

!NOT RECOMMENDED FOR NEW DESIGNS!

RECOM
AC/DC Converter

Features

- Long 5 year warranty
- 2MOPP/250VAC
- Suitable for built in Class II applications
- Wide input voltage range (85-264VAC)
- Low leakage current (<75µA)
- 5000m operation
- -40°C to +85°C operating temperature

Regulated Converter

RACM65

**65 Watt
Enclosed &
Open Frame
Case Style
Single Output**



Description

The RACM65 is a compact 3" x 2" high efficiency AC/DC power supply with 2xMOPP safety approval for medical applications. These space saving enclosed power supplies have an universal input voltage range (85-264VAC), 4kVAC isolation, require no minimum load and can be used at ambient temperatures of between -40°C and +85°C. The 5V, 12V, 15V, 24V or 48V output voltages are fully protected and have tolerances of less than ±0.2% over the entire input voltage range and less than ±0.5% over the entire load range. The output voltage can be trimmed over a ±10% range. The RACM65 series is certified to medical safety standard IEC/ES/EN-60601-1 3rd Edition and with less than 75µA leakage current. It has a built-in Class B EMI filter and comes with a 5 year warranty.

Selection Guide

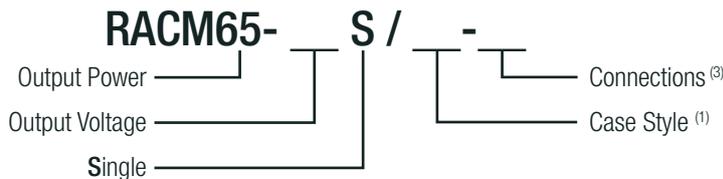
| Part Number | Input Voltage Range [VAC] | Output Voltage [VDC] | Output Current [A] | Efficiency typ. [%] | Max. Capacitive Load ⁽¹⁾ [µF] |
|-----------------------------|---------------------------|----------------------|--------------------|---------------------|--|
| RACM65-05S ^(1,2) | 85-264 | 5 | 10 | 90 | 20000 |
| RACM65-12S ^(1,2) | 85-264 | 12 | 5.42 | 92.5 | 4520 |
| RACM65-15S ^(1,2) | 85-264 | 15 | 4.34 | 93.5 | 2900 |
| RACM65-24S ^(1,2) | 85-264 | 24 | 2.71 | 93.5 | 1130 |
| RACM65-48S ^(1,2) | 85-264 | 48 | 1.36 | 93 | 235 |

Notes:

Note1: Max Cap Load is tested at minimum input and full resistive load



Model Numbering



Notes:

Note2: Case Style: without suffix, standard enclosed case
add suffix "/OF" for open frame style

Note3: Connections: without suffix, standard connection with connector
with suffix "-ST" connection with screw terminals

Examples:

RACM65-12S = 12Vout, standard enclosed case
RACM65-48S/OF = 48Vout, open frame style
RACM65-15S/OF-ST = 15Vout, open frame style with screw terminal connection

PREFERRED ALTERNATIVES

Please consider this alternatives:

RACM60-K Series

CSA/CAN-C22.2 No 60601-1:14 certified
ANSI/AAMI ES60601-1 certified
EN60601-1-2
CISPR11
FCC Part 15 & 18

Specifications (measured at Ta= 25°C, 250VAC, full load and after warm-up)

BASIC CHARACTERISTICS

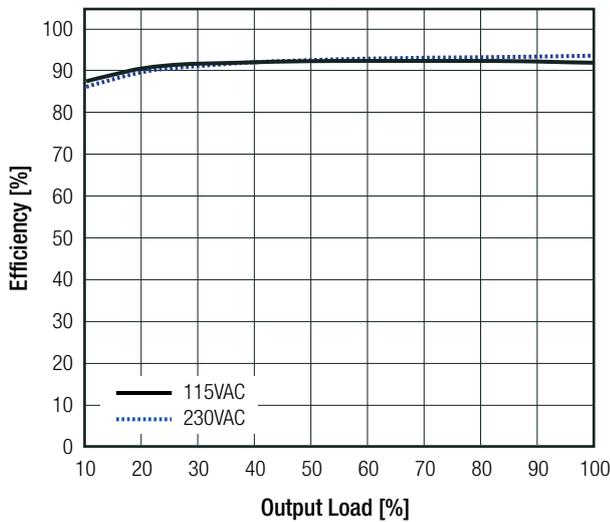
| Parameter | Condition | Min. | Typ. | Max. |
|--|---|--------------------------------|--------------------------------|----------------------|
| Input Voltage | | 85VAC 100VDC ⁽⁴⁾ | 230VAC | 264VAC 370VDC |
| Input Current | 115VAC, full load 230VAC, full load | | | 1.6A 0.9A |
| Inrush Current | cold start, 230VAC | | | 60A |
| No load Power Consumption | | | | 0.11W |
| Input Frequency Range | AC Input | | 50/60Hz | 440Hz ⁽⁴⁾ |
| Output Voltage Trimming | on-board trimpot | | ±10.0% | |
| Minimum Load | | 0% | | |
| Start-up Time | | | | 1s |
| Rise Time | | | 20ms | |
| Hold up Time | 115VAC, full load | | 16ms | |
| Operating Frequency Range | 5VDC, 230VAC others, 230VAC | | 60kHz 120kHz | |
| Output Ripple and Noise (measured @ 20MHz BW) | 5VDC, 12VDC and 15VDC with 10µF/25V MLCC 24VDC, with 1µF/50V MLCC 48VDC, with 0.1µF/100V MLCC | | 75mVp-p 75mVp-p 150mVp-p | |

Notes:

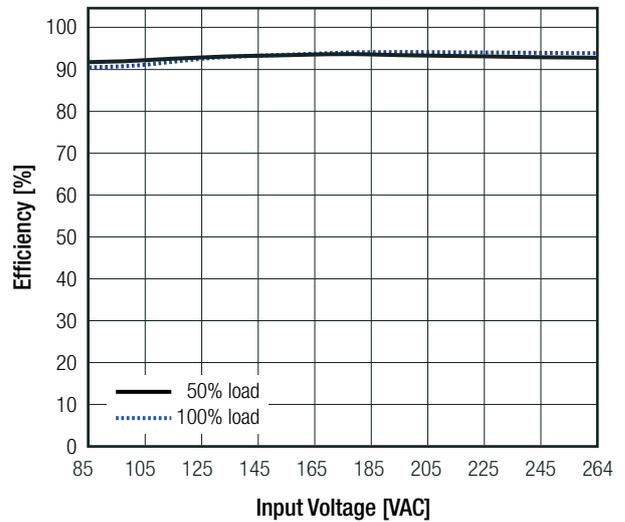
Note4: Confirmed performance, but not covered in certificates. 100V input voltage with derating

RACM65-24S

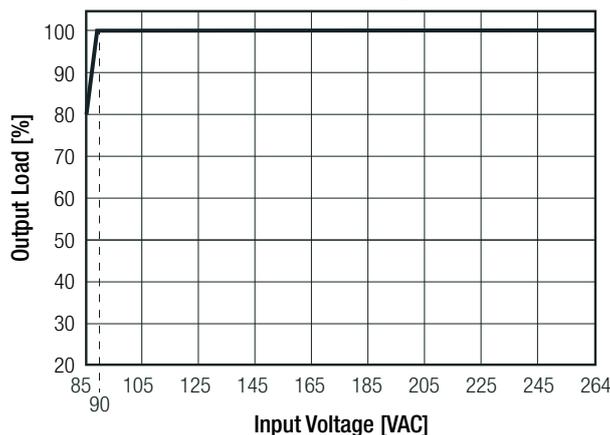
Efficiency vs. Load



Efficiency vs. Input Voltage



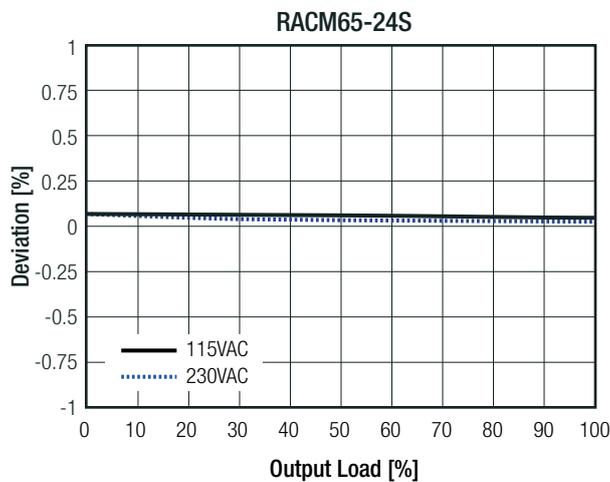
Line Derating



Specifications (measured at Ta= 25°C, 250VAC, full load and after warm-up)

| REGULATIONS | | | |
|--------------------------|--|--------|----------------|
| Parameter | Condition | | Value |
| Set Voltage Accuracy | 230VAC, full load | | ±1.0% |
| Line Voltage Regulation | low line to high line, full load | | ±0.2% |
| Load Voltage Regulation | 0% to 100% load | 5VDC | 0.7% |
| | | others | 0.5% |
| Load Voltage Regulation | 10% to 90% load | 5VDC | 0.6% |
| | | others | 0.4% |
| Transient Peak Deviation | load step from 50% - 75% change at 2.5A/μs | | 3.0% Vout max. |
| Transient Recovery Time | load step from 50% - 75% change at 2.5A/μs | | 600μs typ. |

Deviation vs. Load



| PROTECTIONS | | | |
|----------------------------------|-----------------------------------|--|--|
| Parameter | Condition | | Value |
| Input Fuse | internal line neutral | | T3.15A / 250VAC, slow blow type T3.15A / 250VAC, slow blow type |
| Short Circuit Protection (SCP) | | | continuous, auto-recovery |
| Over Load Protection (OLP) | % of Iout rated (Hiccup) | | 145% typ. |
| Over Voltage Protection (OVP) | % of Vout nominal (Latch off) | | 125% min / 140% max. |
| Isolation Voltage ⁽⁵⁾ | tested for 1 minute | I/P to O/P I/P to Case, O/P to Case | 4kVAC 2.5kVAC |
| Isolation Resistance | 500VDC | | 100MΩ min. |
| Insulation Grade | | | reinforced |
| Leakage Current | 264VAC | | 75μA max. |
| Means of Protection | working voltage 250VAC/continuous | | 2MOPP |
| Medical Device Classification | | | built-in power supply |
| Internal | clearance creepage | | >8.0mm >8.0mm |

Notes:

Note5: For repeat Hi-Pot testing, reduce the time and/or the test voltage

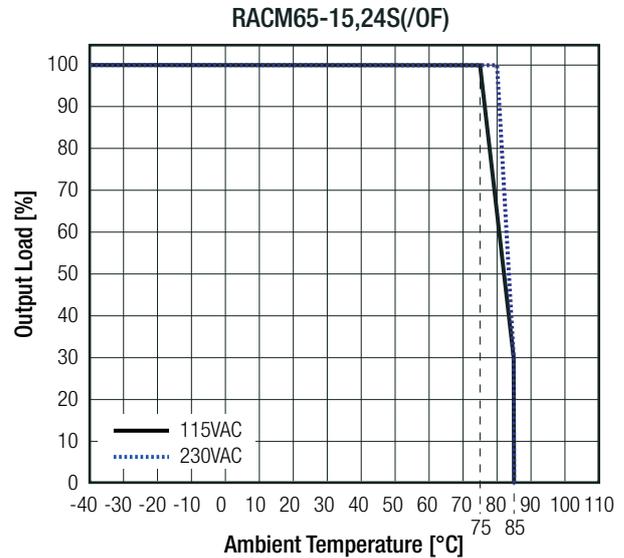
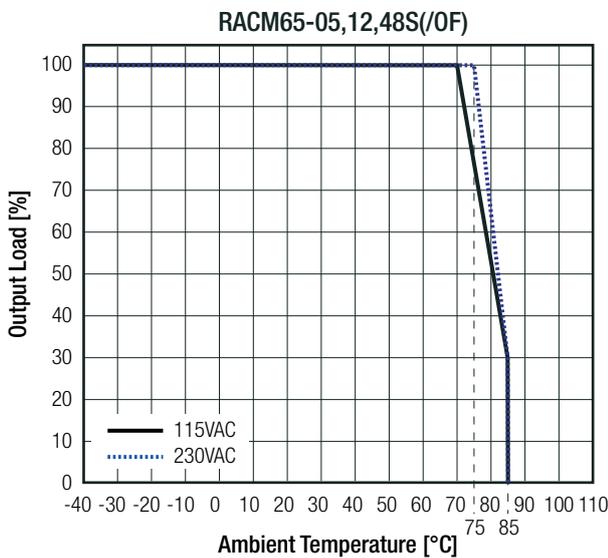
Specifications (measured at Ta= 25°C, 250VAC, full load and after warm-up)

ENVIRONMENTAL

| Parameter | Condition | Value |
|-----------------------------|--|------------------------------|
| Operating Temperature Range | refer to derating graph | -40°C to +85°C |
| Temperature Coefficient | | ±0.02%/K |
| Operating Altitude | | 5000m max. |
| Operating Humidity | non-condensing | 5% to 95% RH |
| Pollution Degree | | PD2 |
| Shock | | according to IEC60068-2-27 |
| Vibration | | according to IEC60068-2-6 |
| MTBF | according to MIL-HDBK-217F, full load, +25°C | 1494 x 10 ³ hours |

Derating Graph

(@ natural convection 0.1m/s)



SAFETY AND CERTIFICATIONS

| Certificate Type (Safety) | Report / File Number | Standard |
|---|----------------------|--|
| Medical Electric Equipment, General Requirements for Safety and Essential Performance | E314885 | CAN/CSA-C22.2 No. 60601-1:14 ANSI/AAMI ES60601-1:2005 + A2:2010 |
| Medical Electric Equipment, General Requirements for Safety and Essential Performance (CB Scheme) | 151101302 | IEC60601-1:2005 + C2:2007, 3rd Edition EN60601-1:2006 |
| Information Technology Equipment - General Requirements for Safety (LVD) | TW1708008-001 | EN60950-1:2006 + A2:2013 |
| Information Technology Equipment - General Requirements for Safety | | IEC60950-1:2005, 2nd Edition + A2:2013 |
| EAC | RU-AT.49.09571 | TP TC 004/2011 TP TC 004/2011 |
| RoHs2+ | | RoHS-2011/65/EU + AM-2015/863 |

EMC Compliance (Medical)

| Conditions | Standard / Criterion |
|--|---------------------------------|
| Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests | EN60601-1-2:2015 |
| Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement | CISPR11:2009 + A1:2010, Class B |

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Specifications (measured at Ta= 25°C, 250VAC, full load and after warm-up)

| EMC Compliance (Medical) | Conditions | Standard / Criterion |
|--|--|--|
| ESD Electrostatic discharge immunity test | Air ±15kV; Contact ±8kV | IEC61000-4-2:2008 |
| Radiated, radio-frequency, electromagnetic field immunity test | 20V/m (80-2700MHz) 27V/m (385MHz) 28V/m (450MHz) | IEC61000-4-3:2006 + A2:2010 |
| Fast Transient and Burst Immunity | AC Power Port: ±2kV | IEC61000-4-4:2012 |
| Surge Immunity | AC Port: L-N= ±1kV L-GND= ±2kV | IEC61000-4-5:2014 |
| Immunity to conducted disturbances, induced by radio-frequency fields | 20Vr.m.s | IEC61000-4-6:2013 |
| Power Frequency Magnetic Field | 50Hz, 30A/m | IEC61000-4-8:2009 |
| Voltage Dips and Interruptions | Dips: >95%; 30%; Interruptions >95% | IEC61000-4-11:2004 |
| Limits of Voltage Fluctuations and Flicker | | EN61000-3-3:2013 |
| Limitations on the amount of electromagnetic interference allowed from digital & electronic devices | | 47CFR FCC Part 15 Subpart B, Class B |
| Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | | ANSI C63.4:2014 |
| FCC methods of measurement of radio noise emissions from industrial, scientific, and medical equipment | | FCC OST/MP-5 |
| EMC Compliance (Industrial) | Conditions | Standard / Criterion |
| Electromagnetic compatibility of multimedia equipment – Emission Requirements | | EN55032:2015+AC:2013, Class B |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement | | EN55024:2010+A1:2015 |
| ESD Electrostatic discharge immunity test | Air ±15kV; Contact ±6kV | IEC61000-4-2:2008, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test | 10V/m (80-1000MHz) 20V/m (80-1000MHz) | IEC61000-4-3:2006 + A2:2010, Criteria A |
| Fast Transient and Burst Immunity | AC Power Port: ±4kV | IEC61000-4-4:2012, Criteria A |
| Surge Immunity | AC Port: L-N= ±2kV L-PE= ±4kV | IEC61000-4-5:2014, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields | AC Power Port 10V, 20V | IEC61000-4-6:2013, Criteria A |
| Power Frequency Magnetic Field | 50Hz/60Hz, 100A/m, 1000A/m | IEC61000-4-8:2009, Criteria A |
| Voltage Dips and Interruptions | Dips: >95%; 60%; 30% Interruptions >95% | IEC61000-4-11:2004, Criteria A IEC61000-4-11:2004, Criteria B |
| Damped oscillatory wave immunity test | AC Port: L-N= ±1kV L/N-G= ±2.5kV | IEC61000-4-18:2006 + A1:2010, Criteria A |
| Limits of Voltage Fluctuations and Flicker | | EN61000-3-3:2013 |

DIMENSION and PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|-------------------|----------------------------|----------------------|
| Material | enclosed case | aluminum |
| | PCB | FR4, (UL94V-0) |
| Dimension (LxWxH) | enclosed case | 91.4 x 60.5 x 33.3mm |
| | open frame | 76.2 x 50.8 x 26.5mm |
| Weight | enclosed case | 172g |
| | open frame + "-ST" version | 137g |

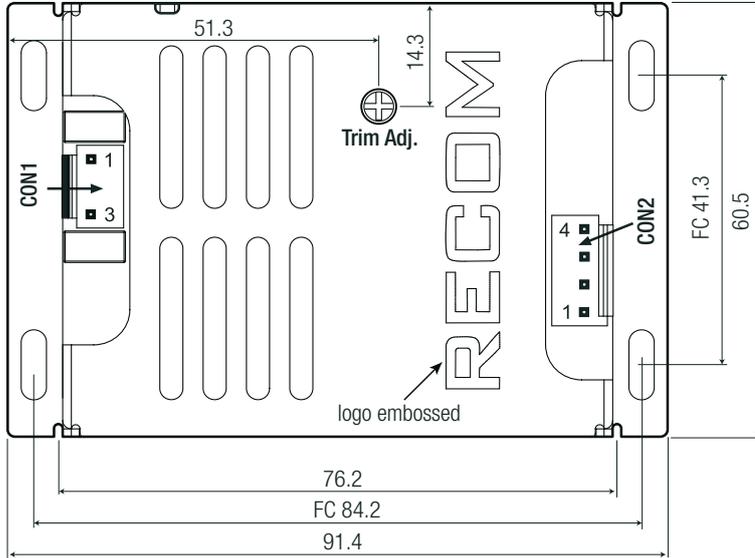
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Specifications (measured at Ta= 25°C, 250VAC, full load and after warm-up)

Dimension Drawing Enclosed Case (mm)



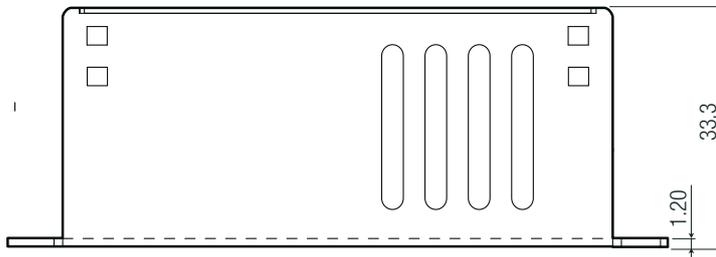
Top View



AC Input Connector (CON1)

| Pin# | Terminal | Mating Housing |
|--------|-------------|----------------|
| 1 AC/L | Molex KK156 | Molex KK156 |
| 3 AC/N | (SD-2478) | (09508031) |

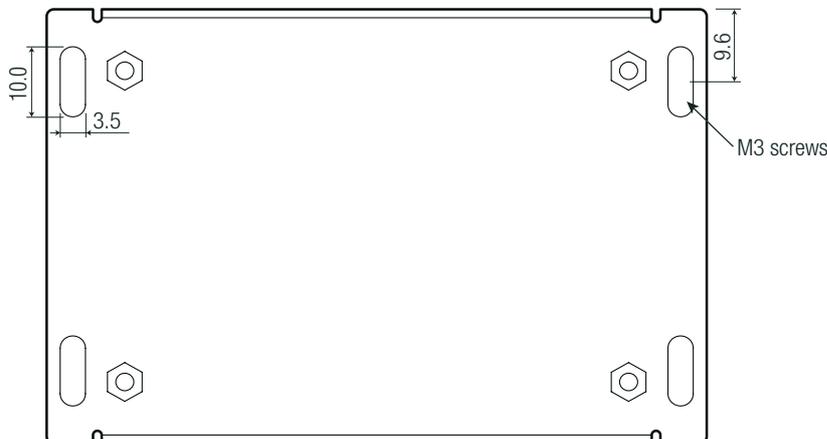
Side View



DC Output Connector (CON2)

| Pin# | Terminal | Mating Housing |
|--------|-------------|----------------|
| 1,2 V- | Molex KK156 | Molex KK156 |
| 3,4 V+ | (SD-2478) | (09508041) |

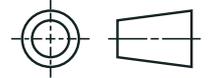
Bottom View



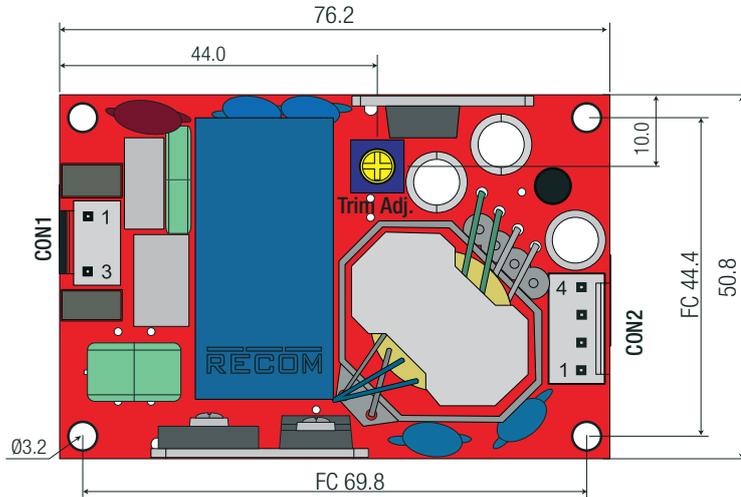
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Specifications (measured at Ta= 25°C, 250VAC, full load and after warm-up)

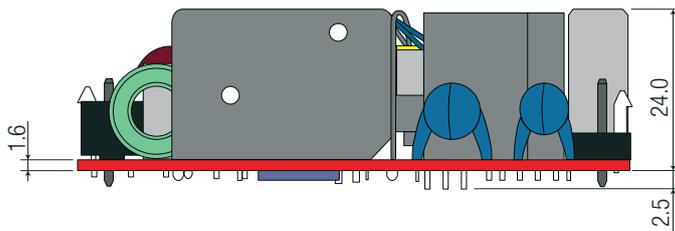
Dimension Drawing Open Frame (/OF) (mm)



Top View



Side View



AC Input Connector (CON1)

| Pin# | Terminal | Mating Housing |
|--------|-------------|----------------|
| 1 AC/L | Molex KK156 | Molex KK156 |
| 3 AC/N | (SD-2478) | (09508031) |

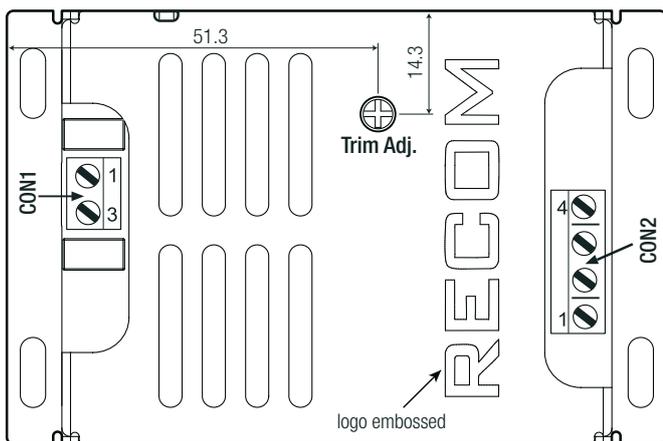
DC Output Connector (CON2)

| Pin# | Terminal | Mating Housing |
|--------|-------------|----------------|
| 1,2 V- | Molex KK156 | Molex KK156 |
| 3,4 V+ | (SD-2478) | (09508041) |

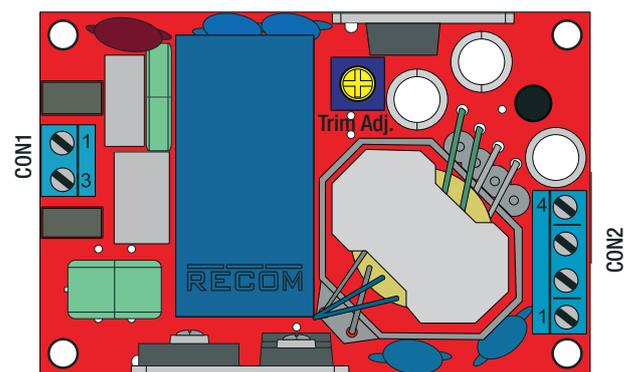
Screw Terminal Connection "-ST"

Top View

Enclosed Version



Open Frame Version



Screw terminal information

| # | Function | AWG | Model |
|-----|------------|-------|----------|
| 1 | VAC in (L) | 26-16 | ETB30 |
| 3 | VAC in (N) | 26-16 | (EK381V) |
| 1,2 | -Vout | 26-16 | ETB30 |
| 3,4 | +Vout | 26-16 | (EK381V) |

recommended tightening torque: 0.2Nm

Specifications (measured at Ta= 25°C, 250VAC, full load and after warm-up)**PACKAGING INFORMATION**

| Parameter | Type | | Value |
|-----------------------------|----------------|---------------|-----------------------|
| Packaging Dimension (LxWxH) | cardboard box | enclosed case | 120.0 x 80.0 x 85.0mm |
| | | open frame | 111.0 x 94.0 x 51.0mm |
| Packaging Quantity | | | 1pcs |
| Storage Temperature Range | | | -40°C to +85°C |
| Storage Humidity | non-condensing | | 5% to 95% RH |

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