

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

15W ◇ Input: 100V-480VAC

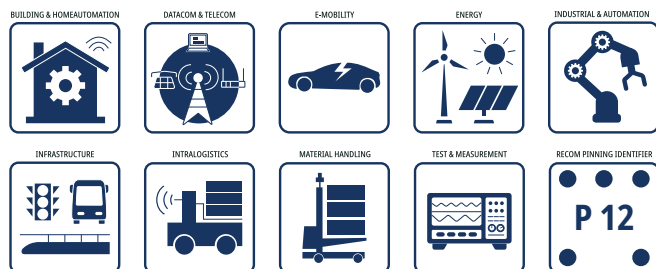
FEATURES

- 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****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)

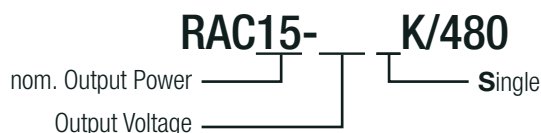
Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current nom. [mA]	Efficiency ⁽¹⁾		Output Power continuous [W]
				typ.		
RAC15-05SK/480	85-528	5	3000	86		15
RAC15-12SK/480	85-528	12	1250	84		15
RAC15-15SK/480	85-528	15	1000	85		15
RAC15-24SK/480	85-528	24	625	87		15

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 @ $T_{AMB} = 25^{\circ}\text{C}$, 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	$V_{OUT} = 5\text{VDC}$			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)

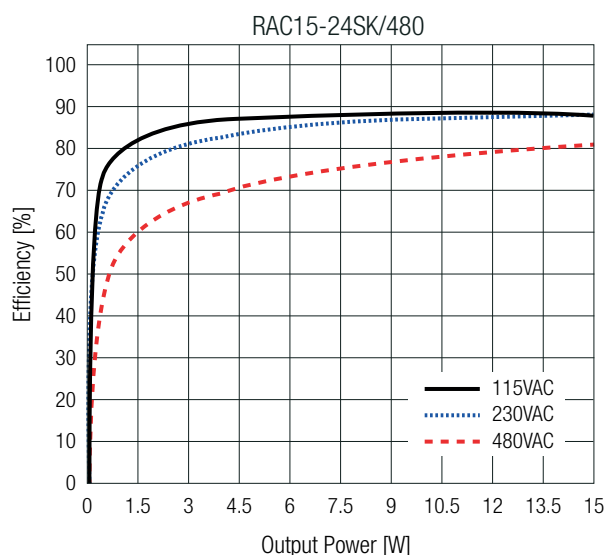
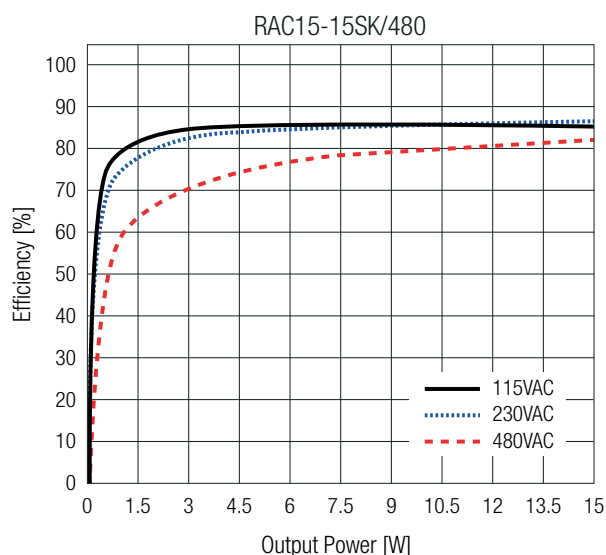
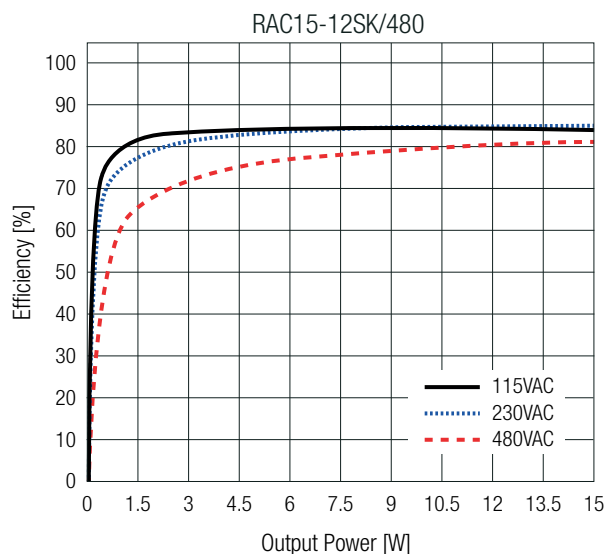
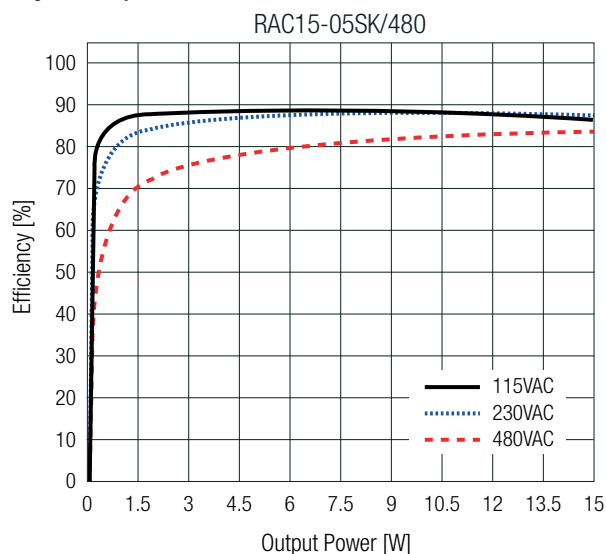
The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

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

Efficiency vs. Output Power



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

Parameter	Condition	Value
Output Accuracy		$\pm 3.0\%$ max.
Line Regulation	low line to high line, full load	$\pm 2.0\%$ 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 @ $T_{AMB}=25^{\circ}\text{C}$, 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 @ $T_{AMB}=25^{\circ}\text{C}$, 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.

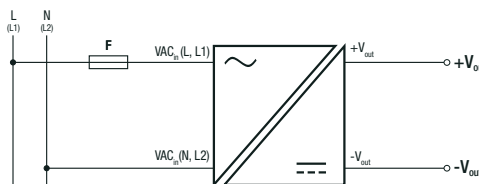
Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

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



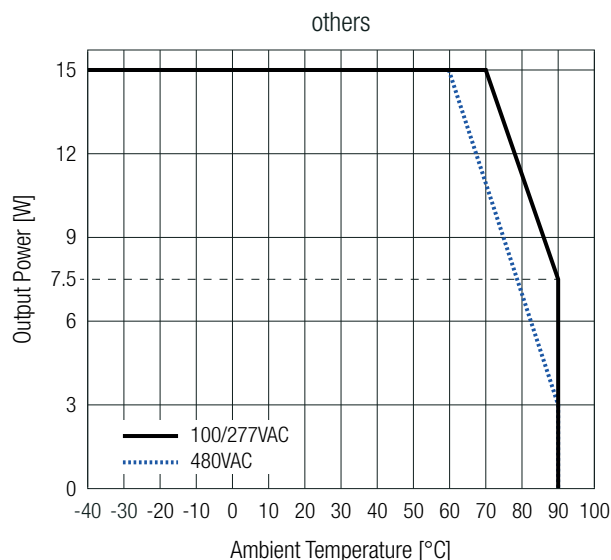
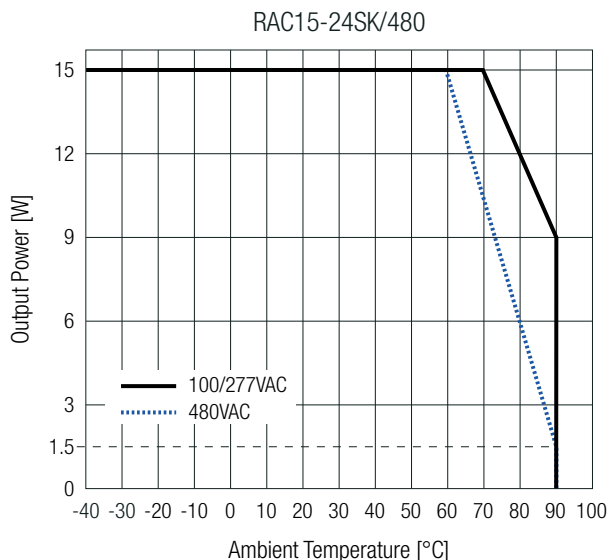
ENVIRONMENTAL (measured @ $T_{AMB}=25^{\circ}\text{C}$, nom. V_{IN} , full load and after warm-up unless otherwise stated)

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)



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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
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure		EN60335-1:2012 + A15:2020
RoHS2		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.

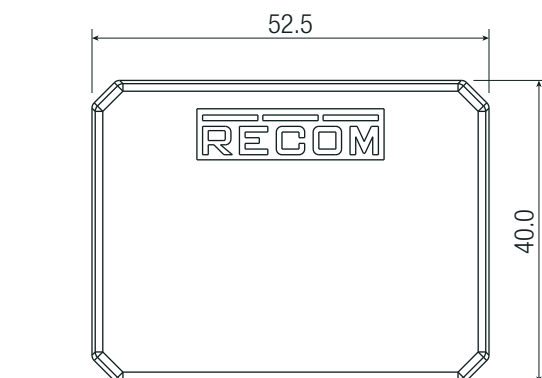
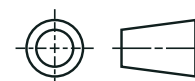
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DIMENSION & PHYSICAL CHARACTERISTICS

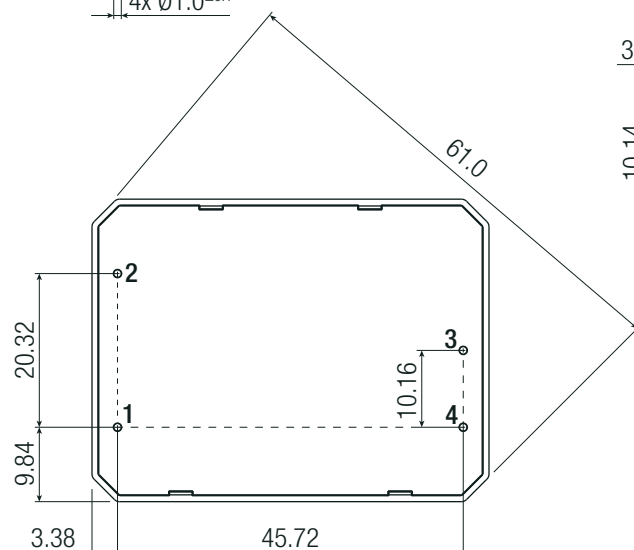
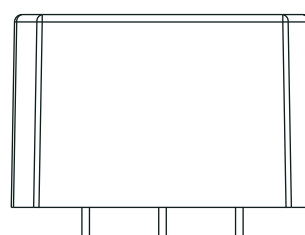
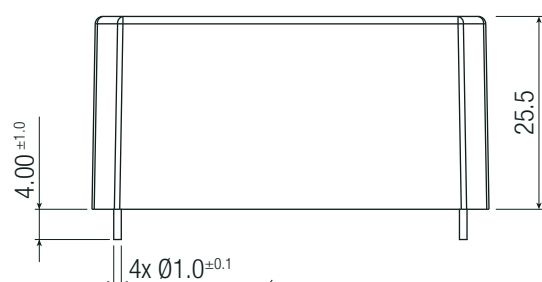
Parameter	Type	Value
Materials	case/baseplate	polycarbonate, (UL94 V-0)
	potting	PU, (UL94 V-0)
	PCB	FR4, (UL94 V-0)
Dimension (LxWxH)		52.5 x 40.0 x 25.5mm
		2.06 x 1.57 x 1.0 inch
Weight		92g typ.
		0.2 lbs

Dimension Drawing (mm)

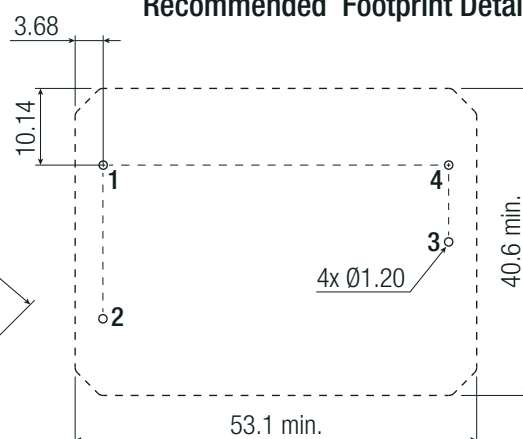


Pinning information [P12]

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



Recommended Footprint Details



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.

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.