load at 25°C.

## PART NUMBER

Series		Output Voltage	DC Plug Type	Cable Type	Cable Length
TR220M	X	XXX	-XX	E	XX
220W Medical Adapter	A : Class I B : Class II	120 : 12V	<a href="#">See Page 6</a>	E : UL2464 with OVP	471 : 950mm with Ferrite Core 12 : 1220mm with Ferrite Core 13 : 1800mm with DC Jack  <a href="#">See page 6 restrictions</a>
		240 : 24V			
		360 : 36V			
		480 : 48V			
		560 : 56V			

Part Number Example:

**TR220MA240-1538E12**, 220W, Class I, 24V<sub>dc</sub> Output, Din Power Plug Molded Type, Cable Length 1220mm

**TR220MB360-11E13**, 220W, Class II, 36V<sub>dc</sub> Output, DC Jack Type, Cable Length 1800mm



# TR220M Series

## TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, full load at 25°C unless otherwise noted.)

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage		All	80		264	V <sub>ac</sub>
Operating Temperature	See Derating Curve	All	-30		70	°C
Storage Temperature		All	-40		85	°C
Operating Altitude		All			5000	m

### INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Voltage Range		All	100		240	V <sub>ac</sub>
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Load, V <sub>in</sub> =100V <sub>ac</sub>	All			2.5	A
Leakage Current (Earth)		All			300	uA
Leakage Current (Touch)		All			100	uA
Under Voltage Protection		All	50	60	65	V
Power Factor	230V <sub>ac</sub> /50Hz @ Full load	All	0.92			

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> , I <sub>o</sub> =60% Full load T <sub>c</sub> =25°C	TR220MA/B120	11.76	12	12.24	V <sub>dc</sub>
		TR220MA/B240	23.52	24	24.48	
		TR220MA/B360	35.28	36	36.72	
		TR220MA/B480	47.04	48	48.96	
		TR220MA/B560	54.88	56	57.12	
Operating Output Current Range	V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> , T <sub>c</sub> =25°C	TR220MA/B120	0		16.67	A
		TR220MA/B240	0		9.17	
		TR220MA/B360	0		6.11	
		TR220MA/B480	0		4.58	
		TR220MA/B560	0		3.93	
Holdup Time	V <sub>in</sub> =115V <sub>ac</sub>	All	20	22		ms
Output Voltage Regulation						
Load Regulation	60%±40% Full load change	TR220MA/B120			±4	%
		TR220MA/B240			±3	
		TR220MA/B360			±2	
		TR220MA/B480			±2	
		TR220MA/B560			±2	
Line Regulation	V <sub>in</sub> =High line to low line	All			±1	%
Over Voltage Protection	Latch Off	TR220MA/B120		13.5		V <sub>dc</sub>
		TR220MA/B240		30		
		TR220MA/B360		42		
		TR220MA/B480		56		
		TR220MA/B560		59.2		
Output Ripple and Noise	1. Add a 0.1uF ceramic capacitor and a 10uF aluminum electrolytic capacitor to output 2. Oscilloscope is 20MHz band width 3. Ambient temperature=25°C	TR220MA/B120			120	mV
		TR220MA/B240			200	
		TR220MA/B360			200	
		TR220MA/B480			200	
		TR220MA/B560			200	



# TR220M Series

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Load Capacitance	1. $V_{in}=115V_{ac}$ and $230V_{ac}$ 2. Output is max. load 3. Ambient temperature= $25^{\circ}C$	TR220MA/B120			16500	uF
		TR220MA/B240			9270	
		TR220MA/B360			6160	
		TR220MA/B480			4540	
		TR220MA/B560			4070	
Efficiency	1. $V_{in}=230V_{ac}$ 2. Output is 75% full load 3. Ambient temperature= $25^{\circ}C$	TR220MA/B120		91%		%
		TR220MA/B240		93%		
		TR220MA/B360		93%		
		TR220MA/B480		94%		
		TR220MA/B560		94%		

## ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 minute (without dielectric breakdown)	All			4400	$V_{ac}$
Input to Earth (Ground)	1 minute (without dielectric breakdown)	All			1800	$V_{ac}$
Output to Earth (Ground)	1 minute (without dielectric breakdown)	All			1800	$V_{ac}$
Isolation Resistance	Input to output	All	100			M $\Omega$

## FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency		All		100		kHz

## GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	$I_o=100\%$ ; $T_a=25^{\circ}C$ per MIL-HDBK-217F	All	585			k hours
Life Time	@ 75% Load, $40^{\circ}C$	All	58			k hours
Humidity	Non-condensing	All			93	% RH
Shock	MIL-STD-810F Table 516.5, TABLE 516.5-1 10ms, each axis 3 times( $\pm X$ 、 $\pm Y$ 、 $\pm Z$ axis)	All		75		g
Vibration	MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X、Y、Z axis, 1 hour(each axis),. total 3 hours.	All		4		g
Weight		All		950		grams
Dimension		All	7.087x2.953x1.752 Inches (180x75x44.5mm)			
Safety	Class I, Class II, IEC60601-1, EN60601-1, ANSI/AAMI ES60601-1 IEC/EN 60601-1-11 for TR220MB (Home Health Care)					Ed 3.1
EMC Emission	EN55011:2016+A1:2017, EN61000-3-2:2014, EN6100-3-3:2013, FCC CFR47 Part 15					
Conducted Disturbance	EN55011:2016+A1:2017, FCC CFR47 Part 15					Class B
Radiated Disturbance	EN55011:2016+A1:2017, FCC CFR47 Part 15					Class B
Harmonic Current Emissions	EN 61000-3-2:2014					Class A
Voltage Fluctuations & Flicker	EN 61000-3-3:2013					Criterion A
EMC Immunity	EN60601-1-2:2015, IEC61000-4-2, 3, 4, 5, 6, 8, 11					Ed 4.0
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008 Air Discharge: $\pm 15kV$ Contact Discharge: $\pm 8kV$					Criterion A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2020					Criterion A
Electrical Fast Transient (EFT)	IEC61000-4-4:2012, $\pm 1kV$ , $\pm 2kV$					Criterion A
Surge	IEC61000-4-5:2014+A1:2017, L-N: $\pm 0.5kV$ , $\pm 1kV$ L-E (Ground): $\pm 0.5kV$ , $\pm 1kV$ , $\pm 2kV$					Criterion A
Conducted Disturbances, Induced by RF Fields	IEC 61000-4-6:2013+COR1:2015					Criterion A
Power Frequency Magnetic Field	IEC 61000-4-8:2009					Criterion A
Voltage Dips	IEC 61000-4-11:2004+A1:2017, Dips:30% reduction, Dips: >95% Reduction, Criteria A					Criterion A
Voltage Interruptions	IEC 61000-4-11:2004+A1:2017, >95% Reduction					Criterion B
Application Note Link						<a href="#">TR220M Series App Notes</a>

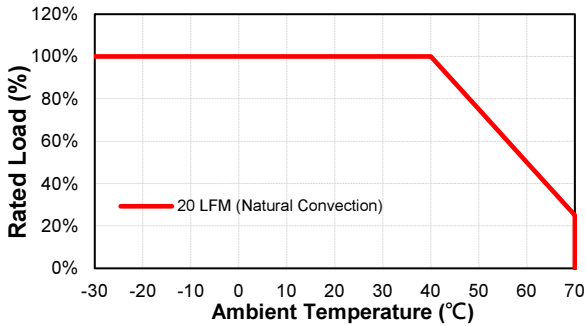


# TR220M Series

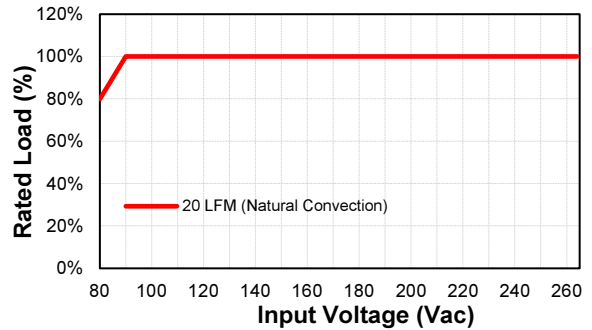
## CHARACTERISTIC CURVE

### Power Derating Curve

TR220M Derating Curve

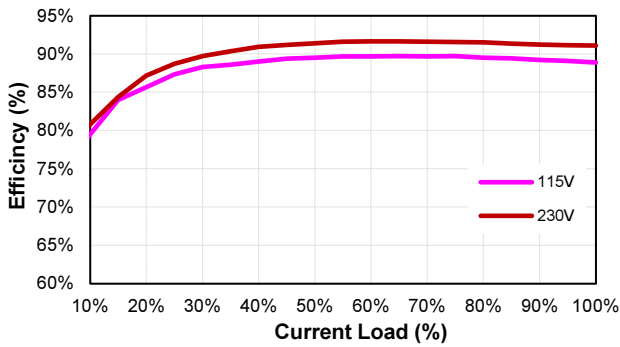


TR220M Input Voltage Derating Curve

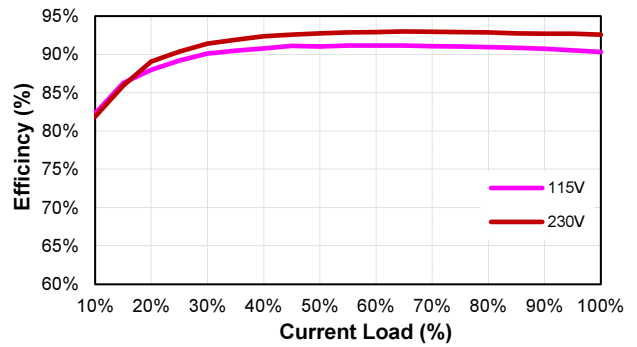


### Performance Data

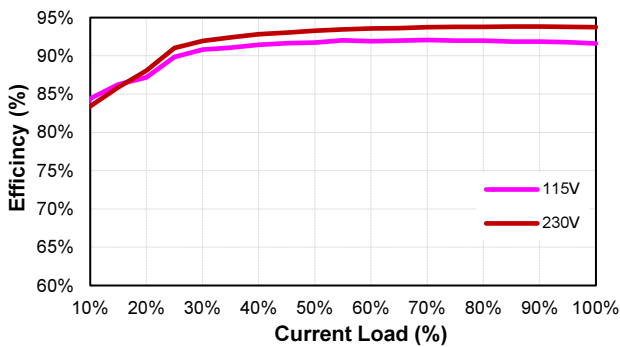
TR220M120 (Eff Vs Io)



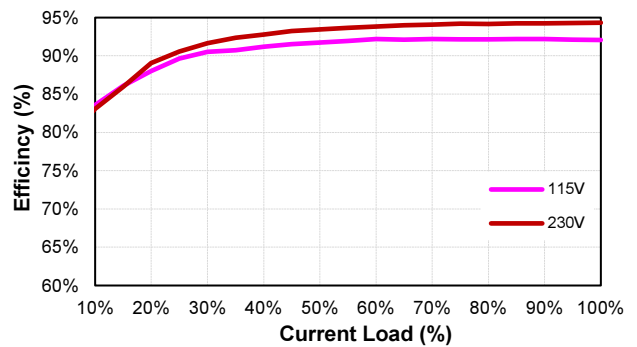
TR220M240 (Eff Vs Io)



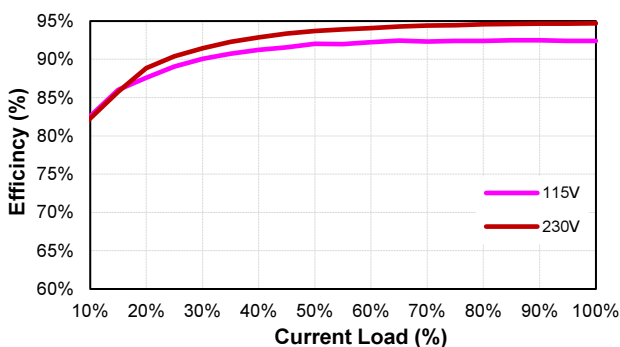
TR220M360 (Eff Vs Io)



TR220M480 (Eff Vs Io)



TR220M560 (Eff Vs Io)



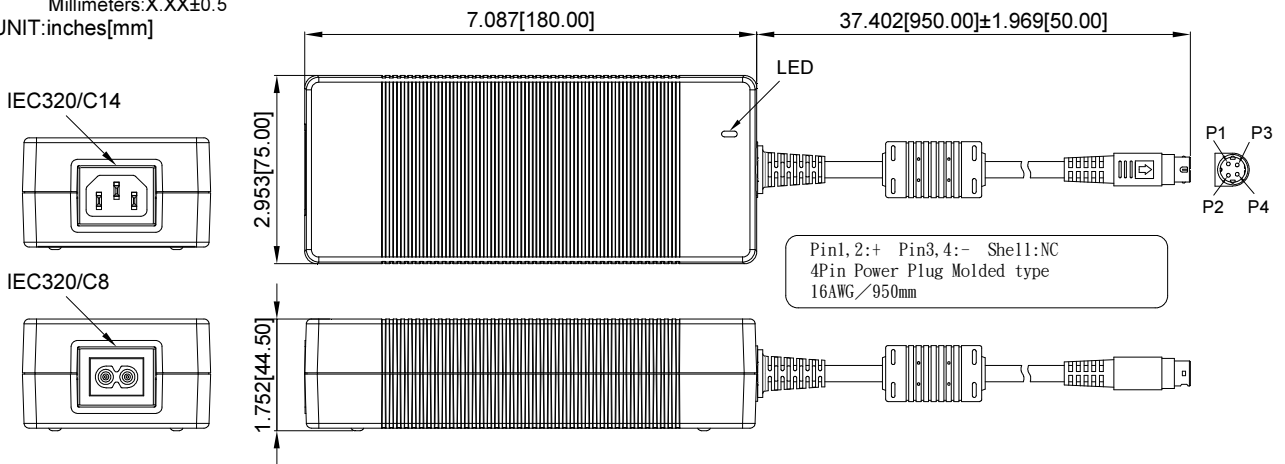


# TR220M Series

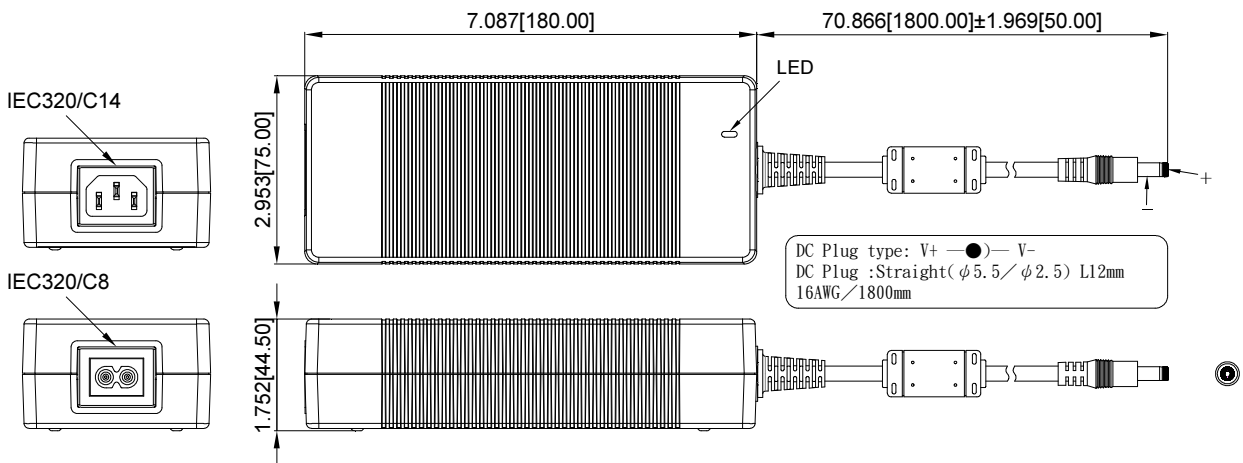
## MECHANICAL SPECIFICATION

All Dimensions are in inches[mm]  
 Tolerance: Inches: X.XXX±0.02  
 Millimeters: X.XX±0.5  
 UNIT: inches[mm]

### Din Power Plug



### DC Jack



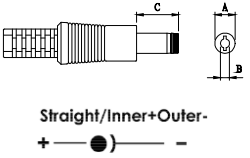
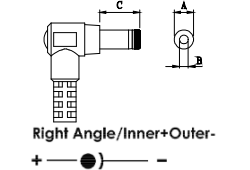
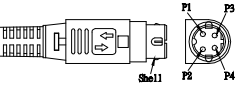
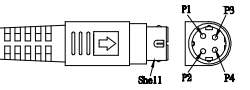
\* For Output Voltage 12Vdc and 24V model, it must select Din Power Plug Molded Type or equivalent

\* For Output Voltage 36Vdc to 56Vdc models, it's able to select Din Power Plug Molded Type, DC Jack or equivalent.



# TR220M Series

## STANDARD OUTPUT DC PLUG

DC Plug Type	Cable Number-XXXXX	A	B	C	Cable Type	Cable Length	Cable AWG
		OD (mm)	ID (mm)	L (mm)			
 <p>Straight/Inner+Outer-</p> <p>+ ● -</p>	11E13	Φ5.5	Φ2.1	12	UL2464	1800mm with Ferrite Core	16AWG for 36V,48V,56V
	12E13	Φ5.5	Φ2.5	12			
	23E13	Φ5.5	Φ2.1	9.5			
	26E13	Φ5.5	Φ2.5	9.5			
 <p>Right Angle/Inner+Outer-</p> <p>+ ● -</p>	01E13	Φ5.5	Φ2.1	12			
	02E13	Φ5.5	Φ2.5	12			
	21E13	Φ5.5	Φ2.5	9.5			
	24E13	Φ5.5	Φ2.1	9.5			
Din Plug Type	Cable Number -XXXXX	Pin Assignment		Cable Type	Cable Length	Cable AWG	
		PIN No.	Polarity				
KYCON KPPX-4P equivalent with Lock (Din Power Plug Assembly Type) 	1446E12	P1	-	UL2464	1200mm with Ferrite Core	16AWG for 24V	
		P2	+				
		P3	-				
	1446E471	P4	+		950mm with Ferrite Core	16AWG for 12V	
		Shell	No Connection				
KYCON KPPX-4P equivalent without Lock (Din Power Plug Molded Type) 	1538E12	P1	+	UL2464	1200mm with Ferrite Core	16AWG for 24V	
		P2	+				
		P3	-				
	1538E471	P4	-		950mm with Ferrite Core	16AWG for 12V	
		Shell	No Connection				

※Other DC Plug Type please refer to the link: <https://www.cincon.com/productdownload/TR220M-cable-DC-plug.pdf>