



E-Star Power Development Co., Ltd. (E-STAR)
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 22069, Taiwan (R.O.C.)
 Phone : 886-2-2957 5580 Fax : 886-2-2957 7473

160W Desktop Power Supply < TRH160A

Features

- Universal Input Range 90~264Vac
- High Efficiency up to 93%
- Class I
- No Load Input Power Consumption < 150mW
- Approval IEC/EN/UL 62368-1
- Approval EN55032 and CISPR/FCC Class B
- Meets IEC/EN 60335-1
- Operating Altitude 5000m
- Continuous Short Circuit Protection
- Over Voltage Protection
- Very Low Leakage Current <90uA
- Meets CoC Tier 2 and DOE Level VI
- IEC320/C14 Compact Size



| MODEL NUMBER | OUTPUT VOLTAGE | OUTPUT CURRENT | RIPPLE & NOISE NOTE1 | VOLTAGE ACCURACY NOTE2 | LINE REGULATION NOTE3 | LOAD REGULATION NOTE4 | %EFF. (Typ.) NOTE5 |
|--------------|----------------|----------------|----------------------|------------------------|-----------------------|-----------------------|--------------------|
| TRH160A120 | 12 V | 12.5 A | 120mV | ±2% | ±1% | ±3% | 91% |
| TRH160A240 | 24 V | 6.66 A | 200mV | ±2% | ±1% | ±2% | 92% |
| TRH160A280 | 28 V | 5.7 A | 200mV | ±2% | ±1% | ±2% | 92% |
| TRH160A300 | 30 V | 5.31 A | 200mV | ±2% | ±1% | ±2% | 92% |
| TRH160A360 | 36 V | 4.44 A | 200mV | ±2% | ±1% | ±2% | 92% |
| TRH160A480 | 48 V | 3.33 A | 200mV | ±2% | ±1% | ±2% | 93% |
| TRH160A560 | 56 V | 2.85 A | 200mV | ±2% | ±1% | ±2% | 93% |

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.

PART NUMBER

| Series | | Output Voltage | DC Plug Type | Cable Type | Cable Length |
|--------------------------|-------------|----------------|----------------------------|---------------------|---------------------------------|
| TRH160 | X | XXX | -XX | E | XX |
| 160W I.T.E Adapter | A : Class I | 120 : 12V | See Page 7 | E : UL2464 with OVP | 12V : 950mm with DIN Power Plug |
| | | 240 : 24V | | | 24V : 1220mm with DC Jack |
| | | 280 : 28V | | | 28V : 1800mm with DC Jack |
| | | 300 : 30V | | | 30V : 1800mm with DC Jack |
| | | 360 : 36V | | | 36V : 1800mm with DC Jack |
| | | 480 : 48V | | | 48V : 1800mm with DC Jack |
| | | 560 : 56V | | | 56V : 1800mm with DC Jack |

Part Number Example:

TRH160A120-1446E471, 150W, Class I, 12V_{dc} Output, DIN Power Plug Type, Cable Length 950mm
TRH160A240-01E12, 160W, Class I, 24V_{dc} Output, DC Jack Type, Cable Length 1220mm



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160W Desktop Power Supply < TRH160A

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 Temperature | See Derating Curve, (-30°C Can be Start-up at full load.) | All | -20 | | 70 | °C |
| Storage Temperature | | All | -40 | | 85 | °C |
| Input/Output Isolation Voltage | 1 minute | All | | | 3000 | 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 | | | 2.0 | A |
| Leakage Current (Earth) | | All | | | 3.5 | mA |
| Leakage Current (Touch) | | All | | | 90 | uA |
| Under Voltage Protection | | All | 60 | 66 | 70 | V _{ac} |
| Power Factor | 230V _{ac} /50Hz at Full load | All | 0.9 | | | |
| Inrush Current | V _{in} =240V _{ac} , Cold start at 25°C | All | | | 120 | A |

OUTPUT CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|--------------------------------|---|------------|-------|------|-------|-----------------|
| Output Voltage Set Point | V _n =115V _{ac} and 230V _{ac} , I _o =60% Full load T _c =25°C | TRH160A120 | 11.76 | 12 | 12.24 | V _{dc} |
| | | TRH160A240 | 23.52 | 24 | 24.48 | |
| | | TRH160A280 | 27.44 | 28 | 28.56 | |
| | | TRH160A300 | 29.4 | 30 | 30.6 | |
| | | TRH160A360 | 35.28 | 36 | 36.72 | |
| | | TRH160A480 | 47.04 | 48 | 48.96 | |
| | | TRH160A560 | 54.88 | 56 | 57.12 | |
| Operating Output Current Range | V _n =115V _{ac} and 230V _{ac} , T _c =25°C | TRH160A120 | 0 | | 12.5 | A |
| | | TRH160A240 | 0 | | 6.66 | |
| | | TRH160A280 | 0 | | 5.7 | |
| | | TRH160A300 | 0 | | 5.31 | |
| | | TRH160A360 | 0 | | 4.44 | |
| | | TRH160A480 | 0 | | 3.33 | |
| | | TRH160A560 | 0 | | 2.85 | |
| Holdup Time | V _n =115V _{ac} | All | | 25 | | ms |
| Output Voltage Regulation | | | | | | |
| Load Regulation | 60%±40% Full load change | TRH160A120 | | | ±3.0 | % |
| | | TRH160A240 | | | ±2.0 | |
| | | TRH160A280 | | | ±2.0 | |
| | | TRH160A300 | | | ±2.0 | |
| | | TRH160A360 | | | ±2.0 | |
| | | TRH160A480 | | | ±2.0 | |
| | | TRH160A560 | | | ±2.0 | |
| Line Regulation | V _n =High line to low line, full load | All | | | ±1.0 | % |



160W Desktop Power Supply < TRH160A

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|--------------------------|---|------------|------|------|-------|-----------------|
| Over Voltage Protection | Latch Off (AC Recycle to Reset) | TRH160A120 | | 13.2 | | V _{dc} |
| | | TRH160A240 | | 28.6 | | |
| | | TRH160A280 | | 33.4 | | |
| | | TRH160A300 | | 34.6 | | |
| | | TRH160A360 | | 41.8 | | |
| | | TRH160A480 | | 55.6 | | |
| | | TRH160A560 | | 59.8 | | |
| Over Current Protection | Auto recovery | All | 110 | | 125 | % |
| 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 | TRH160A120 | | | 120 | mV |
| | | TRH160A240 | | | 200 | |
| | | TRH160A280 | | | 200 | |
| | | TRH160A300 | | | 200 | |
| | | TRH160A360 | | | 200 | |
| | | TRH160A480 | | | 200 | |
| | | TRH160A560 | | | 200 | |
| Load Capacitance | 1. V _{in} =115V _{ac} and 230V _{ac} 2. Output is max. load 3. Ambient temperature=25°C | TRH160A120 | | | 12250 | uF |
| | | TRH160A240 | | | 6600 | |
| | | TRH160A280 | | | 5670 | |
| | | TRH160A300 | | | 5400 | |
| | | TRH160A360 | | | 4330 | |
| | | TRH160A480 | | | 3240 | |
| | | TRH160A560 | | | 2870 | |
| Efficiency | 1. V _{in} =230V _{ac} 2. Output is 75% full load 3. Ambient temperature=25°C | TRH160A120 | | 91% | | % |
| | | TRH160A240 | | 92% | | |
| | | TRH160A280 | | 92% | | |
| | | TRH160A300 | | 92% | | |
| | | TRH160A360 | | 92% | | |
| | | TRH160A480 | | 93% | | |
| | | TRH160A560 | | 93% | | |

ISOLATION CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|-------------------------|---|--------|------|------|------|-----------------|
| Input to Output | 1 minute (without dielectric breakdown) | All | | | 3000 | V _{ac} |
| Input to Earth (Ground) | 1 minute (without dielectric breakdown) | All | | | 1500 | V _{ac} |
| Isolation Resistance | Input to output | All | 100 | | | MΩ |

FEATURE CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---------------------|----------------------|--------|------|------|------|-------|
| Switching Frequency | | All | | 110 | | kHz |

GENERAL SPECIFICATIONS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|-----------|---|--------|------|------|------|---------|
| MTBF | I _o =100%; T _a =25°C per MIL-HDBK-217F | All | 300 | | | k hours |
| Humidity | Non-condensing | All | | | 93 | % RH |
| Shock | MIL-STD-810F Table 516.5, TABLE 516.5-I 10ms, each axis 3 times(±X · ±Y · ±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 | | 575 | | grams |



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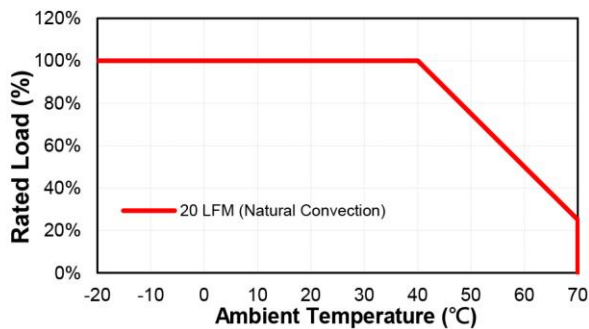
GENERAL SPECIFICATIONS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|--|---|--------|---|------|------|-------------|
| Dimension | | All | 5.906x2.756x1.497 inches (150.00x70.00x38.00 mm) | | | |
| Safety | Class I, IEC62368-1:2014 EN62368-1:2014+A11 UL 62368-1, 2nd Edition | | | | | Ed 2.0 |
| EMC Emission | EN55032:2015+AC:2016, EN61000-3-2:2014, EN61000-3-3:2013, FCC CFR 47 Part 15 | | | | | |
| Conducted Disturbance | EN55032:2015+AC:2016, FCC CFR 47 Part 15 | | | | | Class B |
| Radiated Disturbance | EN55032:2015+AC:2016, FCC CFR 47 Part 15 | | | | | Class B |
| Harmonic Current Emissions | EN61000-3-2:2014 | | | | | Class A |
| Voltage Fluctuations & Flicker | EN61000-3-3:2013 | | | | | Criterion A |
| EMC Immunity | EN55024:2010+A1:2015, EN61000-6-1:2007, EN61204-3:2000, IEC61000-4-2,3,4,5,6,8,11 | | | | | |
| Electrostatic Discharge (ESD) | IEC 61000-4-2:2008, Air Discharge: ±8kV Contact Discharge: ±4kV | | | | | Criterion A |
| Radio-Frequency, Continuous Radiated Disturbance | IEC 61000-4-3:2010 | | | | | Criterion A |
| Electrical Fast Transient (EFT) | IEC 61000-4-4:2012, ±0.5kV, ±1kV | | | | | Criterion A |
| Surge | IEC 61000-4-5:2014+A1:2017, L-N: ±0.5kV, ±1kV, L-E (Ground): ±0.5kV, ±1kV, ±2kV | | | | | Criterion A |
| Conducted Disturbances, Induced by RF Fields | IEC 61000-4-6:2013 | | | | | 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 | | | | | Criterion A |
| Voltage Interruptions | IEC 61000-4-11:2004+A1:2017,>95% reduction | | | | | Criterion B |

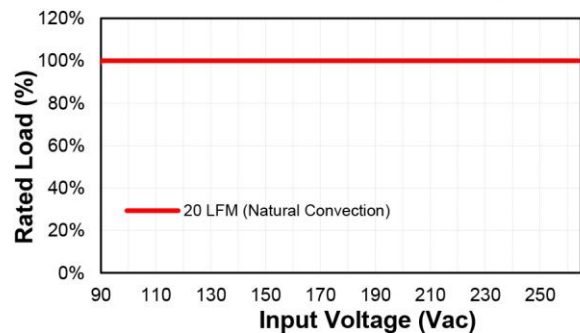
CHARACTERISTIC CURVE

Power Derating Curve

TRH160A Derating Curve

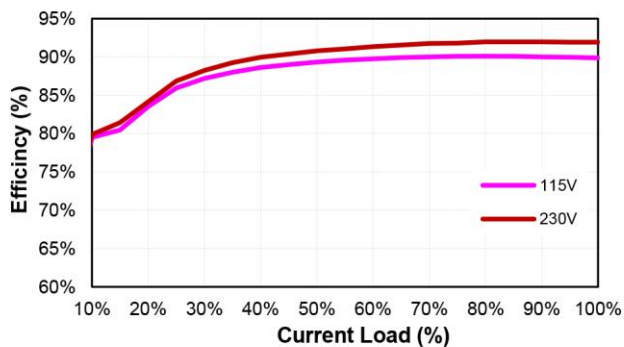


TRH160A Input Voltage Derating Curve

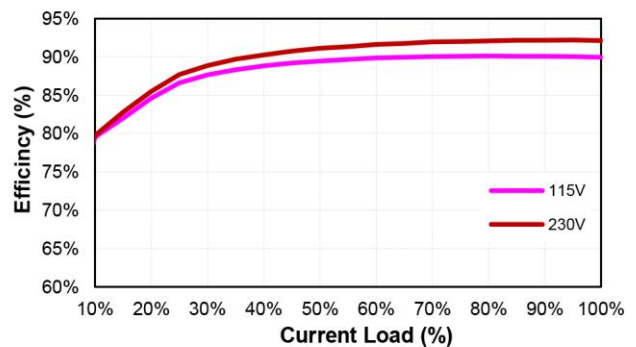


Performance Data

TRH160A120 (Eff Vs Io)



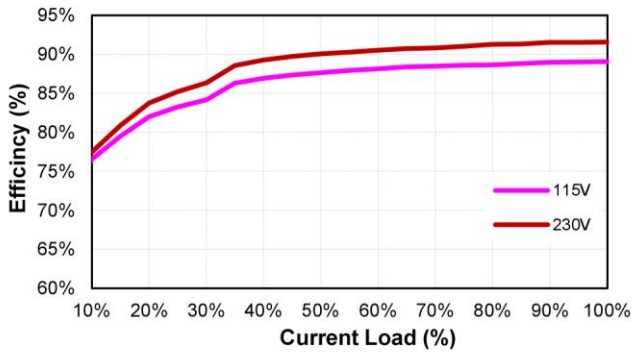
TRH160A240 (Eff Vs Io)



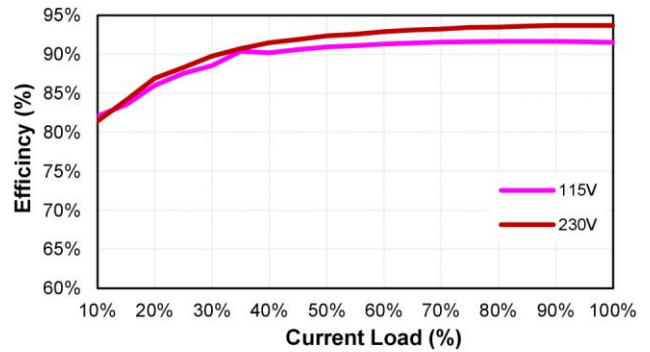


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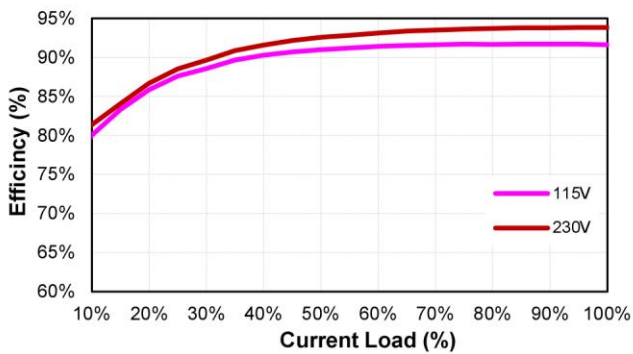
TRH160A280 (Eff Vs Io)



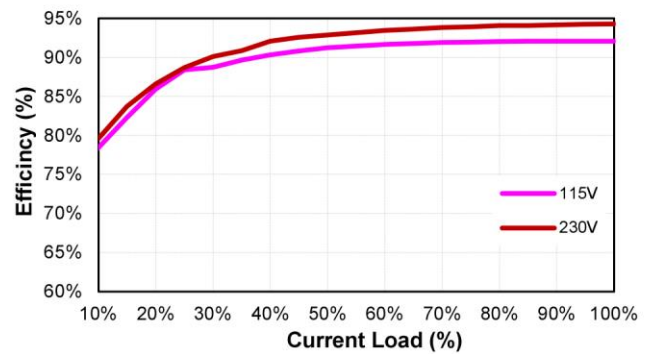
TRH160A300 (Eff Vs Io)



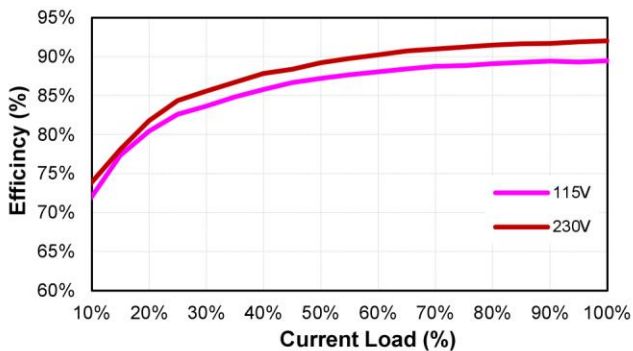
TRH160A360 (Eff Vs Io)



TRH160A480 (Eff Vs Io)



TRH160A560 (Eff Vs Io)





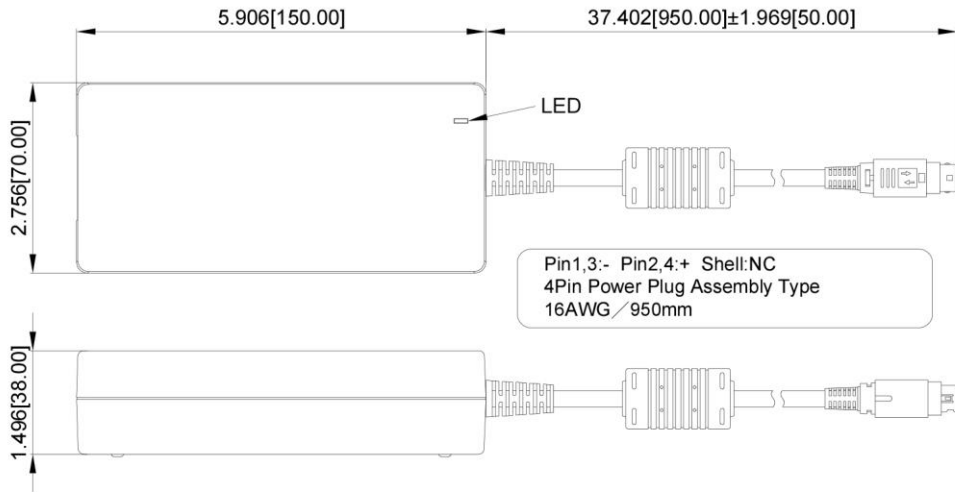
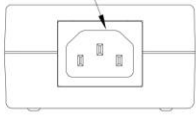
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MECHANICAL SPECIFICATION

Din Power Plug

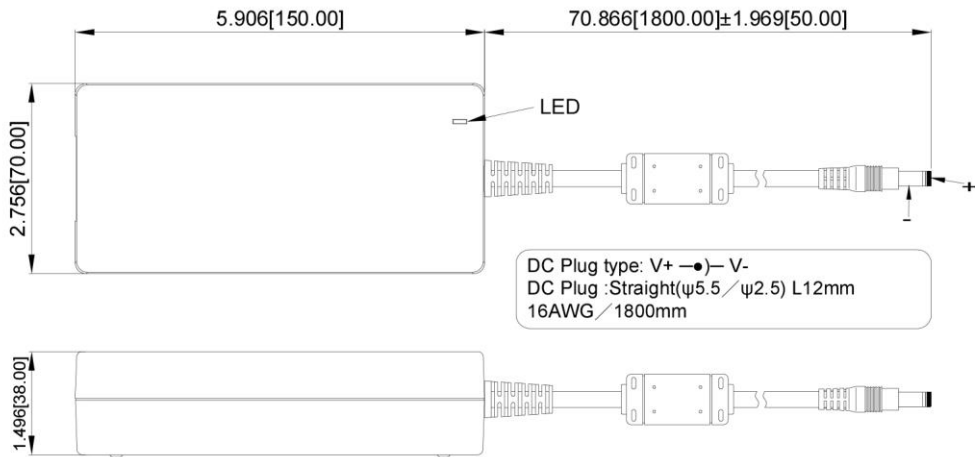
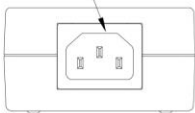
All Dimensions are in inches[mm]
Tolerance:Inches:X.XXX±0.02
Millimeters:X.XX±0.5
UNIT:inches[mm]

IEC320/C14



DC Jack

IEC320/C14



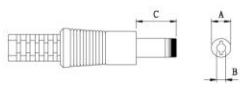
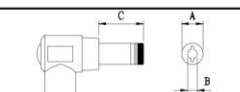
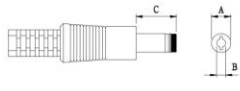
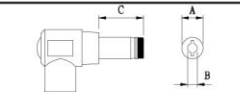
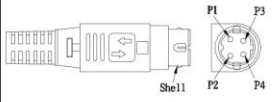
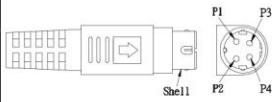
* For Output Voltage 12Vdc model, it must select Din Power Plug Molded Type or equivalent

* For Output Voltage 24Vdc to 56Vdc models, it's able to select Din Power Plug Molded Type, DC Jack or equivalent.



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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) | | | |
|  Straight/Inner+Outer- + ● - - | 11E13 | Φ5.5 | Φ2.1 | 12 | UL2464 | 1800mm with Ferrite Core | 16AWG for 28V,30V,36V, 48V,56V |
| | 12E13 | Φ5.5 | Φ2.5 | 12 | | | |
| | 23E13 | Φ5.5 | Φ2.1 | 9.5 | | | |
| | 26E13 | Φ5.5 | Φ2.5 | 9.5 | | | |
|  Right Angle/Inner+Outer- + ●) - - | 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 | | | |
|  Straight/Inner+Outer- + ● - - | 11E12 | Φ5.5 | Φ2.1 | 12 | UL2464 | 1220mm with Ferrite Core | 16AWG for Vo: 24V |
| | 12E12 | Φ5.5 | Φ2.5 | 12 | | | |
| | 23E12 | Φ5.5 | Φ2.1 | 9.5 | | | |
| | 26E12 | Φ5.5 | Φ2.5 | 9.5 | | | |
|  Right Angle/Inner+Outer- + ●) - - | 01E12 | Φ5.5 | Φ2.1 | 12 | | | |
| | 02E12 | Φ5.5 | Φ2.5 | 12 | | | |
| | 21E12 | Φ5.5 | Φ2.5 | 9.5 | | | |
| | 24E12 | 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)  | 1446E471 | P1 | - | UL2464 | 950mm with Ferrite Core | 16AWG for Vo: 12V | |
| | | P2 | + | | | | |
| | | P3 | - | | | | |
| | | P4 | + | | | | |
| | | Shell | No Connection | | | | |
| KYCON KPPX-4P equivalent without Lock (Din Power Plug Molded Type)  | 1538E471 | P1 | + | | | | |
| | | P2 | + | | | | |
| | | P3 | - | | | | |
| | | P4 | - | | | | |
| | | Shell | No Connection | | | | |