



TRE15 SERIES 15 WATT AC-DC I.T.E SWITCHING ADAPTER

Features

- Universal Input Range 90~264Vac
- High Efficiency up to 86%
- Class II
- No Load Power Consumption < 75mW
- Approved IEC/EN/UL 62368-1
- Meets EN55032 Class B and CISPR/FCC Class B
- Operating Altitude 5000m
- Over Voltage Protection
- Continuous Short Circuit Protection
- Meets CoC Tier 2 & DoE Level VI



MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT	VOLTAGE ACCURACY NOTE1	RIPPLE & NOISE NOTE2	LINE REGULATION NOTE3	LOAD REGULATION NOTE4	%EFF. (Typ.) NOTE5
TRE15050	5 V	2 A	±2%	50 mV	±1%	±4%	79%
TRE15090	9 V	1.4 A	±2%	90 mV	±1%	±2%	84%
TRE15120	12 V	1 A	±2%	100 mV	±1%	±2%	83%
TRE15150	15 V	1 A	±2%	100 mV	±1%	±2%	85%
TRE15240	24 V	0.63 A	±2%	100 mV	±1%	±2%	86%

Note:

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

PART NUMBER

Series	Output Voltage	AC Plug Type	DC Plug Type	Cable Type	Cable Length
TRE15	XXX	-X	-XX	X	XX
15W I.T.E Adapter	050 : 5V 090 : 9V 120 : 12V 150 : 15V 240 : 24V	A: USA 2 Pin E: Europe 2 Pin U: British 3 Pin	See Page 5	G : UL1571 with OVP	01 : 720mm 02 : 1220mm 03 : 1800mm 11 : 720mm with Ferrite Core 12 : 1220mm with Ferrite Core 13 : 1800mm with Ferrite Core See page 5 for restrictions

Part Number Example:

TRE15120-A-01G03, 12V_{dc} Output, AC Plug Type, DC Jack Type, Cable Length 1800mm



TRE15 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	90		264	V _{ac}
Operating Case Temperature	See Derating Curve	All	-20		60	°C
Storage Temperature		All	-20		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 _{ac}
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Full load, V _{in} =100V _{ac}	All			0.5	A
Leakage Current		All			250	uA
Inrush Current	V _{in} =240V _{ac} , Cold start at 25°C	All			50	A

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V _{in} =115V _{ac} and 230V _{ac} , I _o =60% Full load T _c =25°C	TRE15050	4.9	5	5.1	V _{dc}
		TRE15090	8.82	9	9.18	
		TRE15120	11.76	12	12.24	
		TRE15150	14.7	15	15.30	
		TRE15240	23.52	24	24.48	
Operating Output Current Range	V _{in} =115V _{ac} and 230V _{ac} , T _c =25°C	TRE15050			2	A
		TRE15090			1.4	
		TRE15120			1	
		TRE15150			1	
		TRE15240			0.63	
Holdup Time	V _{in} =115V _{ac}	All		10		ms
Output Voltage Regulation						
Load Regulation	60%±40% Full load change	TRE15050			±4.0	%
		TRE15090			±2.0	
		TRE15120			±2.0	
		TRE15150			±2.0	
		TRE15240			±2.0	
Line Regulation	V _{in} =100V _{ac} to 240V _{ac}	All			±1.0	%
Over Voltage Protection	IC component to clamp (auto recovery)	TRE15050			7.14	V _{dc}
		TRE15090			12.1	
		TRE15120			15.8	
		TRE15150			19.5	
		TRE15240			28.4	
Over Current Protection	Auto recovery	All	110		160	%
Short Circuit Protection	Auto recovery	All				
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	TRE15050			50	mV
		TRE15090			90	
		TRE15120			100	
		TRE15150			100	
		TRE15240			100	



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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= $25^{\circ}C$	TRE15050			2000	μF
		TRE15090			1500	
		TRE15120			1000	
		TRE15150			1000	
		TRE15240			660	
Efficiency	1. $V_{in}=230V_{ac}$ 2. Output is 75% full load 3. Ambient temperature= $25^{\circ}C$	TRE15050		79		%
		TRE15090		84		
		TRE15120		83		
		TRE15150		85		
		TRE15240		86		

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 minute	All			3000	V_{ac}
Isolation Resistance	Input to output	All	100			$M\Omega$

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	$V_{in}=115V_{ac}$, $I_o=100\%$	All		85		kHz
	$V_{in}=230V_{ac}$, $I_o=100\%$			65		

GENERAL SPECIFICATIONS

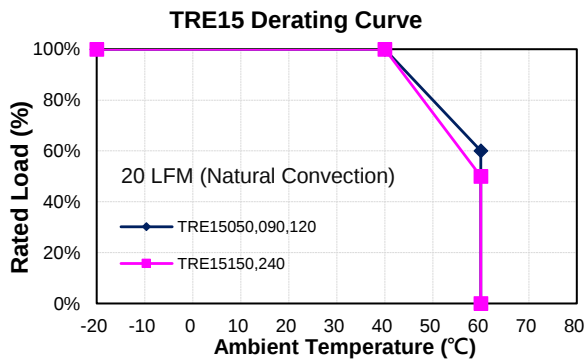
PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	$I_o=100\%$; $T_a=25^{\circ}C$ per MIL-HDBK-217F	All	330			k hours
Humidity	Non-condensing	All			93	% RH
Shock	Meet MIL-STD-810F Table 516.5, Table 516.5-I 10ms, each axis 3 times($\pm X$ 、 $\pm Y$ 、 $\pm Z$ axis)	All		75		g
Vibration	Meet MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X、Y、Z axis, 1 hour (each axis), Total 3 hrs.	All		4		g
Weight		All		100		g
Dimensions		All	2.795x1.906x1.299 inches (71.00x48.40x33.00 mm)			
Safety	Class II, IEC/EN/UL 62368-1/60950-1					Ed 2.0
EMC Emission	EN 55032: 2015/AC: 2016, EN 61000-3-2:2014 EN 61000-3-3:2013, FCC CFR Title 47 Part 15 Subpart B: 2016 Class B					
Conducted Disturbance	EN 55032:2015/AC:2016, EN 61000-6-3, EN 61204-3 FCC CFR Title 47 Part 15 Subpart B: 2016 Class B					Class B
Radiated Disturbance	EN 55032:2015/AC:2016, EN 61000-6-3, EN 61204-3 FCC CFR Title 47 Part 15 Subpart B: 2016 Class B					Class B
Power Harmonics	EN 61000-3-2: 2014					
Voltage Fluctuations	EN 61000-3-3: 2013					
EMC Immunity	EN 61204-3: 2000, EN 55024:2010+A1:2015, EN 61000-6-1, 3, IEC 61000-4-2, 3, 4, 5, 6, 8, 11					
Electrostatic Discharge (ESD)	IEC 61000-4-2 Ed. 2.0: 2008, Air Discharge: $\pm 8kV$, Contact Discharge: $\pm 4kV$					Criteria A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3 Ed. 3.2: 2010					Criteria A
Electrical Fast Transient (EFT)	IEC 61000-4-4 Ed. 3.0: 2012, $\pm 1kV$					Criteria A
Surge	IEC 61000-4-5 Ed. 3.0: 2014, L-N: $\pm 1kV$					Criteria A
Conducted disturbances, induced by RF fields	IEC 61000-4-6 Ed. 4.0: 2013					Criteria A
Power frequency magnetic field	IEC 61000-4-8 Ed. 2.0: 2009					Criteria A
Voltage dips	IEC 61000-4-11 Ed. 2.0: 2004, Dips: 30% Reduction, Dips: >95% Reduction					Criteria A
Voltage interruptions	IEC 61000-4-11 Ed. 2.0: 2004, >95% reduction					Criteria B
Application Note Link			TRE15 Series App Notes			



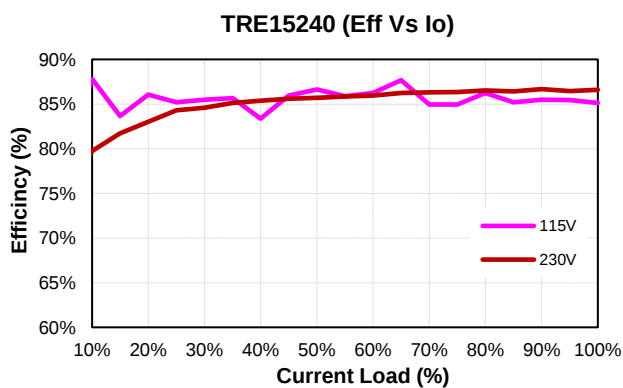
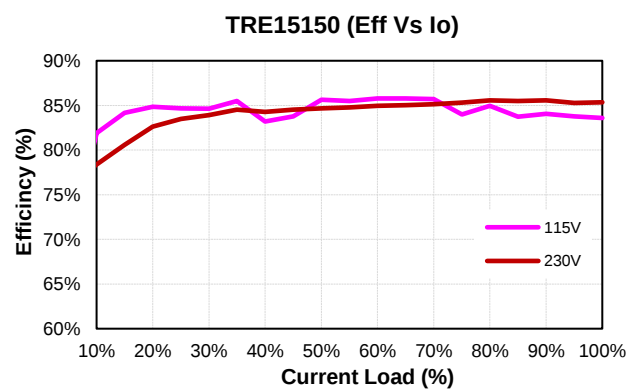
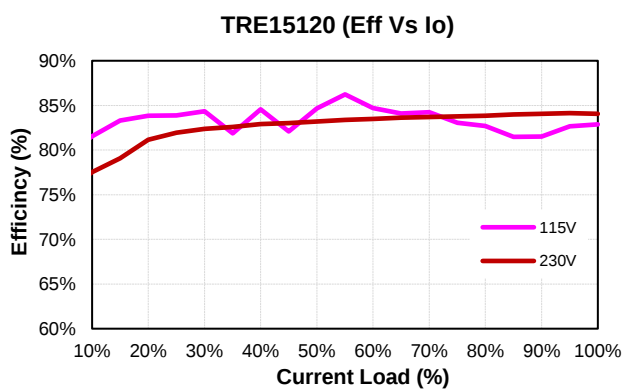
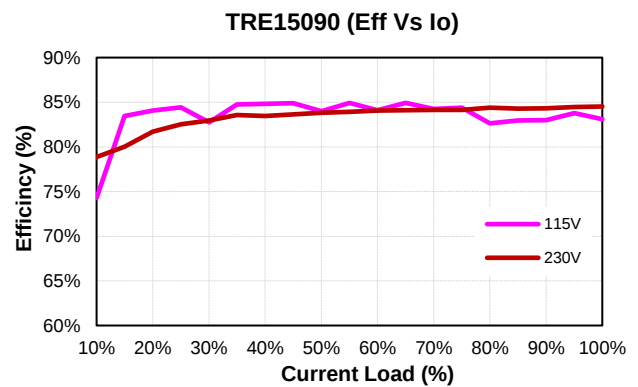
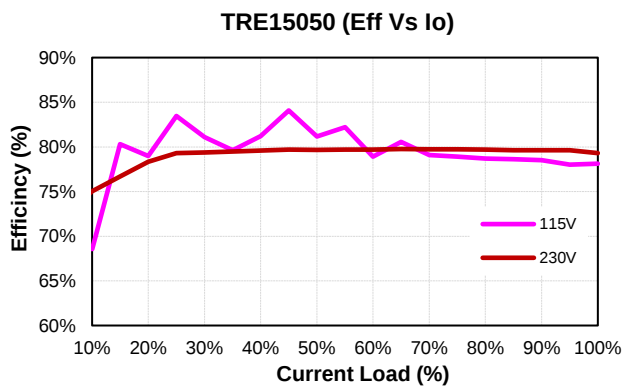
TRE15 Series

CHARACTERISTIC CURVE

Power Derating Curve



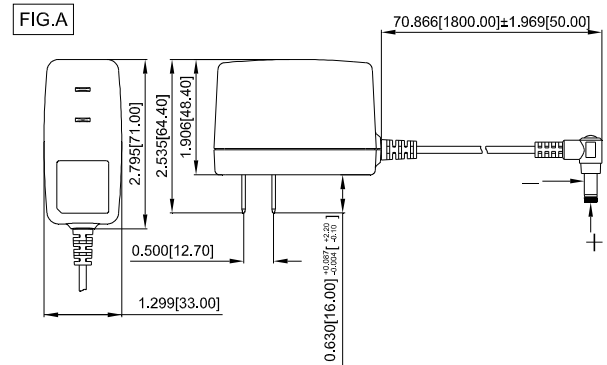
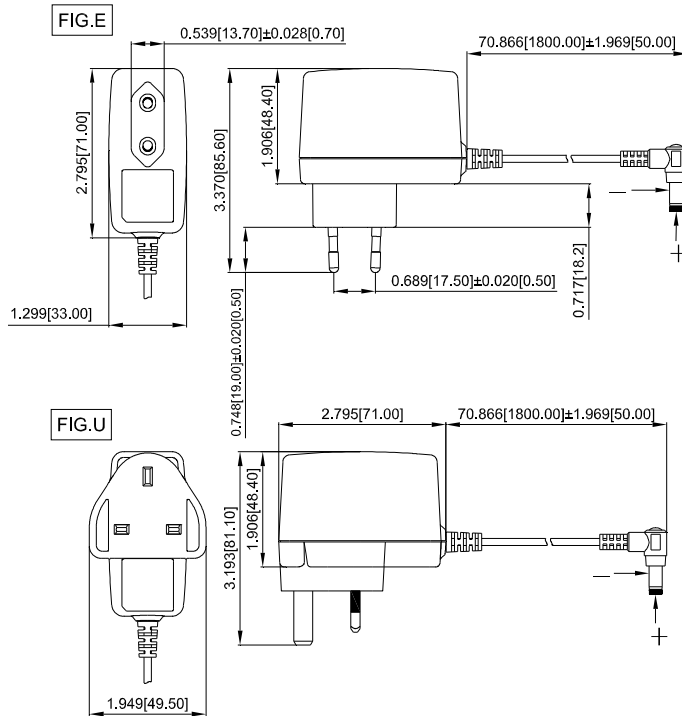
Performance Data





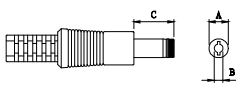
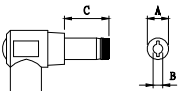
TRE15 Series

MECHANICAL SPECIFICATION



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

STANDARD OUTPUT PLUG

DC Plug Type	Cable Number -XXXXX	A	B	C	Cable Type	Cable Length	Cable AWG
		OD (mm)	ID (mm)	L (mm)			
 Straight/Inner+Outer- + ● -	11G03	Φ5.5	Φ2.1	12	UL1571	1800mm without Core	20AWG for Vo: 5V 18AWG for Vo: 9V 24AWG for Vo: 12V, 15V, 24V
	12G03	Φ5.5	Φ2.5	12			
	23G03	Φ5.5	Φ2.1	9.5			
	26G03	Φ5.5	Φ2.5	9.5			
 Right Angle/Inner+Outer- + ● -	01G03	Φ5.5	Φ2.1	12			
	02G03	Φ5.5	Φ2.5	12			
	21G03	Φ5.5	Φ2.5	9.5			
	24G03	Φ5.5	Φ2.1	9.5			

※Other DC Plug Type please refer to the link: <https://www.cincon.com/productdownload/TRE15-cable-DC-Plug.pdf>

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TRE15 Series

Application Note V12

15W AC-DC I.T.E SWITCHING ADAPTER TRE15 Series APPLICATION NOTE



Approved By:

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TRE15 Series

Application Note V12

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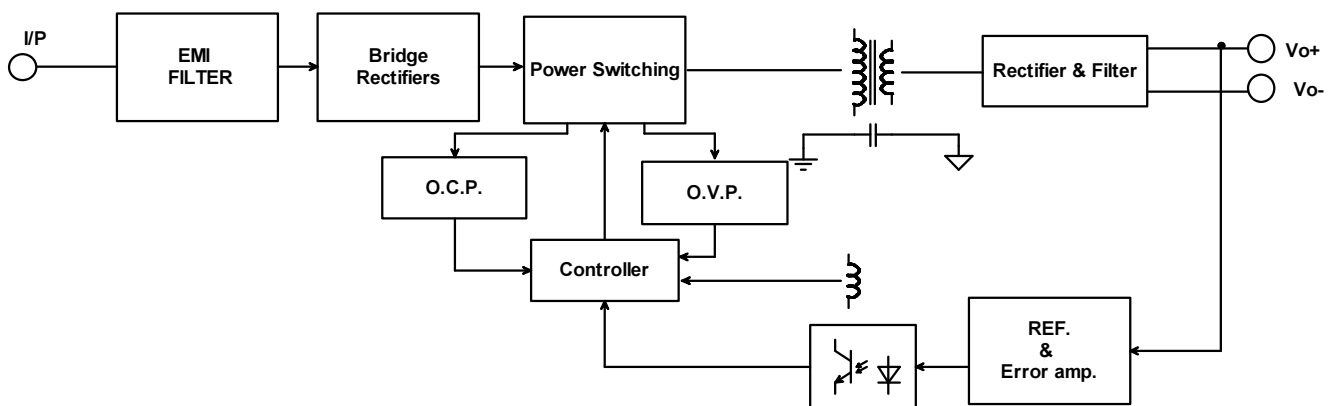
TRE15 Series

Application Note V12

1. Introduction

This application note describes the features and functions of Cincon's TRE15 series of adapter, switching AC-DC power. These are highly efficient, reliable, compact, high power density, single output AC/DC power. The power is fully protected against short circuit and over-voltage conditions. Cincon's world class automated manufacturing methods, together with an extensive testing and qualification program, ensure that the TRE15 series power is extremely reliable.

2. Electrical Block Diagram





TRE15 Series

Application Note V12

3. Main Features and Functions

3.1 Operating Temperature Range

The highly efficient design of Cincon's TRE15 series power has resulted in their ability to operate within ambient temperature environments from -20°C to 40°C. Due consideration must be given to the de-rating curves when ascertaining the maximum power that can be drawn from the power. The maximum power which can be drawn is influenced by a number of factors, such as:

- Input voltage range
- Permissible output load (per derating curve)

3.2 Output Current Protection

All different voltage models have a full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed. The power module will supply up to 110% - 160% of rated current. In the event of an over current converter will go into a hiccup mode protection.

4. Applications

4.1 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown in Figure 1. When testing the Cincon's TRE15 series under any transient conditions, please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate the

- Efficiency
- Load regulation and line regulation.

The value of efficiency is defined as:

$$\eta = \frac{V_o \times I_o}{P_{in}} \times 100\%$$

Where:

V_o is output voltage,
 I_o is output current,
 P_{in} is input power,

The value of load regulation is defined as:

$$Load \ reg. = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

V_{FL} is the output voltage at full load

V_{NL} is the output voltage at 10% load

The value of line regulation is defined as:

$$Line \ reg. = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where :

V_{HL} is the output voltage of maximum input voltage at full load.

V_{LL} is the output voltage of minimum input voltage at full load.

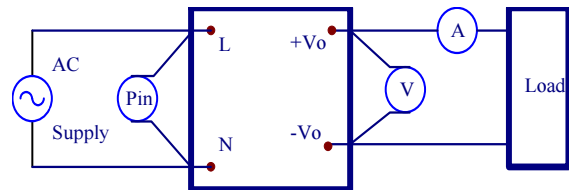


Figure 1. TRE15 Series Test Setup

4.2 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 2. Measured method:

Add a C1: 10uF electrolytic capacitor and a C2: 0.1uF ceramic capacitor to output at 20 MHz band width.

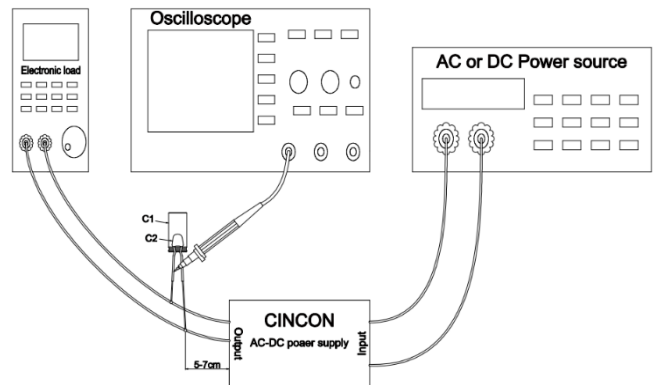


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

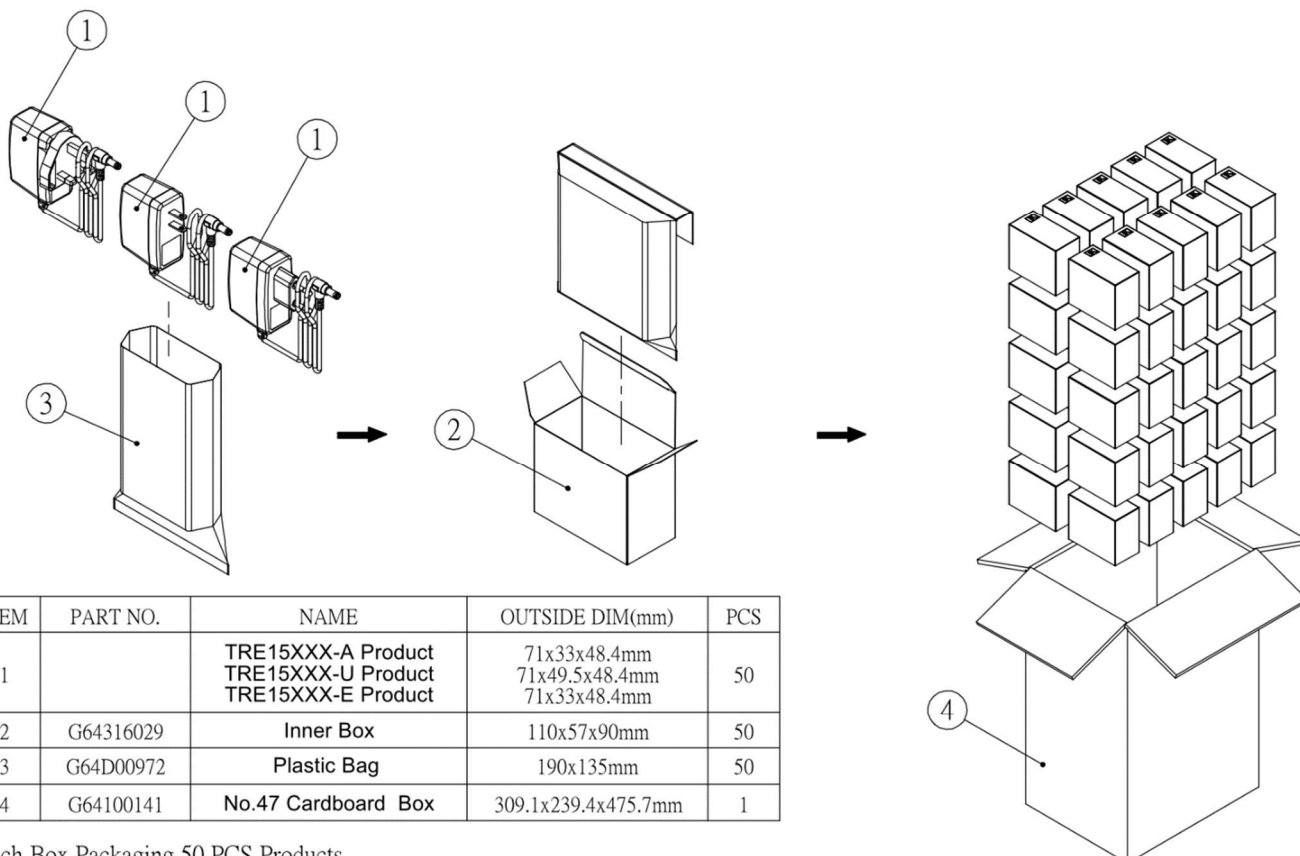


TRE15 Series

Application Note V12

5. Packing Information

The packing information for TRE15 series is showing as follows:



Each Box Packaging 50 PCS Products
Net weight Ref. 5 Kg
Gross weight Ref. 6 Kg

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