Technical Data Sheet

RAC04NE-K/277 Series ◊ AC/DC Power Supply

4W ◊ Input: 100V-277VAC

RECOM AC/DC Converter

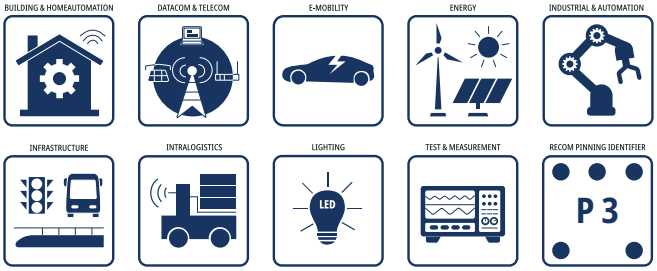
FEATURES

- 85-305VAC input with a full load up to +80°C
- Enhanced surge ratings of 2kV (L-N); 4kV (L-PE)
- OVC III overvolatge category up to 3000m altitude
- 6 watt boost power up to 20s
- Wired version with mounting tabs, IP65 rated
- EN55032 class B; floating or earth referenced
- 3 year warranty

*reference only

THT-mount: 37.0 x 24.0 x 18.0mm (1.45 x 0.94 x 0.70 inch)
Wired: 37.8 x 24.8 x 18.7mm (1.48 x 0.97 x 0.73 inch)

APPLICATIONS



SAFETY & EMC

E224736

HOUSEHOLD CERTIFIED EN-60335-1

RoHS² compliant 10 from 10

Reach compliant

DESCRIPTION

RAC04NE-K are exceptionally robust AC/DC modules for a maximum power range of 4 to 6 watts and have been specially designed for continuous operation under significantly expanded operating conditions. The full output power of 100% is available from -40°C to 80°C and also for all global single-phase AC networks or 100/115/200/230/277 VAC. OVC III is maintained up to 3000m operating altitude, or overvoltage category OVC II up to 5000m. The immunity to interference voltages is 2 kV (L-N); 4 kV (L-PE), which is significantly higher than usual for modules of this size. An integrated emission filter offers scope for system integration in accordance with EN55032 “B”, also with load-side potential equalization of sensitive electronics or protection type PELV. In addition to the encapsulated print modules, a wired mechanical variant with mounting tabs and IP65 water resistance is available, which has also been approved according to IEC61347.

SELECTION GUIDE

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current nom. [mA]	Boost Current max. (1) [mA]	Efficiency (2) typ. [%]	Output Power continuous [W]
RAC04NE-05SK/277	85-305	5	800	1200	75	4
RAC04NE-09SK/277	85-305	9	440	666	78	4
RAC04NE-12SK/277	85-305	12	330	500	80	4
RAC04NE-15SK/277	85-305	15	267	400	81	4
RAC04NE-24SK/277	85-305	24	167	250	79	4

Note1: Refer to **„Boost Power Duty Cycle“**
Note2: Efficiency is tested at 230VAC and full load at +25°C ambient

RAC04NE-K/277 Series ◊ AC/DC Power Supply

4W ◊ Input: 100V-277VAC

RECOM AC/DC Converter

MODEL NUMBERING

RAC04NE-__ __K/277/__

- nom. Output Power
- Output Voltage
- Mechanical Options [3]
  - **S**ingle

Note3: "/277" only= THT-solder mount, encapsulated, potted
add suffix "/W" for wired version, encapsulated, potted (except 9 &15Vout)

ORDERING INFORMATION

Model	Output Voltage	Package Type	
		1.45" x 0.94" THT-solder mount "/277"	1.48" x 0.97" wired "/277/W"
RAC04NE-05SK	5VDC	y	y
RAC04NE-09SK	9VDC	y	on request
RAC04NE-12SK	12VDC	y	y
RAC04NE-15SK	15VDC	y	on request
RAC04NE-24SK	24VDC	y	y

y= standard portfolio; on request= MOQ may apply on project base

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

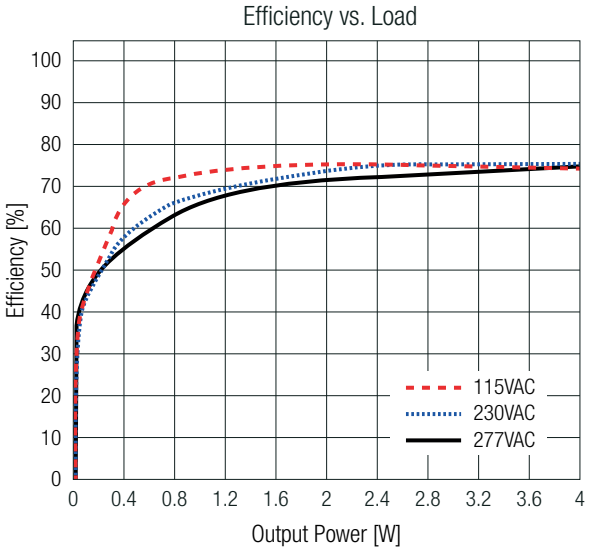
Parameter	Condition		Min.	Typ.	Max.
Nominal Input Voltage	50/60Hz		100VAC		277VAC
Operating Range [4]	47-63Hz		85VAC		305VAC
	DC		120VDC		430VDC
Input Current	115AC				90mA
	230VAC				50mA
	277VAC				45mA
Inrush Current	cold start at 25°C	115VAC			10A
		230VAC			20A
		277VAC			25A
No Load Power Consumption					75mW
Ecodesign Standby Mode Use (Available output power for stated input power)	P_{IN}= 0.5W		0.31W		
	P_{IN}= 1.0W		0.66W		
Input Frequency Range	AC Input		47Hz		63Hz
Minimum Load			0%		
Power Factor	115VAC			0.6	
	230VAC			0.47	
	277VAC			0.44	
Start-up time				15ms	
Rise time				10ms	
Hold-up time	115VAC			15ms	
	230VAC			80ms	
	277VAC			120ms	
Internal Operating Frequency			124kHz	132kHz	140kHz
Output Ripple and Noise [5]	20MHz BW				1% of Vout

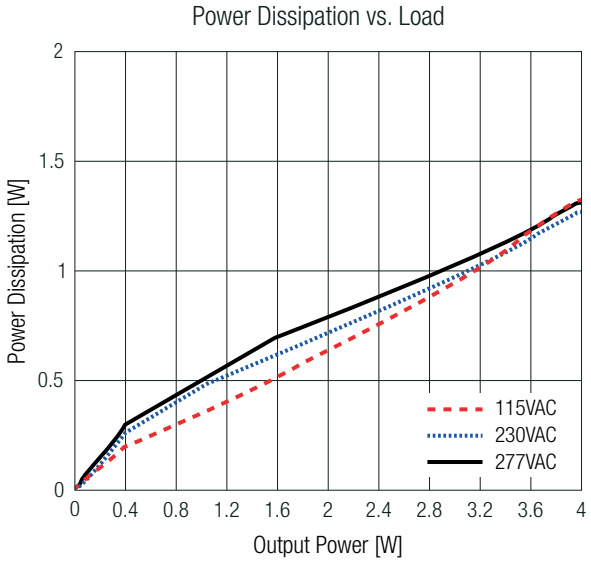
Note4: The products were submitted for safety files at AC-Input operation (90-305VAC).

Note5: 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.)

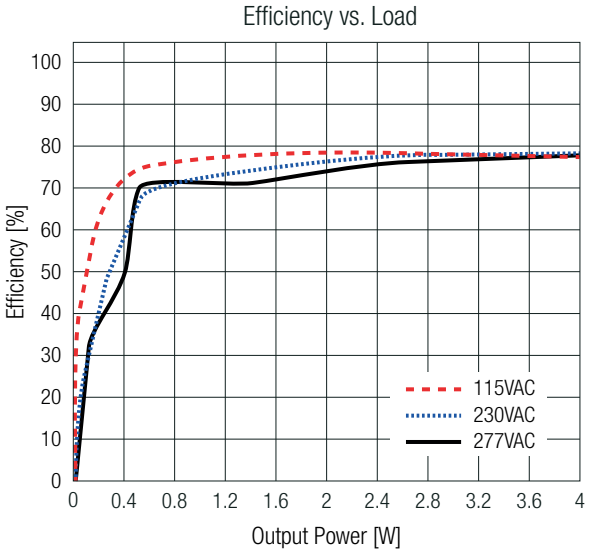
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

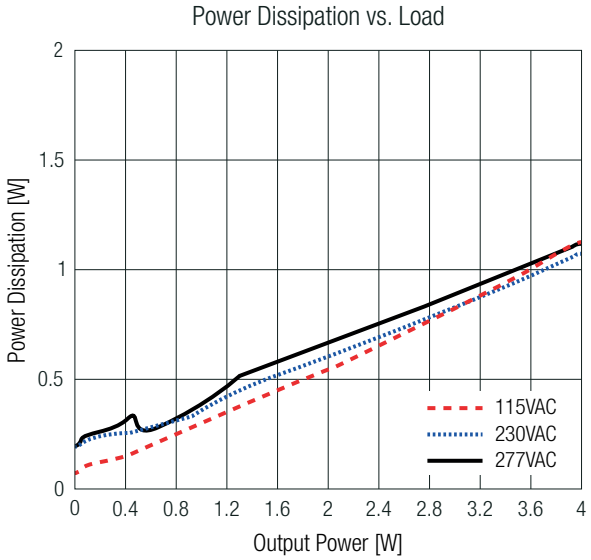
5Vout





others





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

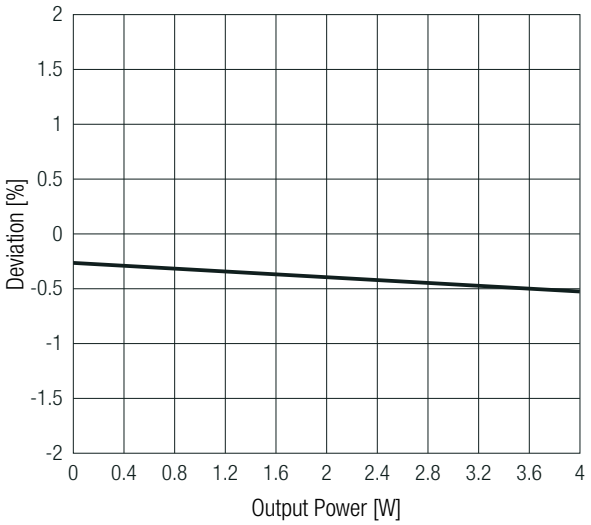
Parameter	Condition	Value
Output Accuracy		±1.0% typ. / ±2.0% max.
Line Regulation		±0.2% typ. / ±0.5% max.
Load Regulation [6]	10% to 100% load	0.5% typ. / 1.0% max.
Transient Response	25% load step change	6.0% max.
	recovery time	350µs typ.

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

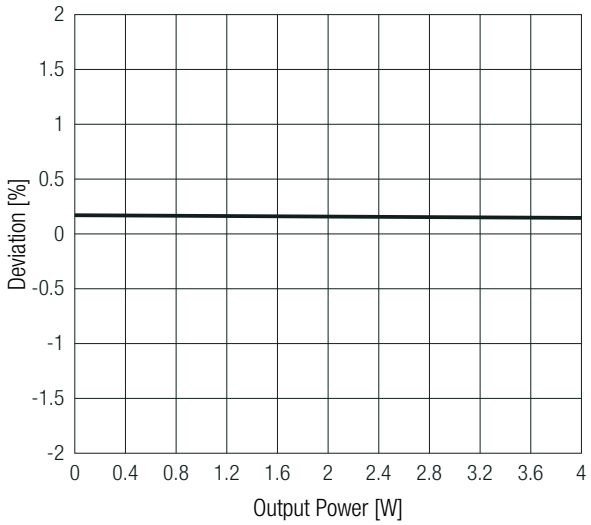
REGULATIONS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Deviation vs. Output Power

RAC04NE-05SK/277



others



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

Parameter	Type		Value
Input Fuse [7]	internal		fusible resistor 20Ω
Short Circuit Protection (SCP)			hiccup mode
Over Voltage Protection (OVP)			120% - 150%, hiccup mode
Over Current Protection (OCP)			300% - 500%, hiccup mode
Over Voltage Category (OVC)	according to 61558-1		OVC II (5000m)
			OVC III (3000m)
Class of Equipment			Class II
Isolation Voltage [8]	1 minute	according to 61558	4.2kVAC
	1 minute	according to 62368-1	6kVDC
Insulation Grade			reinforced
Isolation Resistance			1GΩ min.
Isolation Capacitance			100pF max.

Note7: For system integration with DC operation, consider a suitable DC fuse in front of the input
Note8: For repeat Hi-Pot testing, reduce the time and/or the test voltage

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

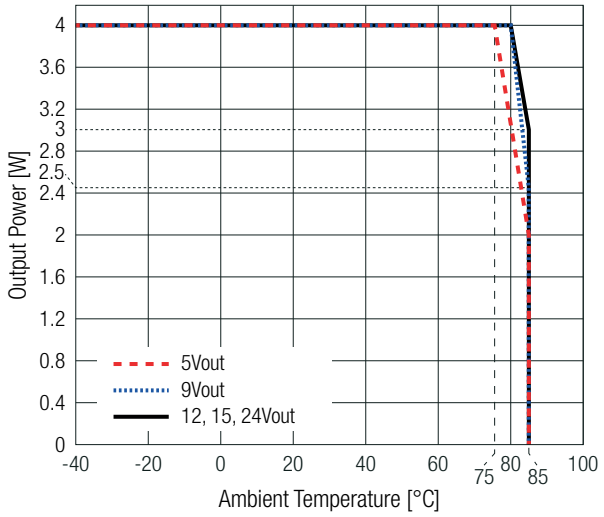
Parameter	Condition		Value
Operating Ambient Temperature Range	@ natural convection (0.1m/s); refer to **„Derating Graph“**		-40°C to +85°C
Maximum Case Temperature			+110°C
Temperature Coefficient			±0.03%/K
Operating Altitude [9]	according to 61558-1		5000m (OVC II)
			3000m (OVC III)
Operating Humidity	non-condensing		90% RH max.
IP Rating	only “/277/W” versions		IP65
Pollution Degree			PD2
MTBF	according to MIL-HDBK-217, G.B.	T_{AMB}= +25°C	2260 x 10^3 hours
		T_{AMB}= +40°C	2040 x 10^3 hours
Design Lifetime	230VAC and full load	T_{AMB}= +50°C	110 x 10^3 hours

Note9: 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

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

Derating Graph

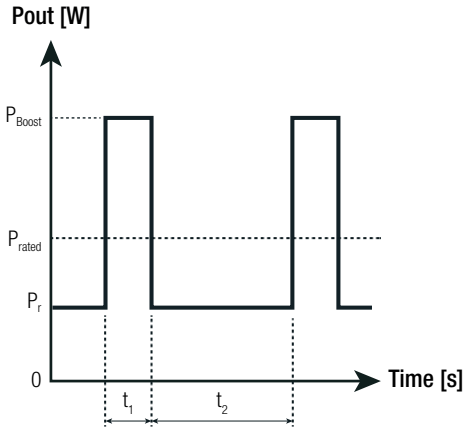
(@ Chamber and natural convection 0.1m/s)



BOOST POWER DUTY CYCLE

P_{rated}	= refer to **„Derating Graph“**	[W]
P_{Boost}	= Boost power (≤6W)	[W]
P_r	= recovery output power	[W]
t_1	= boost time set (20s max.)	[s]
t_2	= recovery time (min. 2 x t_1)	[s]
k	= for nom. 115V-277VAC	[1]
	for nom. 100V-110VAC	[1.1]

$$P_r = \frac{P_{rated} \times (t_1 + t_2) - (P_{Boost} \times t_1)}{t_2 \times k}$$



Practical Example (RAC04NE-12SK/277):

Take the RAC04NE-12SK/277 at 230VAC input voltage and full load at T_{AMB}= 80°C ,with natural convection.

P_{rated} = 4W
P_{Boost} = 6W
t_1 = 20s
t_2 = 40s

$$P_r = \frac{4W \times (20s + 40s) - (6W \times 20s)}{40s \times 1} = \underline{3W}$$

SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	E491408-A6028-UL	UL62368-1:2019, 3rd Edition CAN/CSA-C22.2 No. 62368-1-19, 3rd Edition
Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition	240529004	IEC62368-1:2018, 3rd Edition EN IEC 62368-1:2020 + A11:2020
Household and similar electrical appliances – Safety – Part 1: General requirements	64.110.24.00834.01	IEC60335-1:2010 + C1:2016, 5th Edition EN60335-1:2012 + A15:2021
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure		EN62233:2008 + AC:2008
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V 3rd Edition	085-240083201-000	IEC61558-1:2017, 3rd Edition EN IEC 61558-1:2019
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements	085-240083201-000	IEC61558-2-16:2009 + A1:2013, 1st Edition EN61558-2-16:2009 + A1:2013
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V 3rd Edition	pending	IEC61558-1:2017, 3rd Edition
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements	pending	IEC61558-2-16:2021, 2nd Edition
Lamp controlgear Part 1: General and safety requirements	085-240083301-000	IEC61347-1:2015 + A1:2017, 3rd Edition EN61347-1:2015 + A1:2021

SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Lamp controlgear Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules	085-240083301-000	IEC61347-2-13:2014 + A1:2016, 2nd Edition EN61347-2-13:2014 + A1:2017
Automatic electrical controls - Part 1: General requirements	68.100.24.0073.01	IEC60730-1:2022, 6th Edition
RoHS2		RoHS 2011/65/EU + AM2015/863

EMC Compliance (EN61204-3)	Condition	Standard / Criterion
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)		EN IEC 61204-3:2018 Class B
ESD Electrostatic discharge immunity test	Air: ±2, 4, 8, 15kV Contact: ±8kV	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/EN61000-4-3:2066 + 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 2kV (5, 9 & 15Vout)	IEC/EN61000-4-5:2014 + A1:2017, Criteria B
	AC Port: L-N 0.5, 1kV (5, 9 & 15Vout) AC Port: L-N 0.5, 1, 2kV (12, 13 & 24Vout) AC Port: L-PE, N-PE: 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	100% (0.5P; 1.0P), 60%, 30%, 20%	IEC/EN61000-4-11:2004 + A1:2017, Criteria A
Voltage Interruptions	100%	IEC/EN61000-4-11:2004 + A1:2017, Criteria B
Limits of Harmonic Current Emissions		EN IEC 61000-3-2:2019
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013 + A1:2019

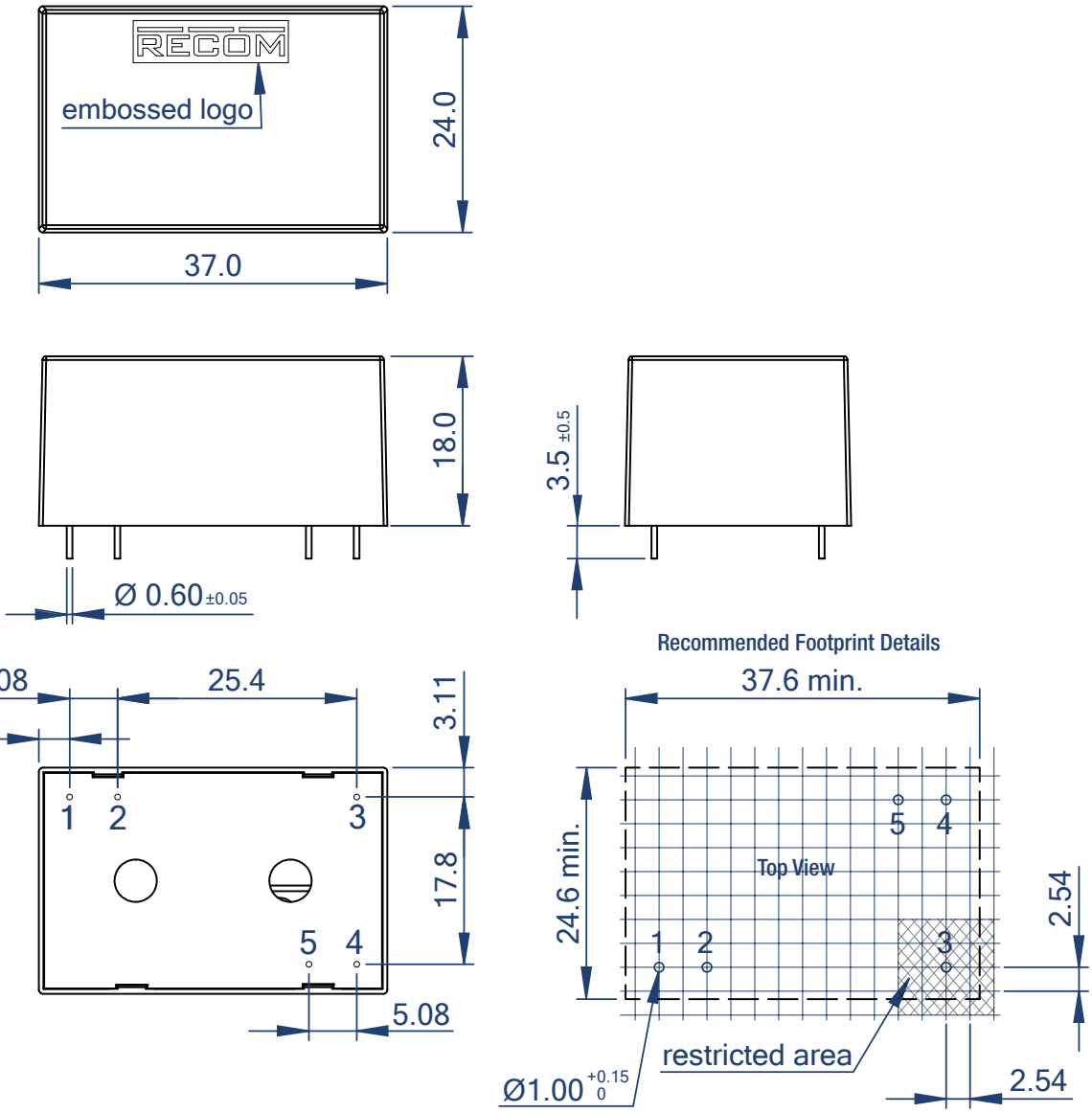
EMC Compliance (EN55032)		
Electromagnetic compatibility of multimedia equipment – Emission Requirements	O/P connected to GND: and floating output; without external filter	EN55032:2015 + A11:2020

DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Materials	case/baseplate	plastic, (UL94-V0)
	potting	silicone, (UL94-V0)
	PCB	FR4, (UL94-V0)
Dimension (LxWxH)	"/277"	37.0 x 24.0 x 18.0mm 1.45 x 0.94 x 0.70 inch
	"/277/W"	37.8 x 24.8 x 18.7mm 1.48 x 0.97 x 0.73 inch
Weight	"/277"	27.8g typ. 0.06 lbs
	"/277/W"	35g typ. 0.07 lbs

DIMENSION & PHYSICAL CHARACTERISTICS

Dimension Drawing "/277" version (mm)



Pinning information [P3]

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

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

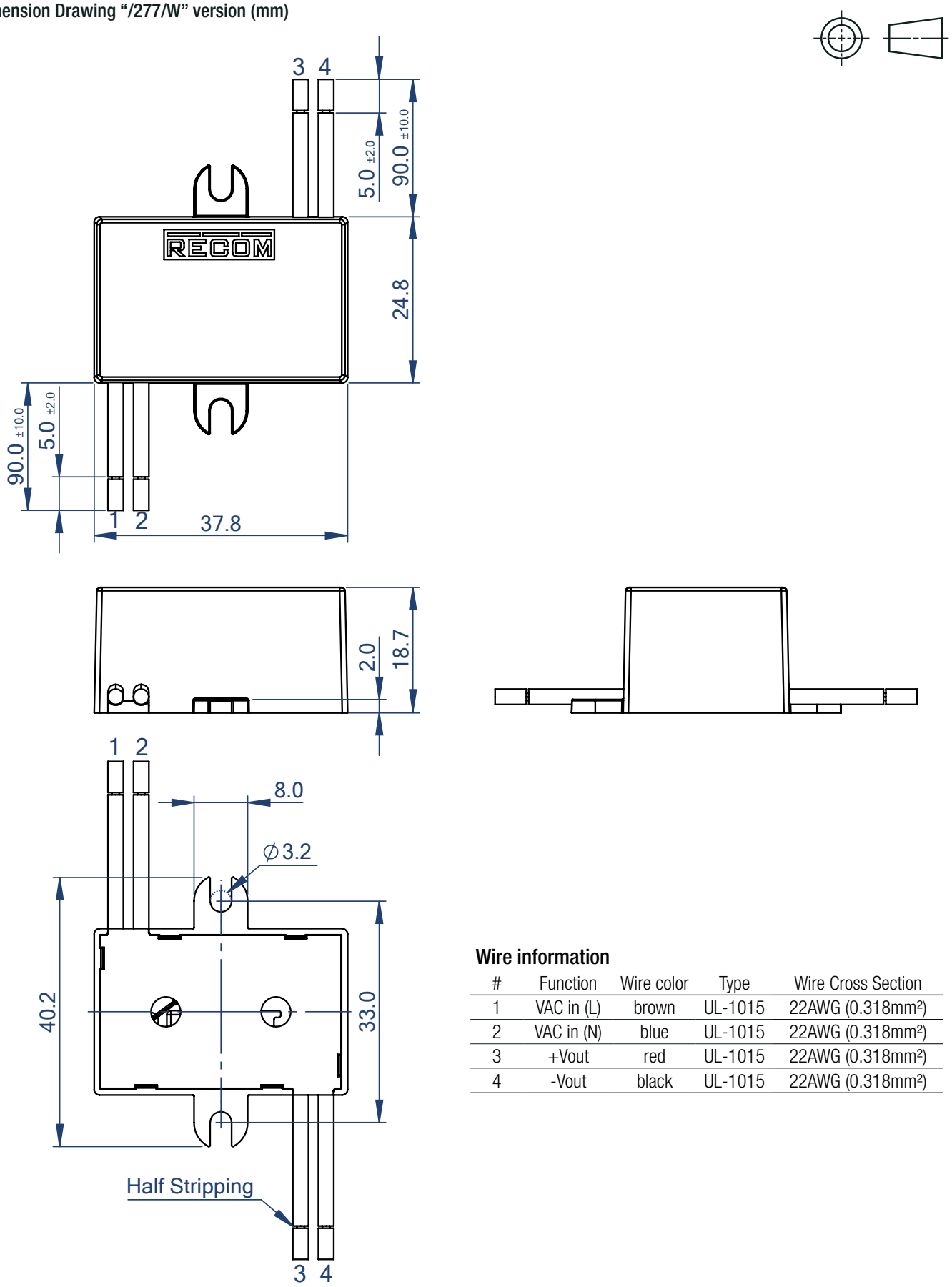
RAC04NE-K/277 Series ◊ AC/DC Power Supply

4W ◊ Input: 100V-277VAC

RECOM AC/DC Converter

DIMENSION & PHYSICAL CHARACTERISTICS

Dimension Drawing "/277/W" version (mm)

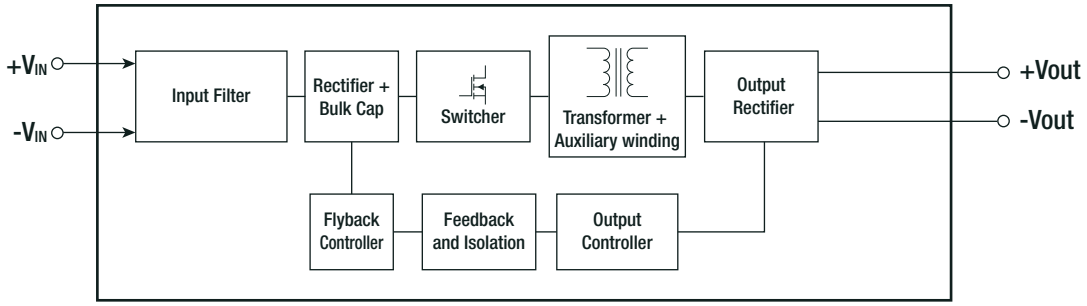


Wire information

#	Function	Wire color	Type	Wire Cross Section
1	VAC in (L)	brown	UL-1015	22AWG (0.318mm²)
2	VAC in (N)	blue	UL-1015	22AWG (0.318mm²)
3	+Vout	red	UL-1015	22AWG (0.318mm²)
4	-Vout	black	UL-1015	22AWG (0.318mm²)

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

BLOCK DIAGRAMM



PACKAGING INFORMATION

Parameter	Type		Value
Packaging Dimension (LxWxH)	tube	"/277"	490.0 x 26.5 x 27.5mm
	tray	"/277/W"	365.0 x 365.0 x 55.0mm
Packaging Quantity	"/277"		12pcs
	"/277/W"		35pcs
Storage Temperature Range			-40°C to +90°C
Storage Humidity	non-condensing		90% RH max.