

# Regulated Converters

- Household, medically and ITE certified
- Class II installations (without FG)
- IP68 waterproof encapsulation
- Long life components, rugged module
- Energy Efficiency Level VI
- Cable and connector modifications on request

The RACM18-ER/W series comprises highly reliable power conversion modules in a potted IP68 certified, waterproof encapsulation to fit into flush mount wall installations. All versions are covered by multiple certifications for household, medical and ITE safety standards as well. With a certified operation up to 5000m altitude and a temperature range from -20°C up to +80°C the modules are designed to power sanitary, healthcare, smart building, automation and household applications. Without the need for any external components they are ready to connect and forget.

| Part Number                   | Input Voltage Range [VAC] | Output Voltage <sup>(1)</sup> [VDC] | Output Current [A] | Efficiency typ. <sup>(2)</sup> [%] |
|-------------------------------|---------------------------|-------------------------------------|--------------------|------------------------------------|
| RACM18-05SER/W <sup>(3)</sup> | 90-264                    | 5                                   | 2.5                | 81                                 |
| RACM18-12SER/W <sup>(3)</sup> | 90-264                    | 12                                  | 1.5                | 82                                 |
| RACM18-24SER/W <sup>(3)</sup> | 90-264                    | 24                                  | 0.75               | 83.5                               |

Note2: Efficiency is tested at nominal input (115/230VAC) and full load at +25°C ambient

**RACM18-** **SER/W**

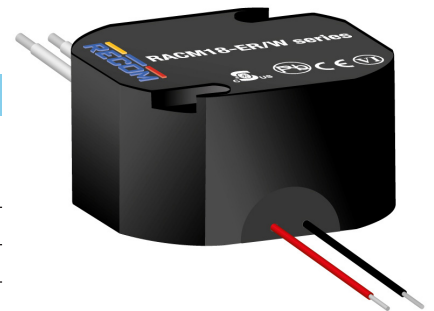
Output Power ———— **Wired Connection** <sup>(3)</sup>

Output Voltage ———— **Single**

Note3: Other connection types on regeuest



**18 Watt**  
**Wired**  
**Round Shape**  
**Single Output**



2MOPP  
280VAC

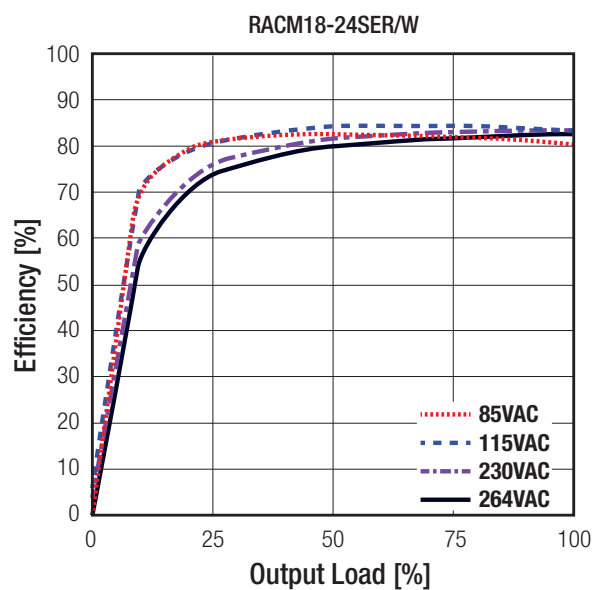
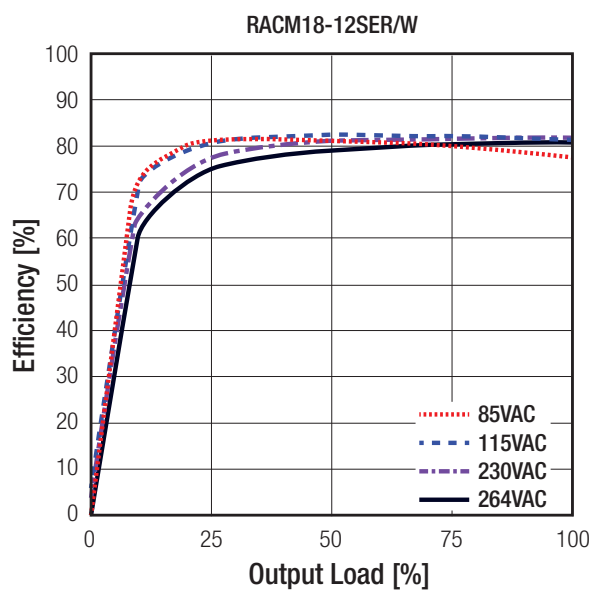
IEC/EN60950-1 certified  
UL60950-1 certified  
ANSI/AAMI ES60601-1 certified  
IEC/EN60601-1 certified  
UL60601-1 certified  
IEC/EN60335-1 certified  
IEC/EN61558-1 certified  
IEC/EN61558-2-16 certified  
IEC/EN60601-1-2 certified  
EN55024/32 certified  
EN55014-1 (-2) certified  
CISPR32 certified  
IEC60529 certified

**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nom.  $V_{in}$  (115/230VAC), full load after warm-up unless otherwise stated)

### BASIC CHARACTERISTICS

| Parameter                    | Condition                     | Min.    | Typ.           | Max.           |
|------------------------------|-------------------------------|---------|----------------|----------------|
| Internal Input Filter        |                               | Pi type |                |                |
| Input Voltage Range          |                               | 90VAC   | 230VAC         | 264VAC         |
| Input Current                | 115VAC<br>230VAC              |         |                | 500mA<br>150mA |
| Inrush Current               | 115VAC<br>230VAC              |         | 24A<br>46A     |                |
| No load Power Consumption    |                               |         | 40mW           | 75mW           |
| Input Frequency Range        |                               | 47Hz    |                | 63Hz           |
| Minimum Load                 |                               | 0%      |                |                |
| Power Factor                 |                               |         | 0.46           |                |
| Start-up Time                | 115VAC<br>230VAC              |         | 180ms<br>200ms |                |
| Rise Time                    | 115VAC/230VAC                 |         | 15ms           |                |
| Hold-up Time                 | 115VAC<br>230VAC              |         | 15ms<br>65ms   |                |
| Internal Operating Frequency | 100% load at nominal $V_{in}$ |         | 100kHz         |                |
| Output Ripple and Noise      | 20MHz BW                      |         |                | 140mVp-p       |

### Efficiency vs. Load



### REGULATIONS

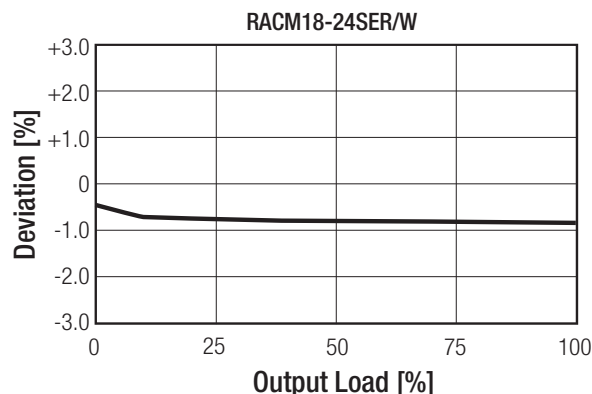
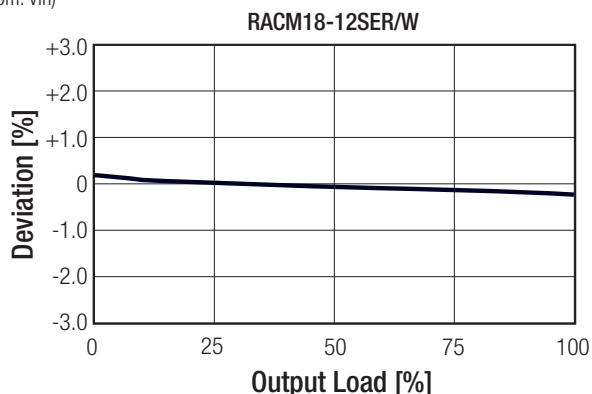
| Parameter          | Condition             | Value            |
|--------------------|-----------------------|------------------|
| Output Accuracy    |                       | $\pm 3.0\%$ max. |
| Line Regulation    | low line to high line | $\pm 1.0\%$ max. |
| Load Regulation    | 0% to 100% load       | $\pm 1.0\%$ max. |
| Transient Response | 100% load step change | $\pm 3.0\%$ max. |

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nom. Vin (115/230VAC), full load after warm-up unless otherwise stated)

### Accuracy vs. Load

(@ nom. Vin)



### PROTECTIONS

| Parameter                         | Type                      |                           | Value  |             |
|-----------------------------------|---------------------------|---------------------------|--|-------------|
| Input Fuse                        | internal (line & neutral) |                           | T2A, slow blow   |             |
| Short Circuit Protection (SCP)    |                           |                           | continuous, auto recovery  |             |
| Over Voltage Protection (OVP)     | 5Vout, 12Vout<br>24Vout   |                           | 16VDC, Latch OFF<br>24VDC, Latch OFF   |             |
| Over Voltage Category (OVC)       |                           |                           | OVCI   |             |
| Over Current Protection (OCP)     | < 1 minute                | 90VAC<br>160VAC<br>264VAC | 145% of nominal Output Current<br>180% of nominal Output Current<br>165% of nominal Output current | Hiccup Mode |
| Over Temperature Protection (OTP) | 95°C ambient              |                           | thermal shutdown, auto recovery  |             |
| Class of Equipment                |                           |                           | Class II   |             |
| Isolation Voltage <sup>(4)</sup>  | I/P to O/P                | tested for 1 minute       | 4.6kVAC  |             |
| Insulation Grade                  |                           |                           | reinforced   |             |
| Leakage Current                   |                           |                           | 100µA max.   |             |
| Means of Protection               | 280VAC working voltage    |                           | 2MOPP  |             |
| Medical Device Classification     |                           |                           | Type BF  |             |

**Notes:**

Note4: For repeat Hi-Pot testing, reduce the time and/or the test voltage

### ENVIRONMENTAL

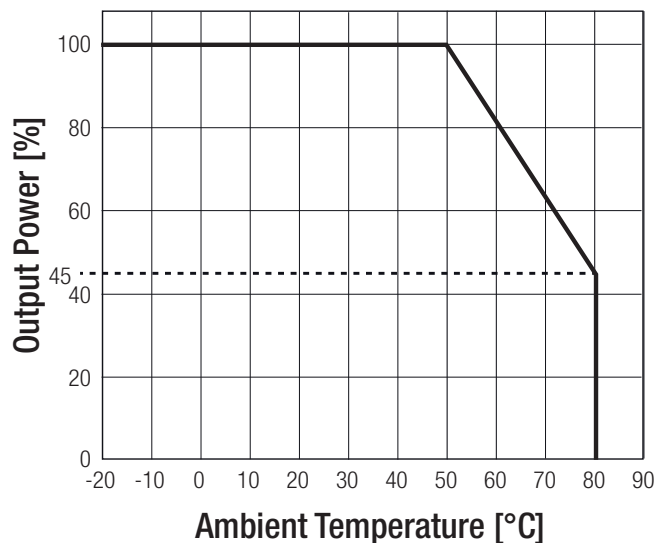
| Parameter                   | Condition                        |                                   | Value  |
|-----------------------------|----------------------------------|-----------------------------------|--|
| Operating Temperature Range | natural convection 0.1m/s        | without derating<br>with derating | -20°C to +50°C<br>-20°C to +80°C                           |
| Maximum Case Temperature    |                                  |                                   | +85°C  |
| Operating Altitude          |                                  |                                   | 5000m  |
| Operating Humidity          | non-condensing                   |                                   | 95% RH max.  |
| IP Rating                   |                                  |                                   | IP68   |
| Pollution Degree            |                                  |                                   | PD2  |
| MTBF                        | according to MIL-HDBK-217F, G.B. | +25°C<br>+50°C                    | 563 x 10 <sup>3</sup> hours<br>112 x 10 <sup>3</sup> hours |
| Design Lifetime             |                                  |                                   | 130 x 10 <sup>3</sup> hours                                |

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nom.  $V_{in}$  (115/230VAC), full load after warm-up unless otherwise stated)

### Derating Graph

(@ Chamber and natural convection 0.1m/s)



### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety)  | Report / File Number | Standard   |
|--|----------------------|--|
| Information Technology Equipment, General Requirements for Safety (CB Scheme)  | T223-0255/17         | IEC60950-1:2005, 2nd Edition + Am2:2013<br>EN60950-1:2006 + A2:2013        |
| Information Technology Equipment, General Requirements for Safety  | T223-0255/17         | UL60950-1, 2nd Edition:2014<br>CAN/CSA C22.2 No. 60950-1, 2nd Edition:2014 |
| Medical Electric Equipment, General Requirements for Safety and Essential Performance (CB Scheme)  | T223-0254/17         | IEC60601-1:2005, AM1:2012<br>EN60601-1:2006 + A12:2014                     |
| Medical Electric Equipment, General Requirements for Safety and Essential Performance  | T223-0254/17         | CAN/CSA-C22.2 No. 60601-1:14, 3rd Edition 2014<br>ANSI/AAMI ES60601-1:2005 |
| Household and similar electrical appliances - Safety Part 1: General requirements (CB Scheme)  | T211-0759/17         | IEC60335-1:2010, 5th Edition + A1:2013<br>EN60335-1:2012 + A11:2014        |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100V  | T211-0760/17         | IEC61558-1:2005, 2nd Edition + A1:2009<br>EN61558-1:2005 + A1:2009         |
| Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 V - Part 2-16: Particular requirements and tests for switch mode power supply units |                      | IEC61558-2-16:2009, 1st Edition + A1:2013<br>EN61558-2-16:2009 + A1:2013   |
| Degrees of protection provided by enclosures (IP Code)   | T211-0584/17         | -1989,2nd-Edition+A1:1999+A2:2013  |
| RoHs 2 (2+)  |                      | RoHs 10/10, AM2015   |

| EMC Compliance (Medical)   | Condition   | Standard / Criterion                    |
|--|---|---|
| Medical electrical equipment Part 1-2: Electromagnetic disturbances – Requirements and tests |   | EN60601-1-2:2015                        |
| ESD Electrostatic discharge immunity test  | Air $\pm 2, 4, 8, 15\text{kV}$ ; Contact $\pm 8\text{kV}$   | IEC61000-4-2:2008, Criteria A           |
| Radiated, radio-frequency, electromagnetic field immunity test                               | 10V/m (80 - 2700MHz)  | IEC61000-4-3:2006 + A2:2010, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test (table 9)                     | 27V/m (385MHz), 28V/m (450MHz), 9V/m (710, 745, 780MHz), 28V/m (810, 870, 930, 1720, 1845, 1970, 2450MHz), 9V/m (5240, 5500, 5785MHz) | IEC61000-4-3:2006 + A2:2010, Criteria A |
| Fast Transient and Burst Immunity  | AC Power Port $\pm 2.0\text{kV}$<br>DC Output Port $\pm 1.0\text{kV}$   | IEC61000-4-4:2012, Criteria A           |
| Surge Immunity   | AC Power Port: L-N $\pm 0.5, 1.0\text{kV}$  | IEC61000-4-5:2005, Criteria A           |

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nom. Vin (115/230VAC), full load after warm-up unless otherwise stated)

| EMC Compliance (Medical)  | Condition   | Standard / Criterion                   |
|---|---|--|
| Immunity to conducted disturbances, induced by radio-frequency fields                           | AC Power Port 6V<br>DC Output Port 6V                                 | IEC61000-4-6:2013, Criteria A          |
| Power Magnetic Field Immunity   | 50Hz, 60Hz, 30A/m   | IEC61000-4-8:2009, Criteria A          |
| Voltage Dips and Interruptions  |   | IEC61000-4-11:2004, Criteria A         |
| EMC Compliance (Household)  | Condition   | Standard / Criterion                   |
| Electromagnetic compatibility of multimedia equipment – Emission Requirements                   |   | EN55014-1:2006 + A2:2011               |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement |   | EN55014-2:1997 + A2:2008               |
| ESD Electrostatic discharge immunity test   | Air $\pm 8\text{kV}$ ; Contact $\pm 4\text{kV}$                       | EN61000-4-2:1995 + A2:2001, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test                                  | 3V/m (80 - 1000MHz)   | EN61000-4-3:2006 + A1:2008, Criteria A |
| Fast Transient and Burst Immunity   | AC Power Port: $\pm 1.0\text{kV}$<br>DC Power Port $\pm 0.5\text{kV}$ | EN61000-4-4:2004, Criteria A           |
| Surge Immunity  | AC Power Port: L-N $\pm 0.5$ , 1.0kV                                  | EN61000-4-5:2006, Criteria A           |
| Immunity to conducted disturbances, induced by radio-frequency fields                           | AC Power Port 3V<br>DC Power Port 3V                                  | EN61000-4-6:2007, Criteria A           |
| Voltage Dips and Interruptions  |   | EN61000-4-11:2004                      |
| EMC Compliance (Multimedia)   | Condition   | Standard / Criterion                   |
| Electromagnetic compatibility of multimedia equipment – Emission Requirements                   |   | EN55032:2010, Class B                  |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement |   | EN55024:2010                           |
| Electromagnetic compatibility of multimedia equipment - Emission requirements                   |   | CISPR 32:2012, Class B                 |
| ESD Electrostatic discharge immunity test   | Air $\pm 2$ , 4, 8kV; Contact $\pm 4\text{kV}$                        | EN61000-4-2:2009, Criteria A           |
| Radiated, radio-frequency, electromagnetic field immunity test                                  | 3V/m (80 - 1000MHz)   | EN61000-4-3:2006 + A2:2010, Criteria A |
| Fast Transient and Burst Immunity   | AC Power Port: $\pm 1.0\text{kV}$<br>DC Power Port $\pm 0.5\text{kV}$ | EN61000-4-4:2004, Criteria A           |
| Surge Immunity  | AC Power Port: L-N $\pm 0.5$ , 1.0kV                                  | EN61000-4-5:2006, Criteria A           |
| Immunity to conducted disturbances, induced by radio-frequency fields                           | AC Power Port 3V<br>DC Power Port 3V                                  | EN61000-4-6:2009, Criteria A           |
| Power Magnetic Field Immunity   | 50Hz, 60Hz, 1A/m  | EN61000-4-8:2010, Criteria A           |
| Voltage Dips and Interruptions  |   | EN61000-4-11:2004                      |
| Limits of Voltage Fluctuations & Flicker  |   | IEC/EN61000-3-3:2013                   |

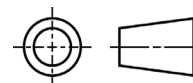
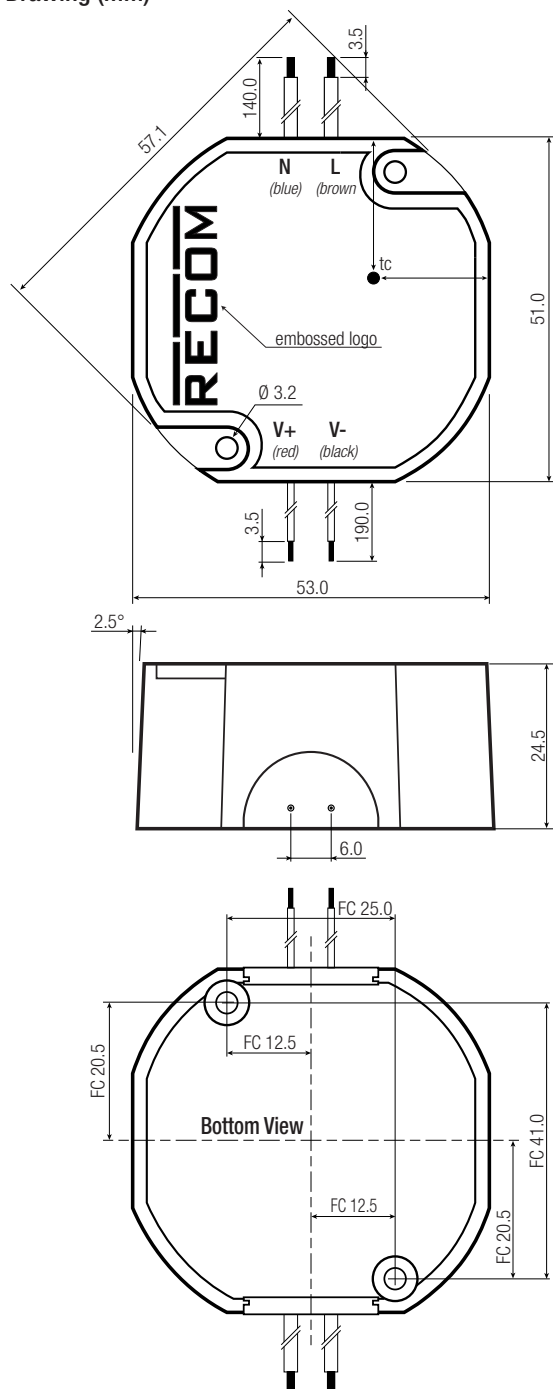
**DIMENSION AND PHYSICAL CHARACTERISTICS**

| Parameter                 | Type                   | Value  |
|---------------------------|------------------------|--|
| Material                  | Case<br>Potting<br>PCB | non-conductive black plastic, (UL94V-0)<br>polyurethane, (UL94V-0)<br>FR4, (UL94V-0) |
| Package Dimension (LxWxH) | (incl. cable length)   | 53.0 x 388.0 x 24.5mm  |
| Package Weight            | (incl. cable length)   | 92g max.   |

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nom. Vin (115/230VAC), full load after warm-up unless otherwise stated)

Dimension Drawing (mm)



### Wired Connection

| # | Function   | Wire Color | Type           |
|---|------------|------------|----------------|
| 1 | VAC in (N) | white      | UL-1007, AWG20 |
| 2 | VAC in (L) | white      | UL-1007, AWG20 |
| 3 | V+         | red        | UL-1007, AWG22 |
| 4 | V-         | black      | UL-1007, AWG22 |

tc= case temperature measuring point

FC= fixing centers

Tolerance: xx.x=  $\pm 0.5\text{mm}$

xx.xx=  $\pm 0.25\text{mm}$

Max. tightening torque fixing screws: 0.3Nm

### PACKAGING INFORMATION

| Parameter                   | Type           | Value                   |
|-----------------------------|----------------|-------------------------|
| Packaging Dimension (LxWxH) | carton         | 310.0 x 220.0 x 100.0mm |
| Packaging Quantity          |                | 10pcs                   |
| Storage Temperature Range   |                | -30°C to +80°C          |
| Storage Humidity            | non-condensing | 95% RH max.             |

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