



TR70M SERIES 70 WATT MEDICAL SWITCH ADAPTER

Features

- Universal Input Range 80~264Vac
- High Efficiency up to 91%
- Class I (TR70MA), Class II (TR70MB)
- No Load Input Power Consumption < 150mW
- Approval IEC/EN/UL 60601-1 2 MOPP
- Approval IEC/EN 60601-1-11 (TR70MB)
- Home Healthcare Applications (TR70MB)
- Approval IP21 (TR70MB)
- Approval EN55011 and CISPR/FCC Class B
- Meets IEC/EN 60335-1
- 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 |
|--------------|----------------|----------------|----------------------|------------------------|-----------------------|-----------------------|--------------------|
| TR70MA120 | 12 V | 5.8 A | 120 mV | ±2% | ±1% | ±5% | 89% |
| TR70MA150 | 15 V | 4.65 A | 150 mV | ±2% | ±1% | ±3% | 89% |
| TR70MA180 | 18 V | 3.9 A | 180 mV | ±2% | ±1% | ±2% | 89% |
| TR70MA240 | 24 V | 3.0 A | 240 mV | ±2% | ±1% | ±2% | 90% |
| TR70MA360 | 36 V | 1.9 A | 360 mV | ±2% | ±1% | ±2% | 90% |
| TR70MA480 | 48 V | 1.5 A | 480 mV | ±2% | ±1% | ±2% | 91% |
| TR70MB120 | 12 V | 5.8 A | 120 mV | ±2% | ±1% | ±5% | 89% |
| TR70MB150 | 15 V | 4.65 A | 150 mV | ±2% | ±1% | ±3% | 89% |
| TR70MB180 | 18 V | 3.9 A | 180 mV | ±2% | ±1% | ±2% | 89% |
| TR70MB240 | 24 V | 3.0 A | 240 mV | ±2% | ±1% | ±2% | 90% |
| TR70MB360 | 36 V | 1.9 A | 360 mV | ±2% | ±1% | ±2% | 90% |
| TR70MB480 | 48 V | 1.5 A | 480 mV | ±2% | ±1% | ±2% | 91% |

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_{ac} to 240V_{ac} 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_{ac} and 75% full load at 25°C.
6. TR70MA120 & TR70MB120 of 115VAC meet DoE Level VI and 230VAC meet CoC Tier 2

PART NUMBER

| Series | Output Voltage | DC Plug Type | Cable Type | Cable Length |
|---------------------|--|--------------|---------------------|---|
| TR70M | XXX | -XX | E | XX |
| 70W Medical Adapter | 120 : 12V 150 : 15V 180 : 18V 240 : 24V 360 : 36V 480 : 48V | See Page 6 | E : UL1185 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 6 for restrictions |

Part Number Example:

TR70MA120-01E02, 70W, Class I, 12V_{dc} Output, DC Jack Type, Cable Length 1220mm



TR70M 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 _{ac} |
| Operating Temperature | See Derating Curve | All | -30 | | 70 | °C |
| Storage Temperature | | All | -40 | | 85 | °C |
| Input/Output Isolation Voltage | 1 minute | All | | | 4400 | V _{ac} |
| 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% Load, V _{in} =100V _{ac} | All | | | 1.5 | A |
| Leakage Current (Earth) | | TR70MA | | | 300 | uA |
| Leakage Current (Touch) | | All | | | 90 | uA |
| Under Voltage Protection | | All | 60 | 65 | 70 | V _{ac} |
| Inrush Current | V _{in} =240V _{ac} , Cold start at 25°C | All | | | 100 | 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 | TR70MA/B120 | 11.76 | 12 | 12.24 | V _{dc} |
| | | TR70MA/B150 | 14.7 | 15 | 15.3 | |
| | | TR70MA/B180 | 17.64 | 18 | 18.36 | |
| | | TR70MA/B240 | 23.52 | 24 | 24.48 | |
| | | TR70MA/B360 | 35.28 | 36 | 36.72 | |
| | | TR70MA/B480 | 47.04 | 48 | 48.96 | |
| Operating Output Current Range | V _{in} =115V _{ac} and 230V _{ac} , T _c =25°C | TR70MA/B120 | 0 | | 5.8 | A |
| | | TR70MA/B150 | 0 | | 4.65 | |
| | | TR70MA/B180 | 0 | | 3.9 | |
| | | TR70MA/B240 | 0 | | 3.0 | |
| | | TR70MA/B360 | 0 | | 1.9 | |
| | | TR70MA/B480 | 0 | | 1.5 | |
| Holdup Time | V _{in} =115V _{ac} | All | 8 | 10 | | ms |
| Output Voltage Regulation | | | | | | |
| Load Regulation | 60%±40% Full load change | TR70MA/B120 | | | ±5.0 | % |
| | | TR70MA/B150 | | | ±3.0 | |
| | | TR70MA/B180 | | | ±2.0 | |
| | | TR70MA/B240 | | | ±2.0 | |
| | | TR70MA/B360 | | | ±2.0 | |
| | | TR70MA/B480 | | | ±2.0 | |
| Line Regulation | V _{in} =High line to low line, full load | All | | | ±1.0 | % |
| Over Voltage Protection | IC component to clamp (auto recovery) | TR70MA/B120 | | 13.5 | | V _{dc} |
| | | TR70MA/B150 | | 16.5 | | |
| | | TR70MA/B180 | | 19.5 | | |
| | | TR70MA/B240 | | 26 | | |
| | | TR70MA/B360 | | 40 | | |
| | | TR70MA/B480 | | 53.5 | | |
| Over Current Protection | Auto recovery | All | 130 | | 150 | % |
| Short Circuit Protection | Auto recovery | All | | | | |



TR70M Series

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|-------------------------|---|-------------|------|------|------|-------|
| 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 | TR70MA/B120 | | | 120 | mV |
| | | TR70MA/B150 | | | 150 | |
| | | TR70MA/B180 | | | 180 | |
| | | TR70MA/B240 | | | 240 | |
| | | TR70MA/B360 | | | 360 | |
| | | TR70MA/B480 | | | 480 | |
| Load Capacitance | 1. $V_{in}=115V_{ac}$ and $230V_{ac}$ 2. Output is max. load 3. Ambient temperature=25°C | TR70MA/B120 | | | 5800 | uF |
| | | TR70MA/B150 | | | 4650 | |
| | | TR70MA/B180 | | | 3900 | |
| | | TR70MA/B240 | | | 3000 | |
| | | TR70MA/B360 | | | 1900 | |
| | | TR70MA/B480 | | | 1500 | |
| Efficiency | 1. $V_{in}=230V_{ac}$ 2. Output is 75% full load 3. Ambient temperature=25°C | TR70MA/B120 | | 89% | | % |
| | | TR70MA/B150 | | 89% | | |
| | | TR70MA/B180 | | 89% | | |
| | | TR70MA/B240 | | 90% | | |
| | | TR70MA/B360 | | 90% | | |
| | | TR70MA/B480 | | 91% | | |

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) | TR70MA | | | 1800 | V_{ac} |
| Output to Earth (Ground) | 1 minute (without dielectric breakdown) | TR70MA | | | 1800 | V_{ac} |
| Isolation Resistance | Input to output | All | 100 | | | MΩ |

FEATURE CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---------------------|----------------------|--------|------|------|------|-------|
| Switching Frequency | | All | | 65 | | 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 | 500 | | | k hours |
| Humidity | Non-condensing | All | | | 93 | % RH |
| Shock | 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 | 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 | | 300 | | grams |
| Dimension | | All | 4.724x2.047x1.220 inches (120.00x52.00x31.00 mm) | | | |
| Safety | Class I (TR70MA), Class II (TR70MB) IEC 60601-1:2005 (Third Edition) + CORR. 1:2006 + CORR. 2:2007 + A1:2012 EN 60601-1:2006;A1 ANSI/AAMI ES60601-1 (2005/(R)2012 + A1:2012, C1:2009/(R)2012 + A2:2010/(R)2012) IEN/EN 60601-1-11-2015 For TR70MB (Home Health Care) | | | | | Ed 3.1 |
| EMC Emission | EN55011:2009+A1:2010, EN61000-3-2:2014, EN6100-3-3:2013, 47 CFR FCC Part 18 | | | | | |
| Conducted Disturbance | EN55011:2009+A1:2010, 47 CFR FCC Part 18 | | | | | Class B |
| Radiated Disturbance | EN55011:2009+A1:2010, 47 CFR FCC Part 18 | | | | | 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 |



TR70M Series

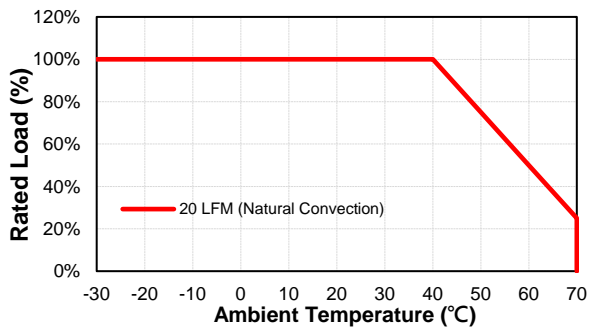
GENERAL SPECIFICATIONS

| | | |
|--|--|-------------|
| Radio-Frequency, Continuous Radiated Disturbance | IEC 61000-4-3:2006+A1:2007+A2:2010 | Criterion A |
| Electrical Fast Transient (EFT) | IEC61000-4-4:2012, $\pm 1\text{kV}$, $\pm 2\text{kV}$ | Criterion A |
| Surge | IEC61000-4-5:2014+A1:2017, L-N: $\pm 0.5\text{kV}$, $\pm 1\text{kV}$, L-E (Ground): $\pm 0.5\text{kV}$, $\pm 1\text{kV}$, $\pm 2\text{kV}$ | 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 | TR70M Series App Notes | |

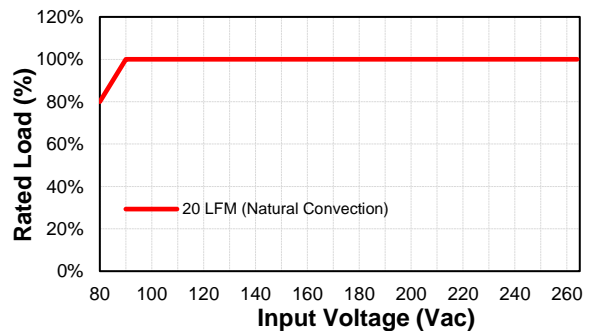
CHARACTERISTIC CURVE

Power Derating Curve

TR70M Derating Curve

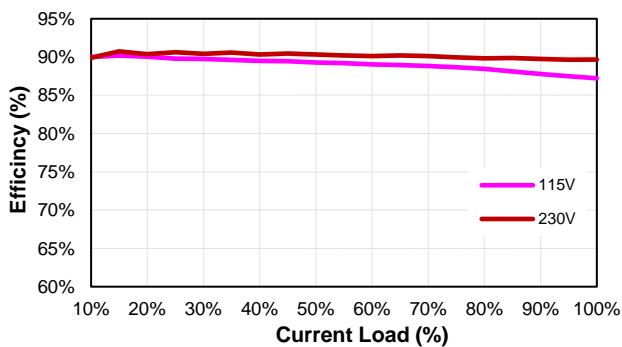


TR70M Input Voltage Derating Curve

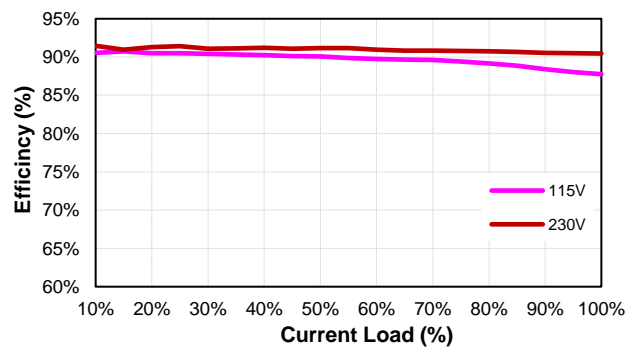


Performance Data

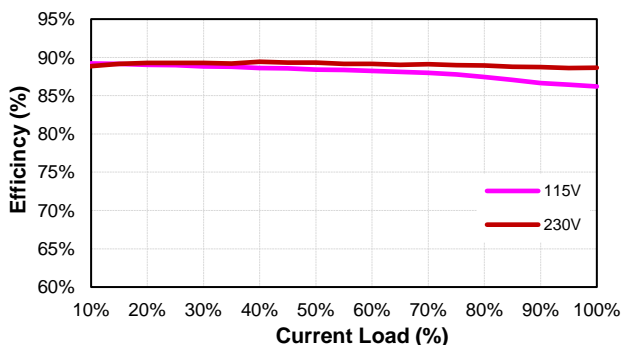
TR70M120 (Eff Vs Io)



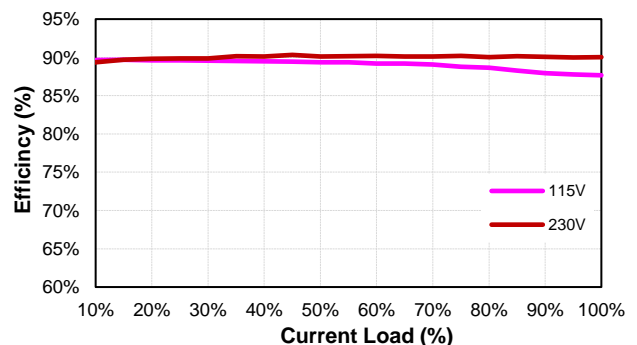
TR70M150 (Eff Vs Io)



TR70M180 (Eff Vs Io)



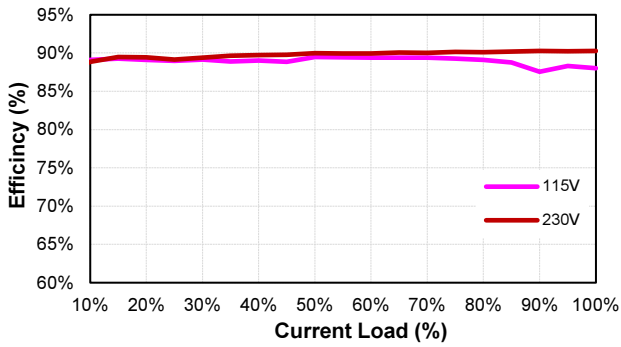
TR70M240 (Eff Vs Io)



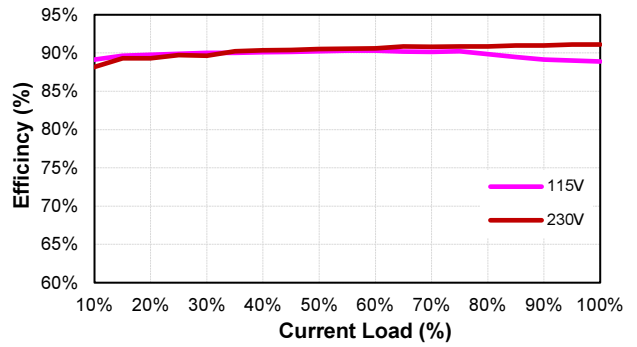


TR70M Series

TR70M360 (Eff Vs Io)



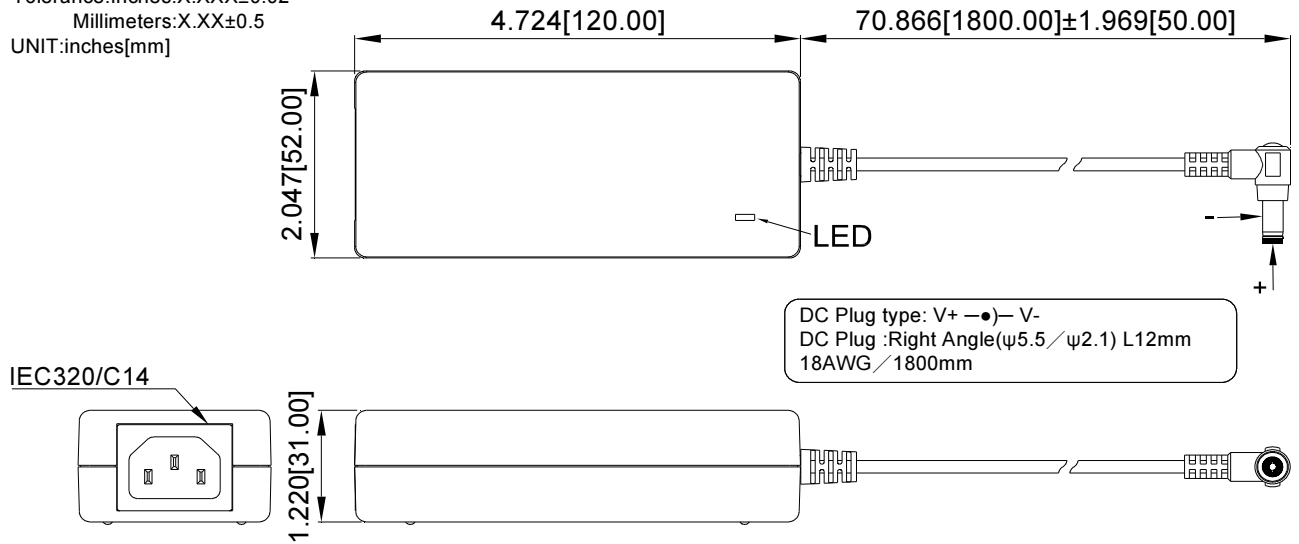
TR70M480 (Eff Vs Io)



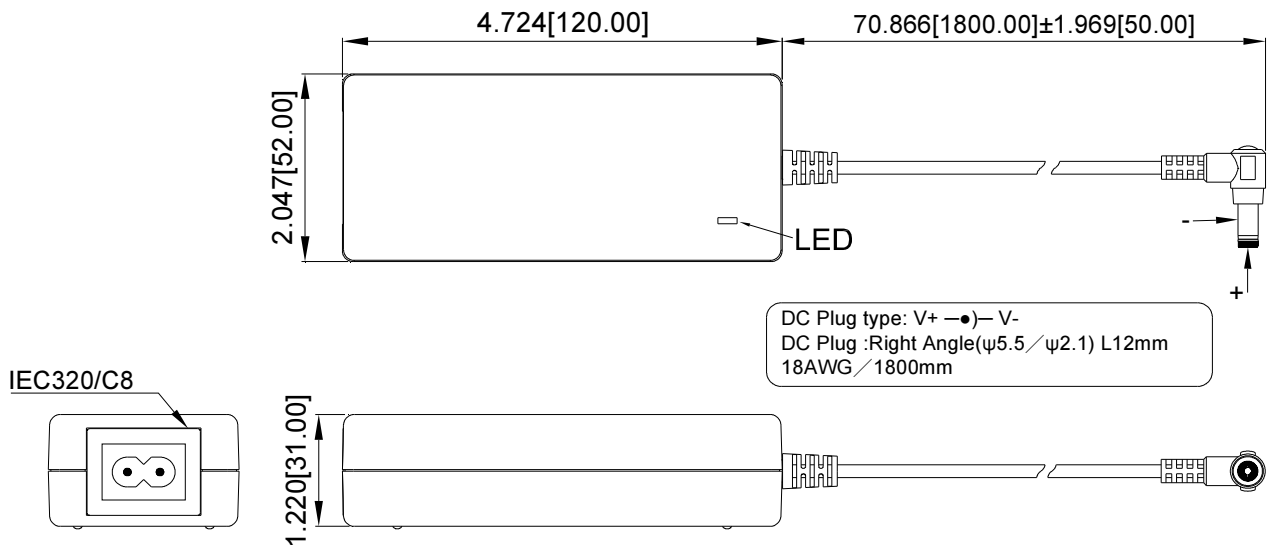
MECHANICAL SPECIFICATION

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

TR70MAXXX Series



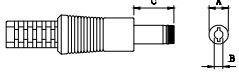
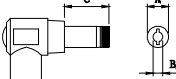
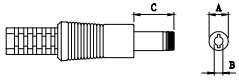
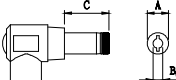
TR70MBXXX Series





TR70M 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> | 11E02 | Φ5.5 | Φ2.1 | 12 | UL1185 | 1200mm without Core | 16AWG for Vo: 12V, 15V |
| | 12E02 | Φ5.5 | Φ2.5 | 12 | | | |
| | 23E02 | Φ5.5 | Φ2.1 | 9.5 | | | |
| | 26E02 | Φ5.5 | Φ2.5 | 9.5 | | | |
|  <p>Right Angle/Inner+Outer- + ● -</p> | 01E02 | Φ5.5 | Φ2.1 | 12 | | | |
| | 02E02 | Φ5.5 | Φ2.5 | 12 | | | |
| | 21E02 | Φ5.5 | Φ2.5 | 9.5 | | | |
| | 24E02 | Φ5.5 | Φ2.1 | 9.5 | | | |
|  <p>Straight/Inner+Outer- + ● -</p> | 11E03 | Φ5.5 | Φ2.1 | 12 | UL1185 | 1800mm without Core | 16AWG for Vo: 18V 18AWG for Vo: 24V, 36V, 48V, |
| | 12E03 | Φ5.5 | Φ2.5 | 12 | | | |
| | 23E03 | Φ5.5 | Φ2.1 | 9.5 | | | |
| | 26E03 | Φ5.5 | Φ2.5 | 9.5 | | | |
|  <p>Right Angle/Inner+Outer- + ● -</p> | 01E03 | Φ5.5 | Φ2.1 | 12 | | | |
| | 02E03 | Φ5.5 | Φ2.5 | 12 | | | |
| | 21E03 | Φ5.5 | Φ2.5 | 9.5 | | | |
| | 24E03 | Φ5.5 | Φ2.1 | 9.5 | | | |

※Other DC Plug Type please refer to the link: <https://www.cincon.com/productdownload/TR70M-cable--DC-Plug.pdf>

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