Technical Data Sheet

RAC15-K/480 Series ◊ AC/DC Power Supply

15W ◊ Input: 100V-480VAC

RECOM
AC/DC Converter

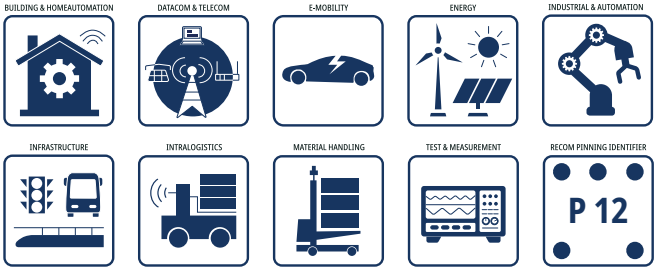
FEATURES

- 85-528VAC extra wide high voltage input
- Over voltage OVC III up to 5000m altitude and PD3
- LPS limited power source
- Surge immunity 2kVAC: L-N &; 4kV: L; N – Earth
- Thermal ratings for operation from -40 to +90°C
- Stand by power <300mW at 480VAC input
- 3 year warranty



52.5 x 40.0 x 25.5mm (2.06 x 1.57 x 1.0 inch)
92g (0.2 lbs)

APPLICATIONS



SAFETY & EMC

RoHS² compliant 10 from 10 | Reach compliant | CE | cULus E224736 | IECEE CB SCHEME

DESCRIPTION

The RAC15-K/480 series AC/DC modules with ultra-wide input range of 100-480VAC are specially designed for harsh industrial conditions of overvoltage category OVC III and pollution degree PD3 in both single-phase and phase-to-phase power connections of class II. These power supplies are capable of operating over a wide temperature range of -40° to 90°C (up to 60°C without derating) by just adding an external fuse, and offer LPS limited outputs with continuous overcurrent protection and emission class B EMC compliance in potential free configuration of the load. These silicone-free encapsulated modules are built extremely compact to fit on printed circuit boards without compromising board area. Global safety certifications ensure fast time-to-market when integrated into applications for markets such as Smart Grid, Smart Metering, Renewable Energy;Sensors and actuators or IoT applications. If the coverage of nominal input voltage up to 400VAC is sufficient you may also like RAC20NE-K/277/400 series in the same footprint and pinning pattern

SELECTION GUIDE (CONSTANT VOLTAGE OPERATION)

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current nom. [mA]	Efficiency (1) typ. [%]	Output Power continuous [W]
RAC15-05SK/480	85-528	5	3000	86	15
RAC15-12SK/480	85-528	12	1250	84	15
RAC15-15SK/480	85-528	15	1000	85	15
RAC15-24SK/480	85-528	24	625	87	15

Note1: Is tested at 230VAC input and constant resistive load at +25°C ambient

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Model Numbering



ALTERNATIVES

Product Series	Description	Landing page link
RAC20NE-K/277/400	Input Voltage up to 400VAC; same footprint and pinning (P12)	RAC20NE-K/277/400 series

ACCESSIBLE PART

Part Number	Description	Datasheet Link
RAC-ADAPT-ST-1	adapter board with screw terminals for easy connection	RAC-ADAPT-ST-1.pdf

BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition		Min.	Typ.	Max.
Nominal Input Voltage (2)	50/60Hz		100VAC		480VAC
Operating Range (3)	47-63Hz		85VAC		528VAC
	DC		120VDC		750VDC
Input Current	115/ 230VAC				500mA
	480VAC				400mA
Inrush Current	cold start at 25°C	115VAC			20A
		230VAC			40A
		480VAC			50A
No Load Power Consumption	85-528VAC				300mW
Input Frequency Range	AC Input		47Hz		63Hz
Minimum Load			0%		
Power Factor	115/230VAC			0.4	
	480VAC			0.3	
Start-up time				150ms	
Rise time				30ms	
Hold-up time	230VAC		30ms		
Internal Operating Frequency				50kHz	
Output Ripple and Noise (4)	20MHz BW	V_{OUT}= 5VDC			100mVp-p
		others			1% of V_{OUT}

Note2: 480VAC limited to L-L connections

Note3: The products were submitted for safety files at AC-Input operation

Note4: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output (low ESR)
The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

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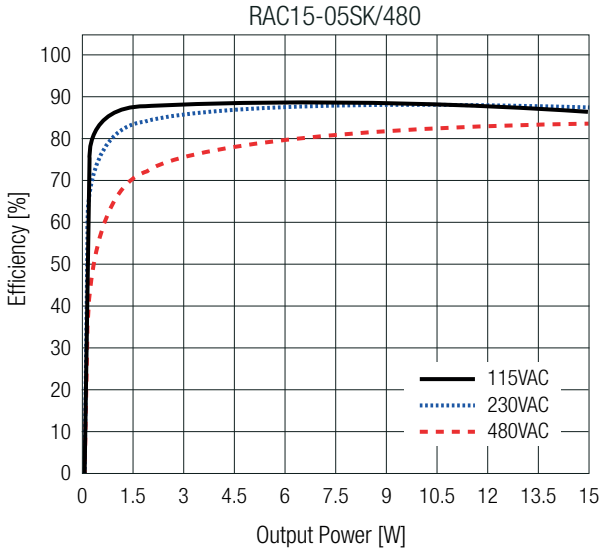
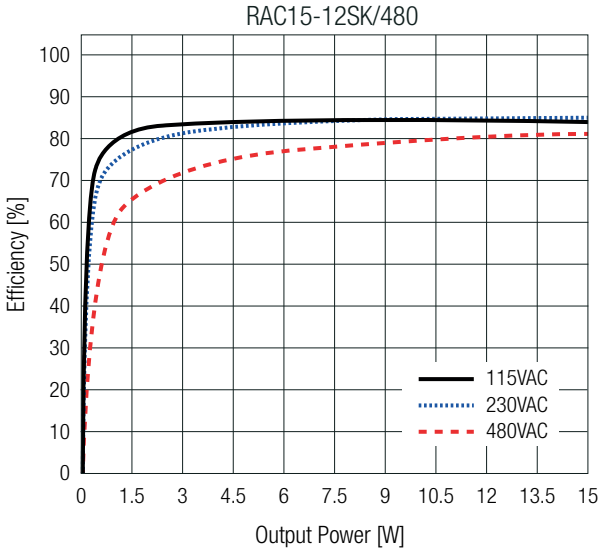
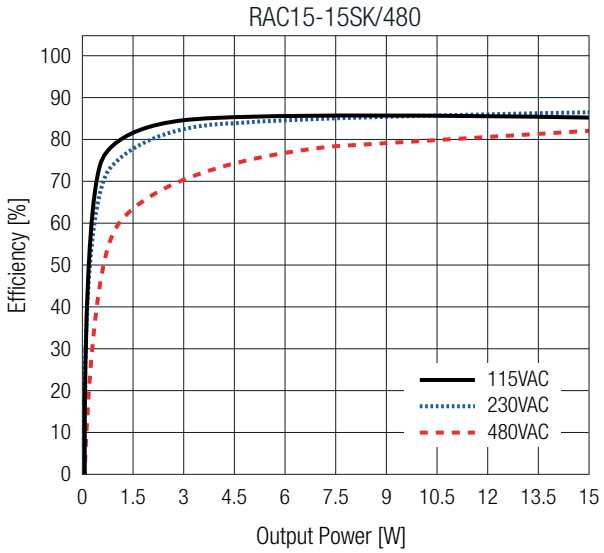
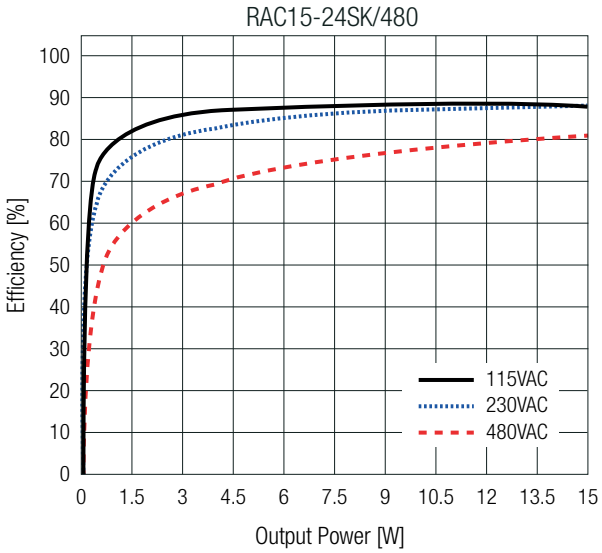
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Efficiency vs. Output Power









REGULATIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Condition	Value
Output Accuracy		±3.0% max.
Line Regulation	low line to high line, full load	±2.0% typ.
Load Regulation [5]	10% to 100% load	2.0% max.
Transient Response	25% load step change	4.0% max.
Recovery Time		1ms typ.

Note5: Operation below 10% load will not harm the converter, but specifications may not be met

PROTECTIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Type	Value
Input Fuse	external **„Protection Circuit“**	T2A, 600VAC min.
Limited Power Source (LPS)	according to IEC62368-1 CB Report	yes
Short Circuit Protection (SCP)	below 100mΩ	hiccup mode; auto recovery
Over Current Protection (OCP)		128% - 155%, hiccup mode
Over Voltage Protection (OVP)		105% - 120%, hiccup mode
Over Voltage Category (OVC)	according to 61010-1	OVC III (5000m)

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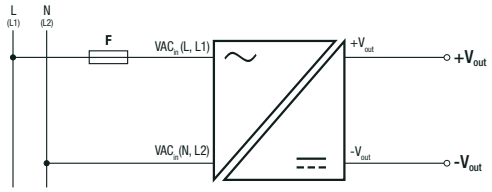
PROTECTIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Type		Value
Isolation Voltage [6]	I/P to O/P	1 minute	4kVAC
Isolation Resistance			1GΩ max.
Isolation Capacitance			200pF max.
Insulation Grade	I/P to O/P		reinforced
Leakage Current			200µA max.

Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Protection Circuit

An external fuse must be provided to protect the device against overcurrents caused by errors on the input side.
Recom suggests a slow type, 600VAC, 2A, as default for AC-operation.
Contact Recom for further Support



ENVIRONMENTAL (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

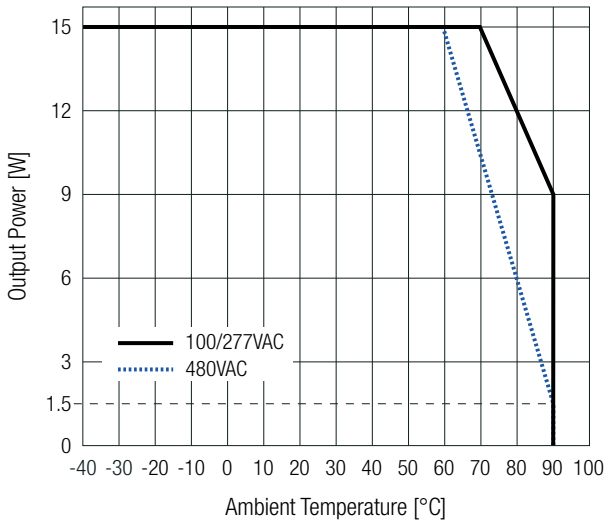
Parameter	Condition			Value
Operating Ambient Temperature Range [7]	@ natural convection (0.1m/s)	refer to **„Derating Graph“**		-40°C to +90°C
Maximum Case Temperature	"/277" and "/277/CC"			+105°C
Temperature Coefficient				±0.02%/K
Operating Altitude				5000m (OVC III)
Operating Humidity				95% RH max.
Pollution Degree				PD3
Vibration	according to MIL-STD-202G			10-500Hz, 2G 10min./1cycle, 60min. each along x,y,z axes
MTBF	according to MIL-HDBK-217, G.B.	V_{OUT}= 5, 12VDC	T_{AMB}= +25°C	1450 x 10^3 hours
		V_{OUT}= 15, 24VDC		1720 x 10^3 hours
		V_{OUT}= 5, 12VDC	T_{AMB}= +40°C	1310 x 10^3 hours
		V_{OUT}= 15, 24VDC		1470 x 10^3 hours
Design Lifetime	full load	T_{AMB}= +50°C		30 x 10^3 hours

Note7: Maximum load for coldstart at temperatures below -25°C should be limited to 12W

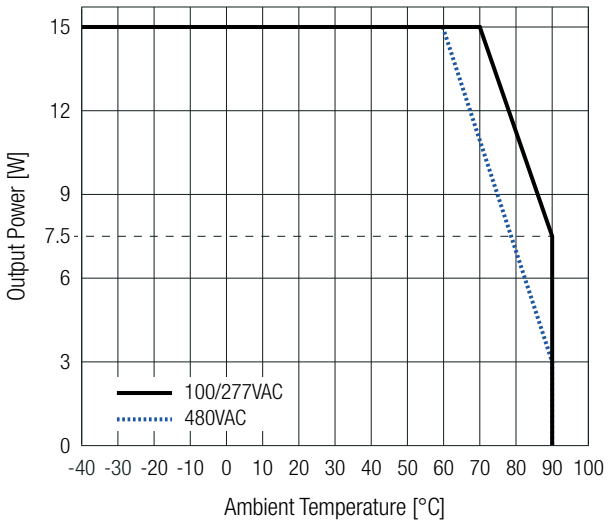
Derating Graph [7]

(@ Chamber and natural convection 0.1m/s)

RAC15-24SK/480



others



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SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Safety requirements	E491408-A6021-UL	UL62368-1, 3rd Edition, 2019
		CAN/CSA C22.2 Nr. 62368-1-14, 3rd Ed. 2019
Audio/Video, information and communication technology equipment - Safety requirements (CB)	211112011	IEC62368-1:2014 2nd Edition
Audio/Video, information and communication technology equipment - Safety requirements (LVD)		EN62368-1:2014 + A11:2017
Audio/Video, information and communication technology equipment - Safety requirements (CB)	211112010	IEC62368-1:2018 3rd Edition
Audio/Video, information and communication technology equipment - Safety requirements		EN/IEC62368-1:2020 + A11:2020
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements	085-210569501-000	IEC61010-1:2010 3rd Edition + A1:2016
Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements	64.210.21.05695.01	EN61010-1:2010 + A1:2019
Household and similar electrical appliances – Safety – Part 1: General requirements	4389221.50	IEC60335-1:2010 + A2:2016, 5th Edition
		EN60335-1:2012 + A15:2020
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure		EN62233:2008
RoHS2		RoHS-2011/65/EU + AM-2015/863

EMC Compliance according to EN55032 [8]	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements		EN55032:2015 + A11:2020, Class B
Electromagnetic compatibility of multimedia equipment – Immunity requirements		EN55035:2017 + A11:2020
ESD Electrostatic discharge immunity test	Air: ±2, 4, 8kV Contact: ±2, 4kV	EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3 V/m (80-5000MHz)	EN61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Port: L, N, L-N ±1kV	EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: L-N: ±1kV	EN61000-4-5:2015, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC: 3Vrms (0.15-10MHz) 3-1Vrms (10-30MHz) 1Vrms (30-80MHz)	EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	1A/m	EN61000-4-8:2010, Criteria A
Voltage Dips	100% (0.5P, 0.5P) 30% (25P, 30P)	EN61000-4-11:2004, Criteria A
Voltage Interruptions	100% (250P/300P)	EN61000-4-11:2004, Criteria B

EMC Compliance according to EN61204-3 [8]	Condition	Standard / Criterion
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)		EN IEC 61204-3:2018
ESD Electrostatic discharge immunity test	Air: ±2, 4, 8kV Contact: ±4kV	EN61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10V/m (80-1000MHz) 3V/m (1400-2000MHz) 1V/m (2000-2700MHz)	EN61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Port: L, N, L-N ±2kV	EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: L-N: ±1kV	EN61000-4-5:2014 + A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC: 10Vrms (0.15-80MHz)	EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity		EN61000-4-8:2010, Criteria A
Voltage Dips	100% (0.5P, 0.5P) 100% (1.0P, 1.0P) 60% (10P, 12P) 30% (25P, 30P) 20% (250P, 300P)	EN61000-4-11:2004 + A1:2017, Criteria A
Voltage Interruptions	100% (250P, 300P)	EN61000-4-11:2004 + A1:2017, Criteria B
Limits of Harmonic Current Emissions		EN IEC 61000-3-2:2019
Limits of Harmonic Current Emissions		EN61000-3-2:2014
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013 + A1:2019

Note8: With earth referenced output connections, use of an external common mode choke 45mH (E-type) may be considered at the input.

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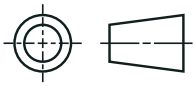
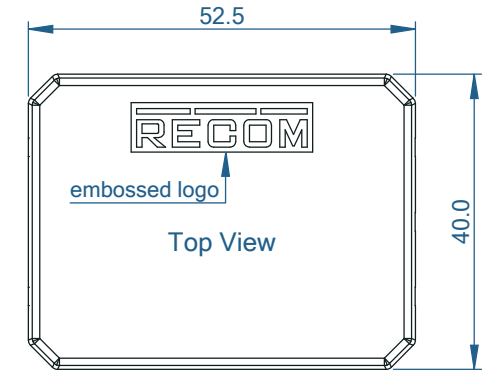
DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Materials	case/baseplate	polycarbonate, (UL94 V-0)
	potting	PU, (UL94 V-0)
	PCB	FR4, (UL94 V-0)
Dimension (LxWxH)		52.5 x 40.0 x 25.5mm 2.06 x 1.57 x 1.0 inch
Weight		92g typ. 0.2 lbs

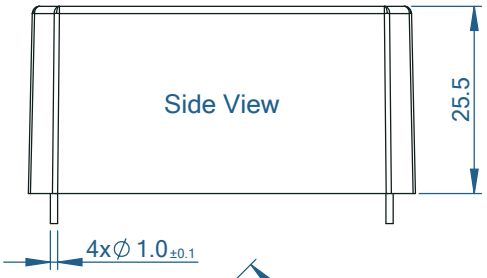
Dimension Drawing (mm)

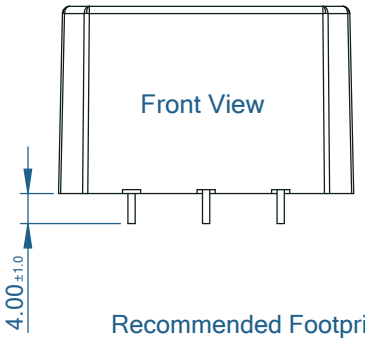


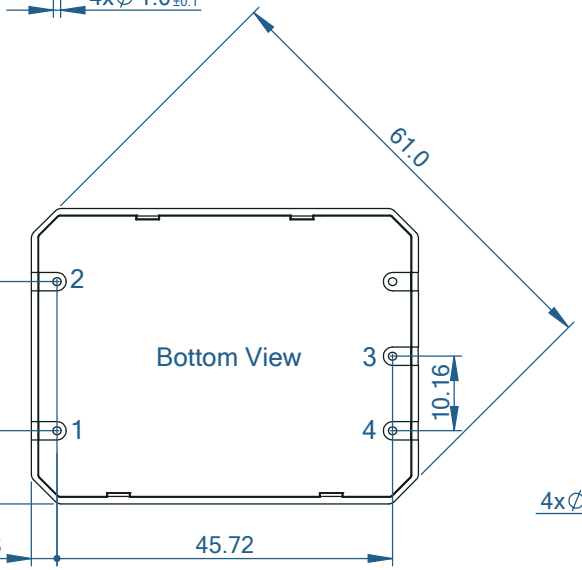


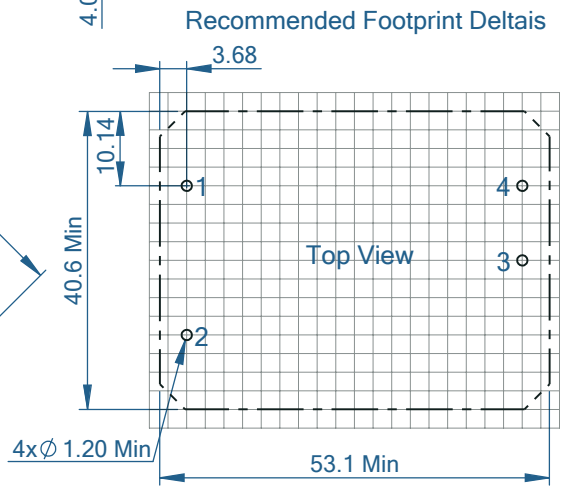
Pinning information [P12]

Pin #	Single
1	VAC in (N) (L2)
2	VAC in (L) (L1)
3	-Vout
4	+Vout









Tolerance: xx.x= ±0.5mm
xx.xx= ±0.25mm

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PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	490.0 x 56.0 x 40.0mm
Packaging Quantity		11pcs
Storage Temperature Range		-40°C to +90°C
Storage Humidity		95% RH max.

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