

## Features

## Regulated Converter

- Long 5 year warranty
- 2MOPP/250VAC
- Suitable for built in Class II applications
- Wide input voltage range (85-264VAC)
- Low leakage current (<100µA)
- 5000m operation
- Active power factor correction

**RECOM**  
AC/DC Converter

## RACM150

**150 Watt  
Enclosed  
Case Style  
Single Output**



### Description

The RACM150-S(/F) is a compact 4" x 2" high efficiency AC/DC power supply with 2xMOPP safety approval for medical applications. These space saving enclosed power supplies have a universal input voltage range (85-264VAC), 4kVac isolation, require no minimum load and can be used at ambient temperatures of between -25°C and +80°C. The 12V, 15V, 24V or 48V output voltages are fully protected and have tolerances of less than  $\pm 0.2\%$  over the entire input voltage range and less than  $\pm 0.5\%$  over the entire load range. The RACM150-S(/F) series is certified to medical safety standard IEC/ES/EN-60601-1 3rd Edition and with less than 100µA leakage current. It has a built-in Class B EMI filter and comes with a five year warranty.

### Selection Guide

| Part Number                  | Input Voltage Range [VAC] | Output Voltage [VDC] | Output Current [A] 115/230VAC | Efficiency typ. [%] | max. cont. Power Rating [W] 115/230VAC | Max. Cap. Load <sup>(1)</sup> [µF] |
|------------------------------|---------------------------|----------------------|-------------------------------|---------------------|----------------------------------------|------------------------------------|
| RACM150-12S                  | 85-264                    | 12                   | 10.0 / 10.84                  | 91                  | 120 / 130                              | 10400                              |
| RACM150-15S                  | 85-264                    | 15                   | 8.33 / 9.0                    | 92                  | 125 / 135                              | 6600                               |
| RACM150-24S                  | 85-264                    | 24                   | 5.2 / 5.63                    | 92                  | 125 / 135                              | 2600                               |
| RACM150-48S                  | 85-264                    | 48                   | 2.5 / 2.71                    | 91                  | 120 / 130                              | 650                                |
| RACM150-12S/F <sup>(1)</sup> | 85-264                    | 12                   | 12.5                          | 91                  | 150                                    | 10400                              |
| RACM150-15S/F <sup>(1)</sup> | 85-264                    | 15                   | 10.0                          | 92                  | 150                                    | 6600                               |
| RACM150-24S/F <sup>(1)</sup> | 85-264                    | 24                   | 6.25                          | 92                  | 150                                    | 2600                               |
| RACM150-48S/F <sup>(1)</sup> | 85-264                    | 48                   | 3.13                          | 91                  | 150                                    | 650                                |

#### Notes:

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



### Model Numbering



#### Notes:

Note2: with suffix "/F" = mounted fan (Please note that removing the fan from the /F version will not give the same performance as the equivalent fanless type. The two versions are not identical) without suffix, without fan

#### Examples:

RACM150-12S = 12Vout, without fan  
RACM150-24S/F = 24Vout, with fan

**PREFERRED ALTERNATIVES**  
Please consider this alternatives:

**RACM230-G/ENC Series**

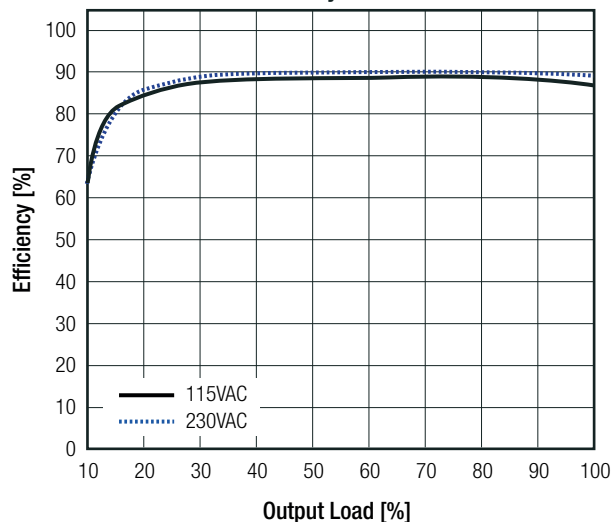
IEC/EN60601 certified  
ANSI/AAMI ES60601 certified  
EN55011 certified  
CISPR11  
FCC Part 15

**Specifications** (measured @ Ta= 25°C, 230VAC, full load and after warm-up)

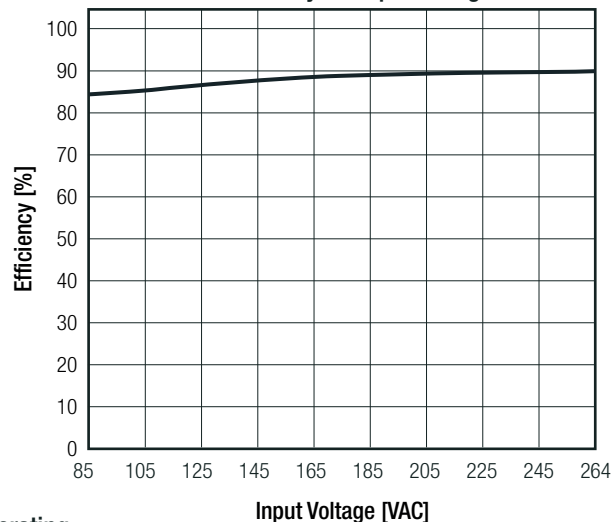
**BASIC CHARACTERISTICS**

| Parameter                                        | Condition                                                                                                       | Min.            | Typ.                                         | Max.             |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------|------------------|
| Input Voltage                                    |                                                                                                                 | 85VAC<br>120VDC |                                              | 264VAC<br>370VDC |
| Input Current                                    | 115VAC, full load<br>230VAC, full load                                                                          |                 |                                              | 1.7A<br>0.8A     |
| Inrush Current                                   | cold start, 115VAC<br>cold start, 230VAC                                                                        |                 |                                              | 30A<br>60A       |
| No load Power Consumption                        | 230VAC, with fan<br>230VAC, without fan                                                                         |                 | 0.6W<br>0.25W                                | 1W<br>0.3W       |
| Input Frequency Range                            | AC Input                                                                                                        | 47Hz            |                                              | 63Hz             |
| Output Voltage Trimming                          |                                                                                                                 |                 | ±10.0%                                       |                  |
| Minimum Load                                     |                                                                                                                 | 0%              |                                              |                  |
| Power Factor                                     |                                                                                                                 | 0.95            |                                              |                  |
| Start-up Time                                    |                                                                                                                 |                 | 0.7s                                         | 1s               |
| Rise Time                                        |                                                                                                                 |                 | 20ms                                         |                  |
| Hold up Time                                     |                                                                                                                 |                 | 30ms                                         |                  |
| Internal Operating Frequency                     |                                                                                                                 |                 | 60kHz                                        |                  |
| Output Ripple and Noise<br>(measured @ 20MHz BW) | 12VDC, with 1µF/25V MLCC<br>15VDC, with 1µF/25V MLCC<br>24VDC, with 1µF/50V MLCC<br>48VDC, with 0.1µF/100V MLCC |                 | 120mVp-p<br>150mVp-p<br>220mVp-p<br>250mVp-p |                  |

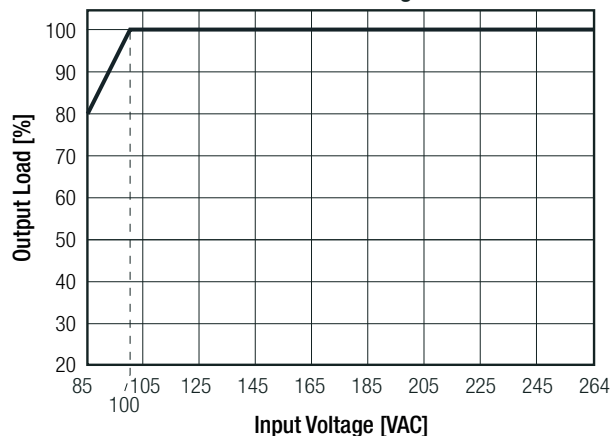
**Efficiency vs. Load**



**Efficiency vs. Input Voltage**



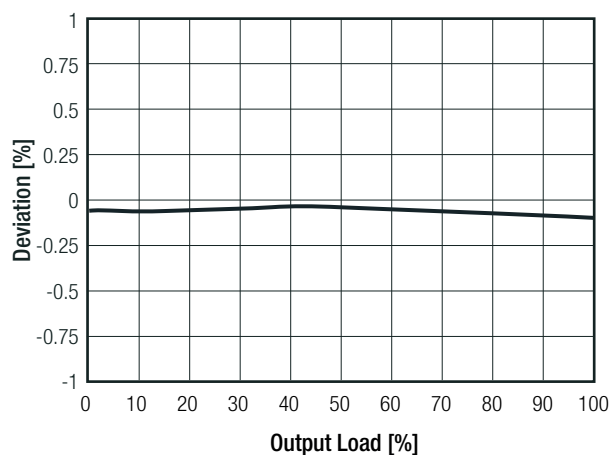
**Line Derating**



**Specifications** (measured @ Ta= 25°C, 230VAC, full load and after warm-up)

**REGULATIONS**

| Parameter                | Condition                                  | Value                 |
|--------------------------|--------------------------------------------|-----------------------|
| Output Accuracy          | 230VAC, full load                          | ±1.0%                 |
| Line Regulation          | low line to high line, full load           | ±0.2%                 |
| Load Regulation          | 0% to 100% load                            | 0.1% typ. / 0.5% max. |
| 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 | 500μs typ.            |

**Deviation vs. Load**

**PROTECTIONS**

| Parameter                        | Condition                         |                                          | Value                           |
|----------------------------------|-----------------------------------|------------------------------------------|---------------------------------|
| Input Fuse                       | internal line and neutral         |                                          | T3.15A / 250VAC, slow blow type |
| Short Circuit Protection (SCP)   |                                   |                                          | continuous, auto-recovery       |
| Over Load Protection (OLP)       | % of Iout rated (Hiccup)          |                                          | 115% min. / 150% max.           |
| Over Voltage Protection (OVP)    | % of Vout nominal (Latch off)     |                                          | 115% min. / 135% max.           |
| Isolation Voltage <sup>(5)</sup> | tested for 1 minute               | I/P to O/P<br>I/P to Case<br>O/P to Case | 4kVAC<br>2kVAC<br>2kVAC         |
| Isolation Resistance             | 500VDC                            |                                          | 100MΩ min.                      |
| Insulation Grade                 |                                   |                                          | reinforced                      |
| Leakage Current                  | 264VAC                            |                                          | 100μA max.                      |
| Means of Protection              | working voltage 250VAC/continuous |                                          | 2MOPP                           |
| Medical Device Classification    |                                   |                                          | built-in power supply           |
| Internal                         | clearance                         |                                          | >8.0mm                          |
|                                  | creepage                          |                                          | >8.0mm                          |

**Notes:**

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

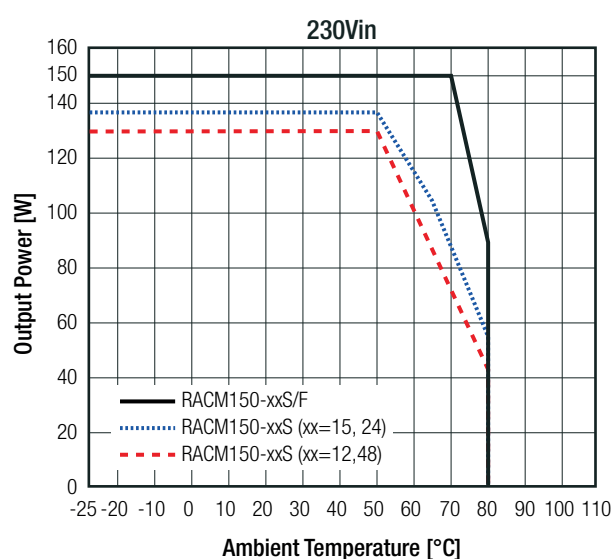
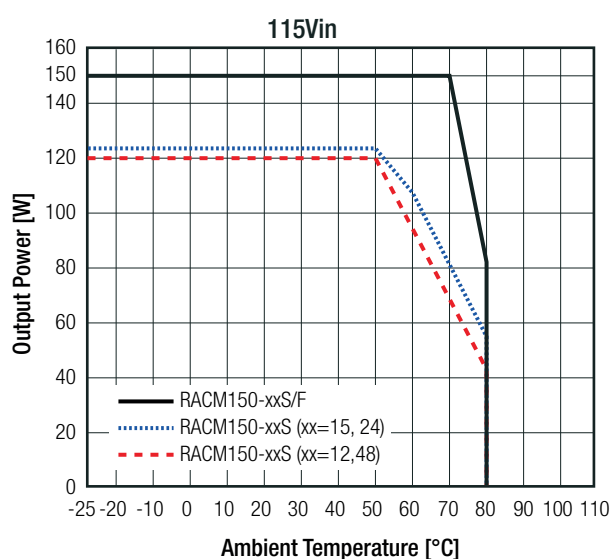
**Specifications** (measured @ Ta= 25°C, 230VAC, full load and after warm-up)

**ENVIRONMENTAL**

| Parameter               | Condition               |                                              | Value                            |
|-------------------------|-------------------------|----------------------------------------------|----------------------------------|
|                         | refer to derating graph | without fan<br>with fan                      | -25°C to +80°C<br>-25°C to +80°C |
| Temperature Coefficient |                         |                                              | ±0.02%/K                         |
| Operating Altitude      |                         |                                              | 5000m max.                       |
| Operating Humidity      |                         | non-condensing                               | 5% to 95% RH                     |
| Pollution Degree        |                         |                                              | PD2                              |
| MTBF                    |                         | according to MIL-HDBK-217F, full load, +25°C | 786.1 x 10 <sup>3</sup> hours    |

**Derating Graph**

(@ Chamber and 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<br>ANSI/AAMI ES60601-1:2005 + A2:2010 |
| Medical Electric Equipment, General Requirements for Safety and Essential Performance (CB)                                                                                             | 181200102            | IEC60601-1:2005 + A1:2012, 3rd Edition                             |
| Medical Electric Equipment, General Requirements for Safety and Essential Performance                                                                                                  |                      | EN60601-1:2006 +12:2014                                            |
| 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                                                         |                      | EN55011:2009 + A1:2010<br>Class B Conducted, Class A Radiated      |
| Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement                                                         |                      | CISPR11:2009 + A1:2010<br>Class B Conducted, Class A Radiated      |

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**Specifications** (measured @ Ta= 25°C, 230VAC, 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                                                                     | 10V/m (80-2700MHz)<br>27V/m (385MHz)<br>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<br>L-GND= ±2kV                                              | IEC61000-4-5:2005                                                |
| Immunity to conducted disturbances, induced by radio-frequency fields                                                              | 6Vr.m.s                                                                        | IEC61000-4-6:2013                                                |
| Power Frequency Magnetic Field                                                                                                     | 50Hz, 30A/m                                                                    | IEC61000-4-8:2009                                                |
| Voltage Dips and Interruptions                                                                                                     | Dips: >95%; 30%;<br>Interruptions >95%                                         | IEC61000-4-11:2004                                               |
| Limits of Harmonic Current Emissions                                                                                               |                                                                                | EN61000-3-2:2005 + A2:2009, Class D                              |
| 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 9kHz to 40GHz |                                                                                | ANSI C63.4:2014                                                  |
| 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 ±8kV; Contact ±6kV                                                         | IEC61000-4-2:2008, Criteria A                                    |
| Radiated, radio-frequency, electromagnetic field immunity test                                                                     | 3V/m (80-1000MHz)<br>20V/m (80-1000MHz)<br>3V/m (1-2.5GHz)<br>10V/m (1-2.5GHz) | IEC61000-4-3:2006 + A2:2010, Criteria A                          |
| Fast Transient and Burst Immunity                                                                                                  | DC Port: ±2kV                                                                  | IEC61000-4-4:2012, Criteria A                                    |
| Surge Immunity                                                                                                                     | DC Port: ±1kV                                                                  | IEC61000-4-5:2014, Criteria A                                    |
| Immunity to conducted disturbances, induced by radio-frequency fields                                                              | DC Power Port 3V + 20V                                                         | IEC61000-4-6:2013, Criteria A                                    |
| Power Frequency Magnetic Field                                                                                                     | 50Hz/60Hz 1A/m<br>50Hz/60Hz 10A/m                                              | IEC61000-4-8:2009, Criteria A                                    |
| Voltage Dips and Interruptions                                                                                                     | Dips: >95%; 60%; 30%<br>Interruptions >95%                                     | IEC61000-4-11:2004, Criteria A<br>IEC61000-4-11:2004, Criteria B |
| Limits of Harmonic Current Emissions                                                                                               |                                                                                | EN61000-3-2:2014, Class D                                        |
| Limits of Voltage Fluctuations and Flicker                                                                                         |                                                                                | EN61000-3-3:2013                                                 |

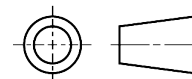
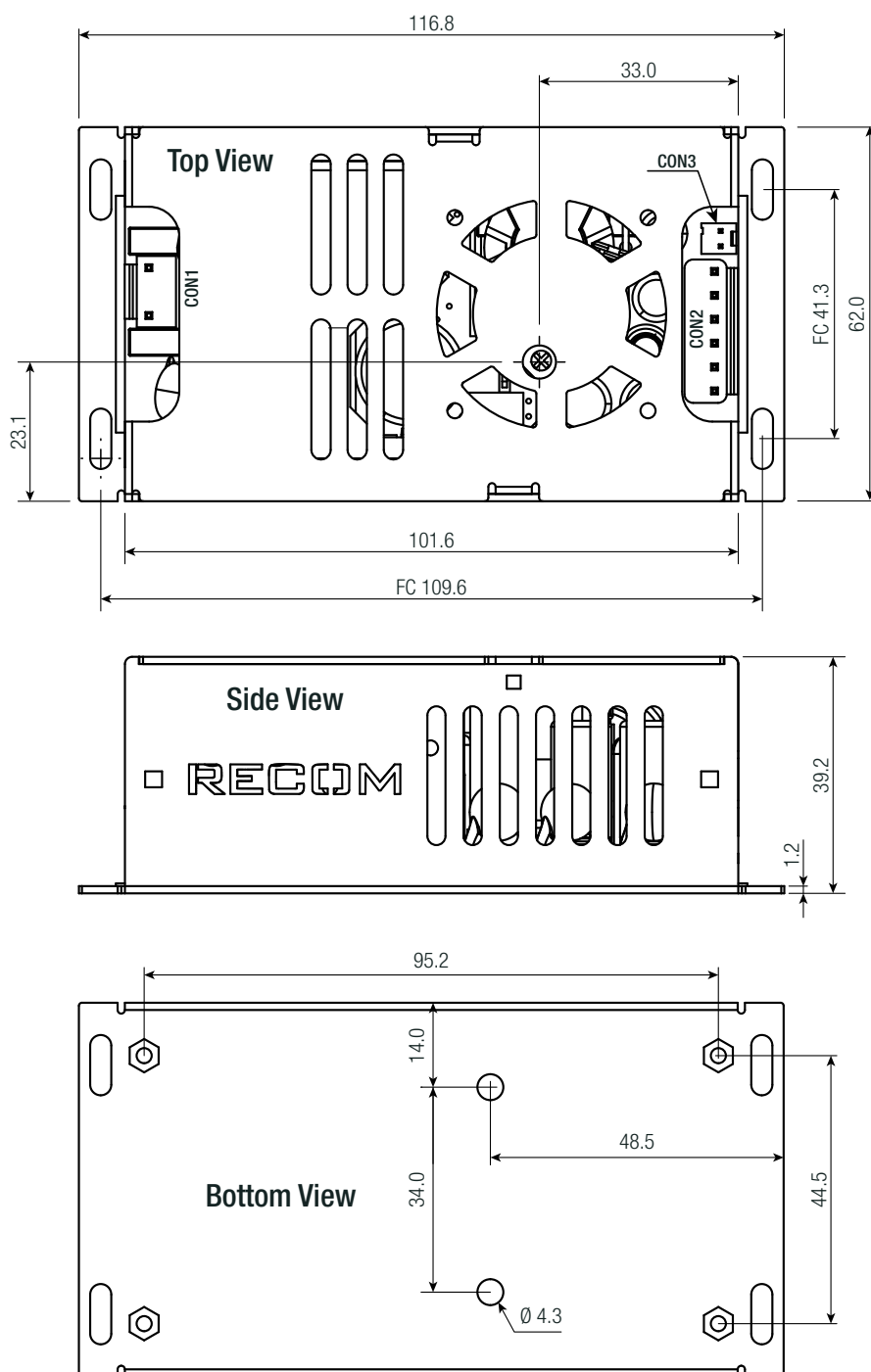
**DIMENSION and PHYSICAL CHARACTERISTICS**

| Parameter         | Type        | Value                 |
|-------------------|-------------|-----------------------|
| Material          | enclosed    | aluminum              |
| Dimension (LxWxH) | with Fan    | 116.8 x 62.0 x 49.2mm |
|                   | without Fan | 116.8 x 62.0 x 39.2mm |
| Weight            | with Fan    | 270g                  |
|                   | without Fan | 255g                  |

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Specifications (measured @ Ta= 25°C, 230VAC, full load and after warm-up)

Dimension Drawing without FAN (mm)



### AC Input Connector CON1

**Pin1** Line

**Pin3** Neutral

Mates with

JST housing: VHR-3N

JST crimp terminals: SVH-21T-P1.1

### DC Output Connector CON2

**Pin1,2,3** -Vout

**Pin4,5,6** +Vout

Mates with

JST housing: VHR-6N

JST crimp terminals: SVH-21T-P1.1

### FAN Output Connector CON3

**Pin1** -Fan

**Pin2** +Fan

Mates with

Molex housing: 22-01-1022

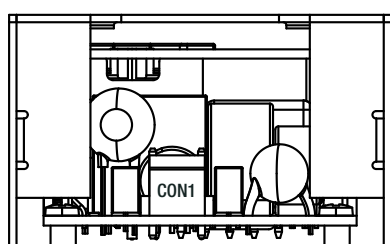
Molex crimp terminals: 2759

Tolerance:  $\pm 0.5\text{mm}$

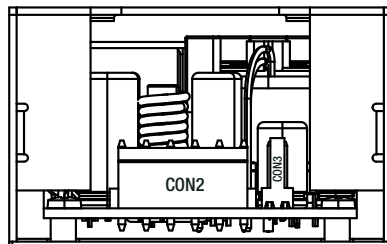
FC: fixing center

Recommended tightening torque for mounting holes = 0.49Nm

AC Input Side

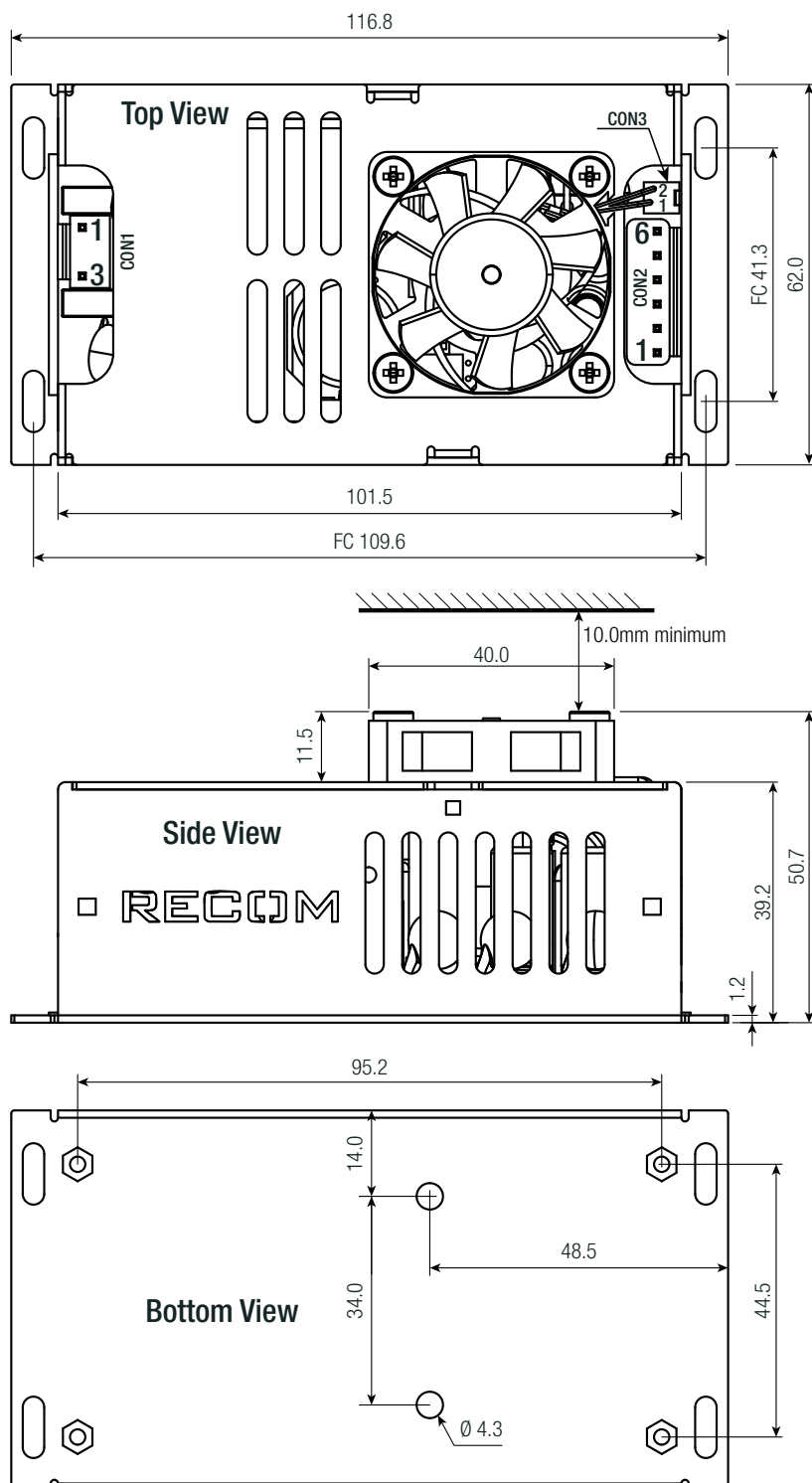


DC/FAN Output Side



Specifications (measured @ Ta= 25°C, 230VAC, full load and after warm-up)

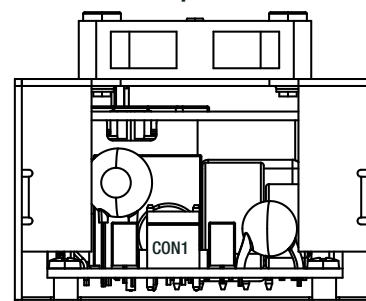
Dimension Drawing with FAN (mm)



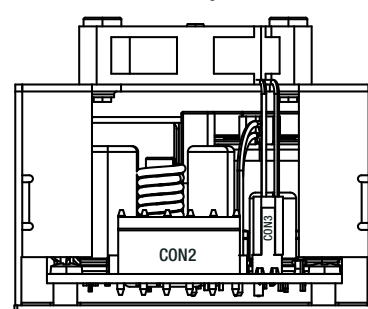
**FAN**

|                       |                          |
|-----------------------|--------------------------|
| Rated Voltage:        | 12V (7-13.8)             |
| Input Power:          | 0.96W typ. 1.8W max.     |
| Speed:                | 6000RPM                  |
| Air Flow:             | 7CFM/Min.; 30dBA max.    |
| exp. Lifetime (40°C): | >70khours continuous     |
| Cable length:         | 55mm including connector |

**AC Input Side**



**DC/FAN Output Side**



**AC Input Connector CON1**

**Pin1** Line  
**Pin3** Neutral

Mates with  
JST housing: VHR-3N  
JST crimp terminals: SVH-21T-P1.1

**DC Output Connector CON2**

**Pin1,2,3** -Vout  
**Pin4,5,6** +Vout

Mates with  
JST housing: VHR-6N  
JST crimp terminals: SVH-21T-P1.1

**FAN Output Connector CON3**

**Pin1** -Fan  
**Pin2** +Fan

Mates with  
Molex housing: 22-01-1022  
Molex crimp terminals: 2759

Tolerance: ±0.5mm  
FC: fixing center  
Recommended tightening torque for  
mounting holes= 0.49Nm



# RACM150

## Series

**Specifications** (measured @ Ta= 25°C, 230VAC, full load and after warm-up)

### PACKAGING INFORMATION

| Parameter                   | Type           | Value                   |
|-----------------------------|----------------|-------------------------|
| Packaging Dimension (LxWxH) | cardboard Box  | 418.0 x 308.0 x 105.0mm |
| Packaging Quantity          |                | 10pcs                   |
| Storage Temperature Range   |                | -40°C to +80°C          |
| Storage Humidity            | non-condensing | 5% to 95% RH            |

The product information and specifications may be subject to changes even without prior written notice. The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.