

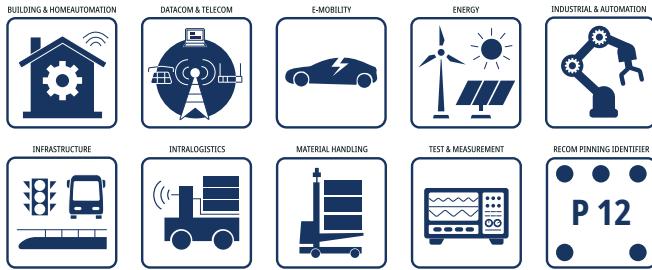
## FEATURES

- 90-460VAC extra wide high voltage input
- OVC III over voltage category up to 5000m altitude
- EN55032 "B": O/P either floating or earth coupled
- Surge immunity 2kVAC: L-N & 4kV: L; N – Earth
- LPS limited power source rating
- Thermal ratings from -40 to +85°C
- Stand by power <150mW at 400VAC input
- 3 year warranty



52.5 x 40.0 x 25.5mm (2.06 x 1.57 x 1.0 inch)  
95g (0.2 lbs)

## APPLICATIONS



## SAFETY &amp; EMC



## DESCRIPTION

RAC20NE-K/277/400 encapsulated solder mount built in power supplies with additional variants for phase to phase lines with an high voltage extra wide input of 100 to 400Vac are optimized for the requirements of new energy applications such as energy management, monitoring or actuator operation. These compact AC/DC modules meet increased requirements in terms of ambient temperatures, high immunity levels against transients, adopted insulation barriers, over voltage category OVCIII ratings up to 5000m altitude, limited power source LPS, EMC interference freedom with secondary ground or earth coupling and low power loss in full load operation as well as in standby and sleep mode. The modules are available in various versions according to worldwide industrial, household and safety transformer standards at operating altitudes of up to 5000 m under OVC III approved. High effective power density and industry standard P12 pinning on a 1.5"x2" footprint fits in space critical applications. For even higher input voltage range requests of up to 528VAC the [RAC15-K/480 Series](#) with the same pinning and footprint may be of interest.

## SELECTION GUIDE (CONSTANT VOLTAGE OPERATION)

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current nom. [A]	Efficiency <sup>(1)</sup> typ. [%]	Output Power continuous [W]
RAC20NE-12DK/277/400	90-460	±12	+1.58 / -0.083	84	20
RAC20NE-24SK/277/400	90-460	24	0.833	86	20

Note1: Efficiency is tested at 230VAC and full load at +25°C ambient.

## Model Numbering



## ALTERNATIVES

Product Series	Description	Landing page link
RAC15-K/480	Input Voltage up to 528VAC; same footprint and pinning (P12)	<a href="#">RAC15-K/480 series</a>

## ACCESSIBLE PART

Part Number	Description	Datasheet Link
RAC-ADAPT-ST-1	adapter board with screw terminals for easy connection	<a href="#">RAC-ADAPT-ST-1.pdf</a>

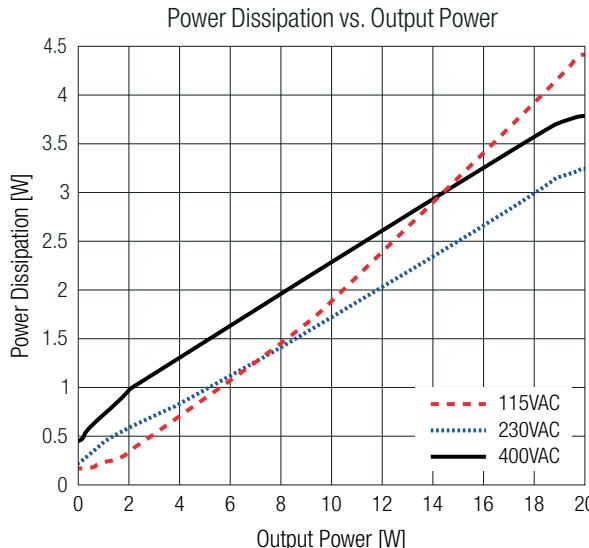
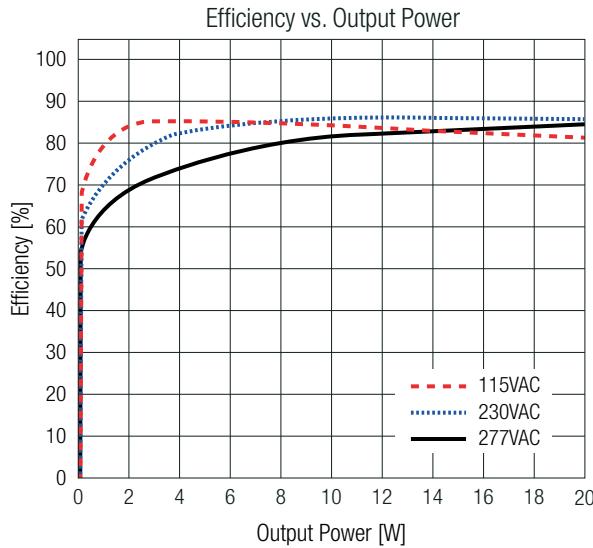
BASIC CHARACTERISTICS (measured @  $T_{AMB} = 25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

Parameter	Condition		Min.	Typ.	Max.
Nominal Input Voltage		50/60Hz	100VAC		400VAC
Operating Range <sup>(2)</sup>		47-63Hz	90VAC		460VAC
		DC	120VDC		430VDC
Input Current		115VAC		350mA	500mA
		230VAC		250mA	500mA
		277VAC		200mA	500mA
		400VAC		150mA	500mA
Inrush Current	cold start at 25°C	115VAC			20A
		230/277/400VAC			40A
No Load Power Consumption		230VAC			60mW
		400VAC			150mW
Ecodesign Standby Mode Use (Available output power for stated input power)	115/230VAC	$P_{IN} = 0.5\text{W}$			0.34W
		$P_{IN} = 1.0\text{W}$			0.74W
		$P_{IN} = 2.0\text{W}$			1.6W
	400VAC	$P_{IN} = 0.5\text{W}$			0.22W
		$P_{IN} = 1.0\text{W}$			0.63W
		$P_{IN} = 2.0\text{W}$			1.36W
Input Frequency Range	AC Input		47Hz		63Hz
Minimum Load			0%		
Power Factor		115VAC		0.6	
		230VAC		0.5	
		277VAC		0.4	
Start-up time					150ms
Rise time			40ms		
Hold-up time		230VAC	30ms		
		277VAC	50ms		
Internal Operating Frequency					150kHz
Output Ripple and Noise <sup>(3)</sup>	20MHz BW	RAC20NE-12DK/277/400			300mVp-p
		RAC20NE-24SK/277/400			400mVp-p

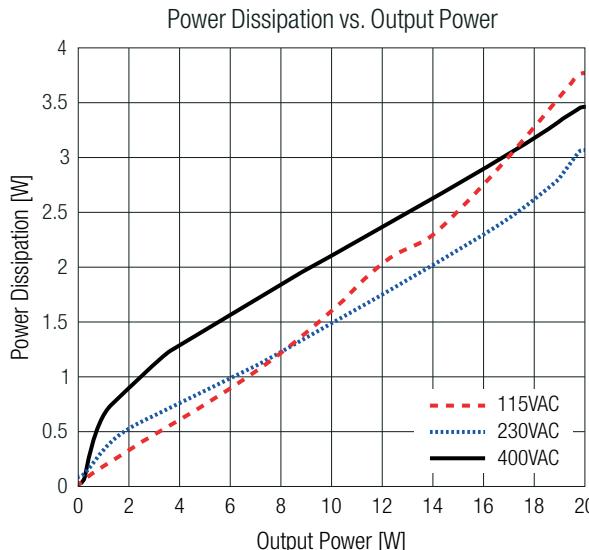
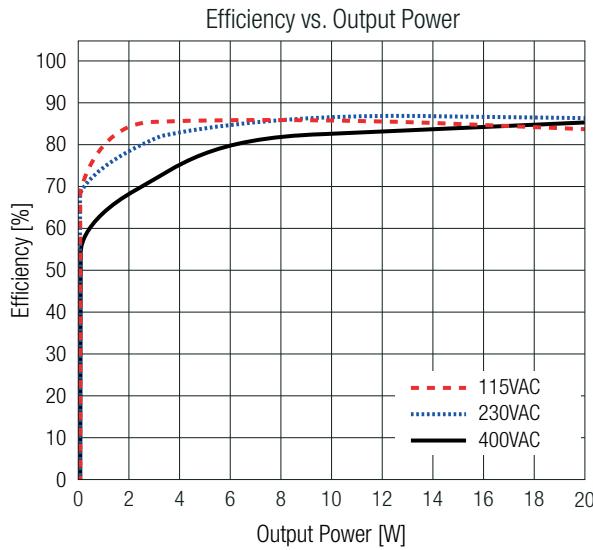
Note2: The products were submitted to all safety files at AC-operation. (100-400VAC)

Note3: Measurements are made with a 0.1µF MLCC &amp; 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.)

BASIC CHARACTERISTICS (measured @  $T_{AMB} = 25^\circ C$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)RAC20NE-12DK/277/400<sup>(4)</sup>

## RAC20NE-24SK/277/400



Note4: Only the positive output of the dual voltage converter was loaded.

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

Parameter	Condition	Value
Output Accuracy <sup>(5)</sup>		$\pm 3.0\%$ max.
Line Regulation <sup>(6)</sup>	low line to high line, full load	$\pm 1.5\%$ max.
Load Regulation <sup>(5,6)</sup>	10% to 100% load	2.0% max.
Cross Regulation	dual version only	$\pm 1.0\%$ max
Transient Response	25% load step change	800mV max.
Recovery Time		3000 $\mu$ s max.

Note5: For dual output converters, this value refers only to the positive main output.

Note6: Operation below 10% load will not harm the converter, but specifications may not be met

## RAC20NE-K/277/400 Series ◊ AC/DC Power Supply

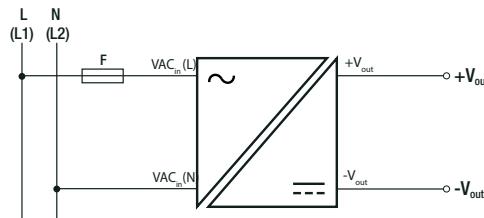
20W ◊ Input: 100V-400VAC

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

Parameter	Type			Value
Input Fuse <sup>(7)</sup>				no internal fuse
Limited Power Source (LPS)				yes
Short Circuit Protection (SCP)				hiccup mode; auto recovery
Over Current Protection (OCP)				130% - 190%, hiccup mode
Over Voltage Protection (OVP)				120% - 135%, hiccup mode
Over Voltage Category (OVC)	according to 62368-1			OVC III (5000m)
Class of Equipment				Class II
Isolation Voltage	I/P to O/P	1 minute	according to 61558	4.2kVAC
			according to 62368-1	6kVDC
Insulation Grade	I/P to O/P			reinforced

Note7: Refer to local safety regulations if input over-current protection is also required

## Protection Circuit

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

Parameter	Condition		Value
Operating Ambient Temperature Range	@ natural convection (0.1m/s)	refer to „Derating Graph“	-40°C to +85°C
Maximum Case Temperature			+110°C
Temperature Coefficient			±0.05%/K
Operating Altitude <sup>(8)</sup>			5000m (OVC III)
Operating Humidity			95% RH max.
Pollution Degree			PD2
MTBF	according to MIL-HDBK-217, G.B.	$T_{AMB} = +25^{\circ}C$	$876 \times 10^3$ hours
Design Lifetime	full load	$T_{AMB} = +25^{\circ}C$	$66 \times 10^3$ hours

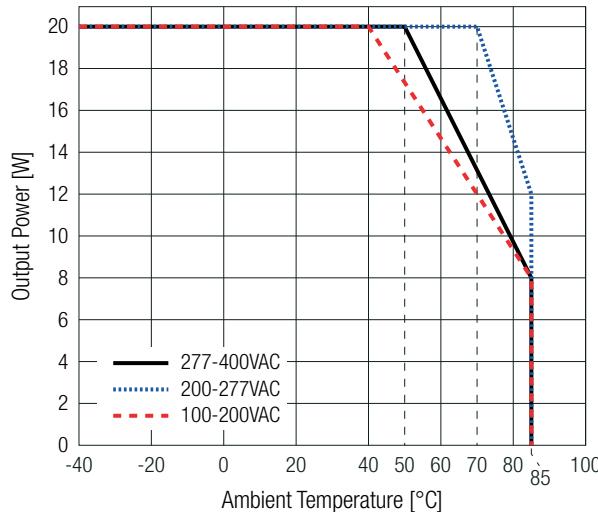
Note8: Recognized by safety agency for safe operation up to 5000m. High altitude operation may impact the performance and lifetime.

Please contact RECOM tech support for advice

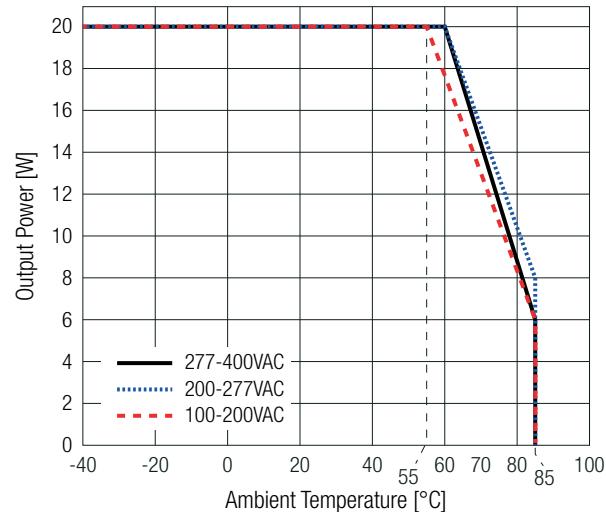
## Derating Graph

(@ Chamber and natural convection 0.1m/s)

RAC20NE-12DK/277/400



RAC20NE-24SK/277/400



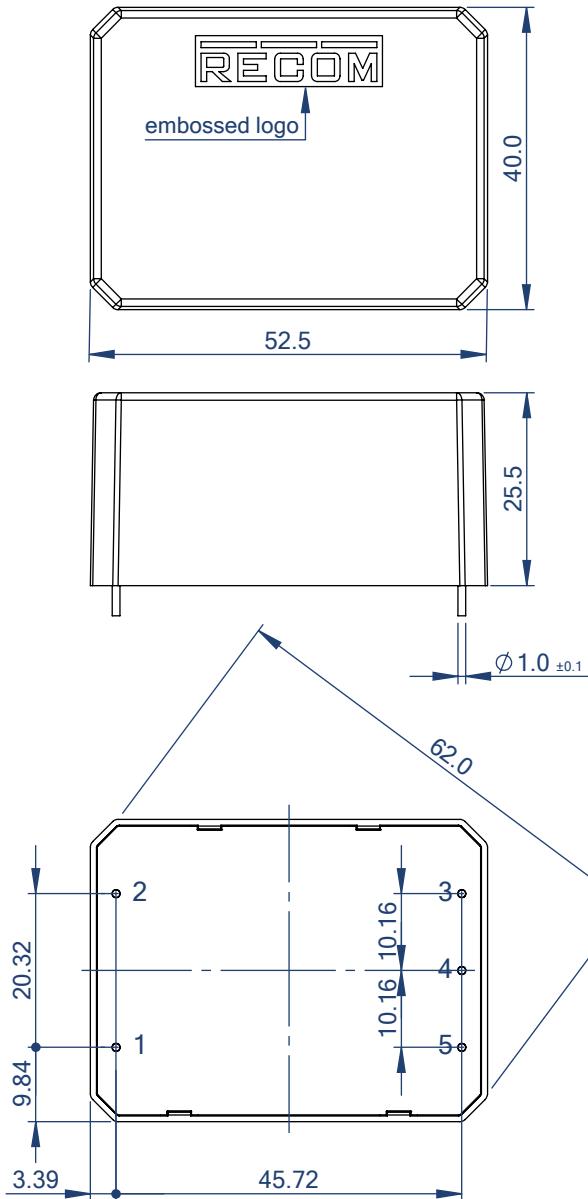
## SAFETY &amp; CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	085-240223001-000	IEC62368-1:2018 3rd Edition EN IEC 62368-1:2020+A11:2020
EMC Compliance according to EN IEC61204-3	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, 8, 15kV	IEC61000-4-2:2008, Criteria A 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)	IEC/EN61000-4-3:2006 + A2:2010 Criteria A
Fast Transient and Burst Immunity	AC Port L, N, L-N 4kV	IEC/EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port L-N 0.5, 1, 2, 4kV	IEC/EN61000-4-5:2014 + A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10Vrms (0.15-80MHz)	IEC61000-4-6:2013, Criteria A EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	30A/m	IEC61000-4-8:2009 , Criteria A EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Dips: 100% (0.5P, 1.0P), 60%, 30%, 20%  Interruption: 100%	IEC/EN61000-4-11:2004+A1:2017, Criteria A  IEC/EN61000-4-11:2004+A1:2017, Criteria B
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013+A1:2019
EMC Compliance according to EN55032	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment – Emission Requirements	O/P either floating or earth coupled (FE; PE or GND)	EN55032:2015+A11:2020, Criteria B

## DIMENSION &amp; PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Materials	case/baseplate	plastic, (UL94 V-0)
	potting	silicone, (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		95g typ. 0.2 lbs

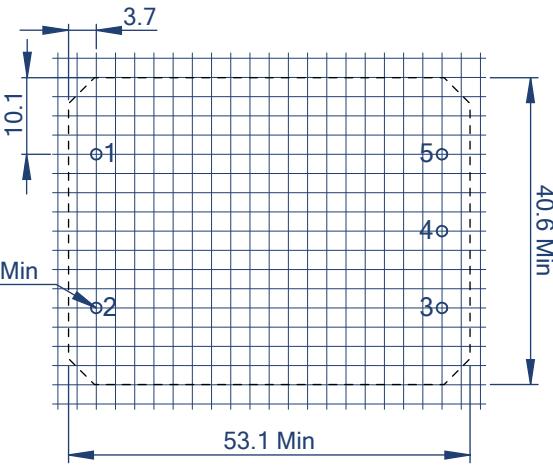
## Dimension Drawing (mm)



## Pinning information [P12]

Pin #	Single	Dual
1	VAC in N (L2)	VAC in N (L2)
2	VAC in L (L1)	VAC in L (L1)
3	no pin	-Vout
4	-Vout	COM
5	+Vout	+Vout

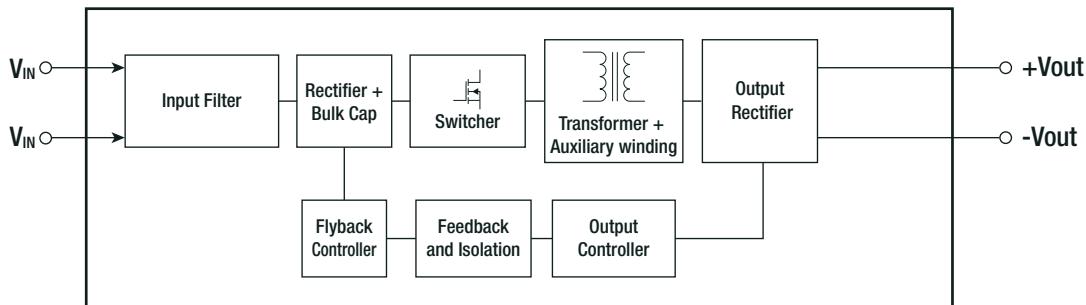
## Recommended Footprint Details



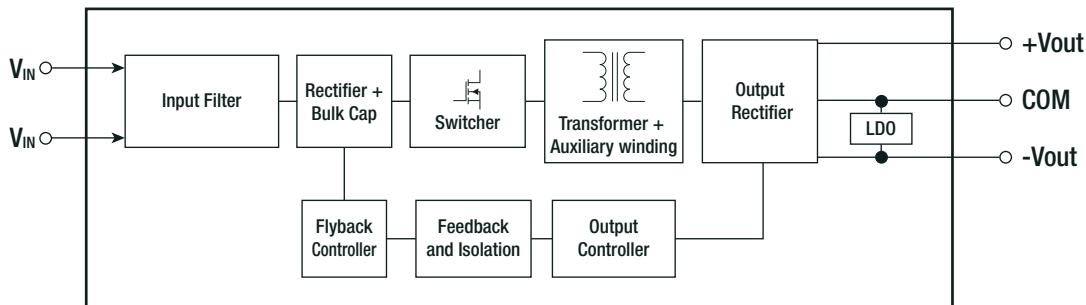
Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

## BLOCK DIAGRAMM

## Single Version



## Dual Version



## 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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