

# Features

# Regulated Converter

- OVC III and PD3 rating
- Continuous max withstanding voltage 528VAC
- UL certified input 90-318VAC
- Operating temperature range: -40°C to +85°C
- Class II installations (without FG)
- EN55032 class "B" with floating outputs
- No load power consumption <0.5W



## RAC05-K/480

5 Watt  
2" x 1"  
Single Output



### Description

The RAC05-K/480 series of 5 watt AC/DC units are specially designed for harsh industrial and outdoor mains conditions. These PCB-mount power supplies are rated to OVC III and/or PD3 conditions from 100-480VAC nominal input lines with phase-to-phase or single phase operation in class II installations by just adding a single fuse externally. The modules support an operating temperature range from -40°C to +80°C and come with fully protected outputs as well as EMC Class B compliance in floating output connections. All these features make them an ideal fit for integration into smart grid, renewable energy, smart metering and IoT applications.

### Selection Guide

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [µF]
RAC05-05SK/480	85-528	5	1000	63	10000
RAC05-12SK/480	85-528	12	420	65	1200
RAC05-15SK/480	85-528	15	330	60	1000

#### Notes:

Note1: Efficiency is tested at nominal input and full load at +25°C ambient

Note2: Max Cap Load is tested at nominal input and full resistive load

### Model Numbering



#### Ordering Examples:

RAC05-05SK/480      5Vout      Single Output  
RAC05-12SK/480      12Vout      Single Output

### Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

BASIC CHARACTERISTICS					
Parameter	Condition	Min.	Typ.	Max.	
Internal Input Filter					Pi type
Input Voltage Range <sup>(3,4)</sup>	nom. Vin= 480VAC	85VAC 120VDC		528VAC 745VDC	
Input Current	100VAC 400VAC 480VAC			110mA 40mA 35mA	
Inrush Current	cold start at +25°C	400VAC 480VAC	18A 20A		
No load Power Consumption				500mW	
Input Frequency Range	AC Input	47Hz		63Hz	
Minimum Load		0%			
<b>Notes:</b>					
Note3: The products were submitted for safety files at AC-Input operation					
Note4: Refer to „Line Derating“					
continued on next page					

- IEC/EN62368-1 compliant
- UL61010-1 certified
- CSA C22.2 No. 61010-1 certified
- IEC/EN61010-1 certified
- IEC/EN61204-3 compliant
- EN55032 compliant
- EN55014-1 compliant
- EN55014-2 compliant
- EN55024 compliant
- EN61000 compliant
- CB Report

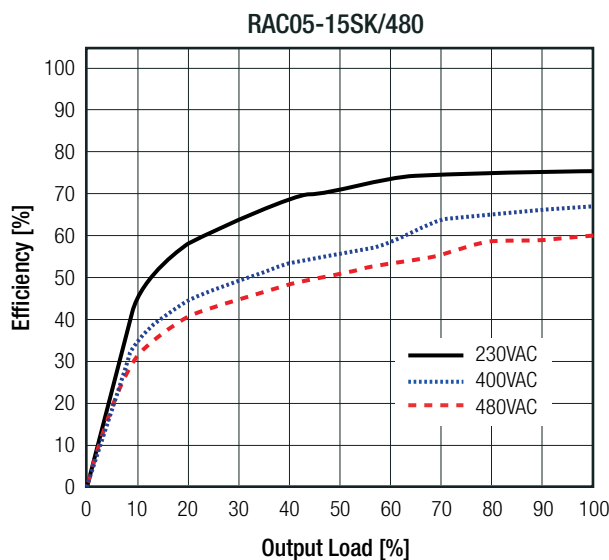
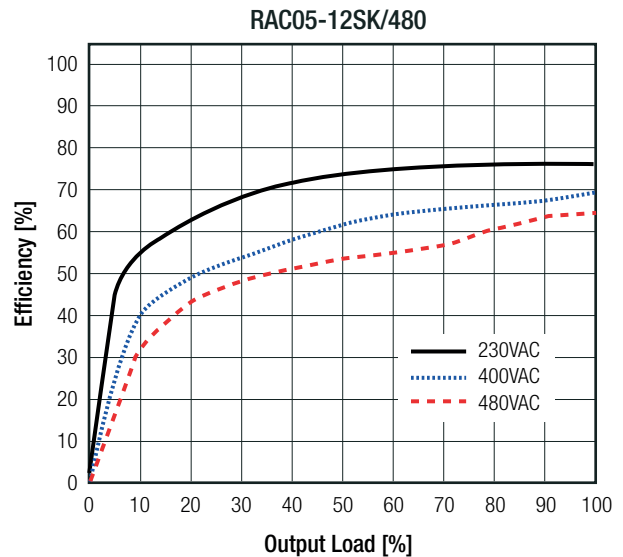
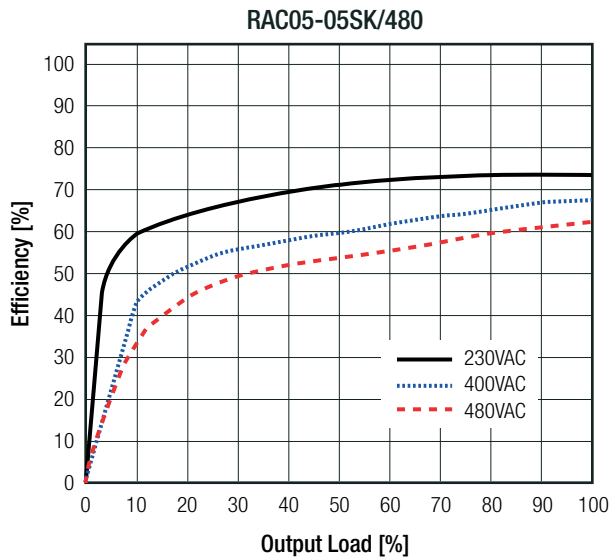
### Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Parameter	Condition		Min.	Typ.	Max.
Power Factor	400VAC/480VAC		0.45		
Start-up Time				25ms	
Rise Time					20ms
Hold-up Time	100VAC			14ms	
	400VAC			150ms	
	480VAC			200ms	
Internal Operating Frequency				130kHz	
Output Ripple and Noise <sup>(6)</sup>	20MHz BW	400VAC		50mVp-p	
		480VAC			

#### Notes:

Note5: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

### Efficiency vs. Load

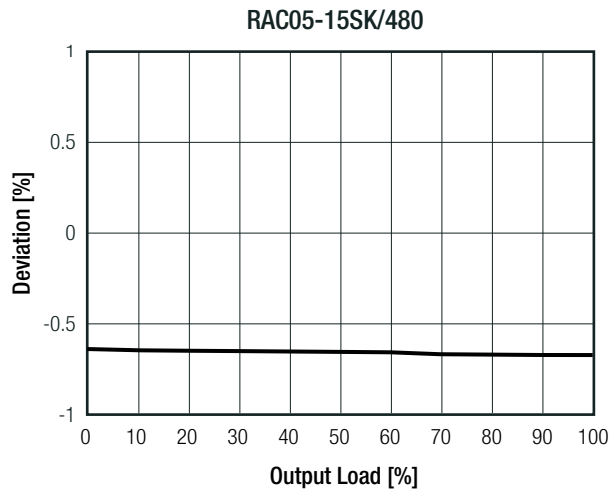
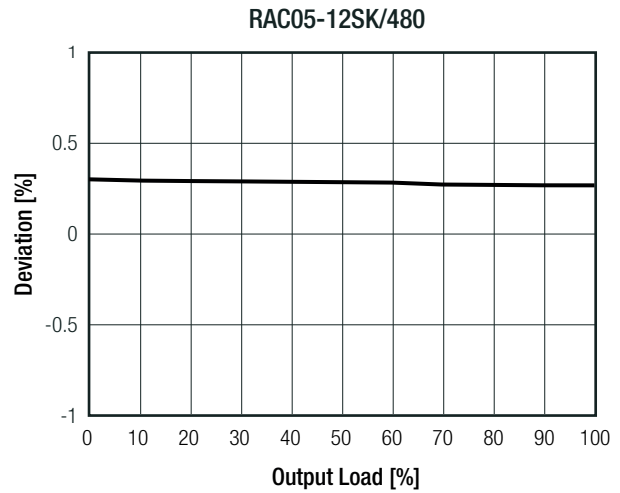
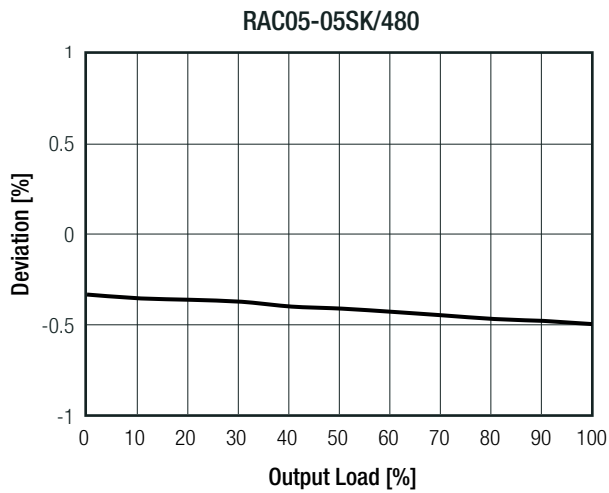


**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

**REGULATIONS**

Parameter	Condition	Value
Output Accuracy		±1.0% typ.
Line Regulation		±0.5% typ.
Load Regulation	10% to 100% load	1.0% typ.
Transient Response	25% load step change recovery time	4.0% max. 500µs typ.

**Deviation at 400/480VAC**



**PROTECTIONS**

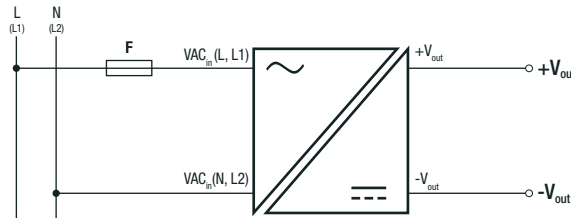
Parameter	Type	Value
Input Fuse <sup>(6)</sup>	external	slow blow 600VAC, 2A
Limited Power Source (LPS)	according to IEC62368-1 CB Report	yes
Short Circuit Protection (SCP)	below 100mΩ	hiccup, automatic restart
Over Voltage Protection (OVP)		150% - 195%, hiccup mode
Over Voltage Category		OVCIII
Over Current Protection (OCP)		150% - 195%, hiccup mode
Class of Equipment		Class II

continued on next page

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Parameter	Type		Value
Isolation Voltage <sup>(7)</sup>	I/P to O/P	1 minute	5.4kVAC
Isolation Resistance			1GΩ min.
Isolation Capacitance			100pF max.
Insulation Grade			reinforced
Leakage Current			25μA max.

**Protection Circuit** <sup>(3,6)</sup>



**Notes:**

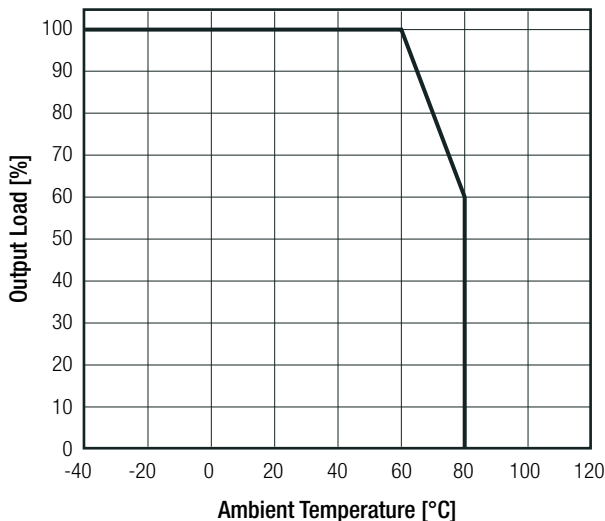
- Note6: An external fuse is mandatory in order to protect the device in addition on the AC input side. RECOM recommend: slow blow type, 600Vac, 2A.
- Note7: For repeat Hi-Pot testing, reduce the time and/or the test voltage

**ENVIRONMENTAL**

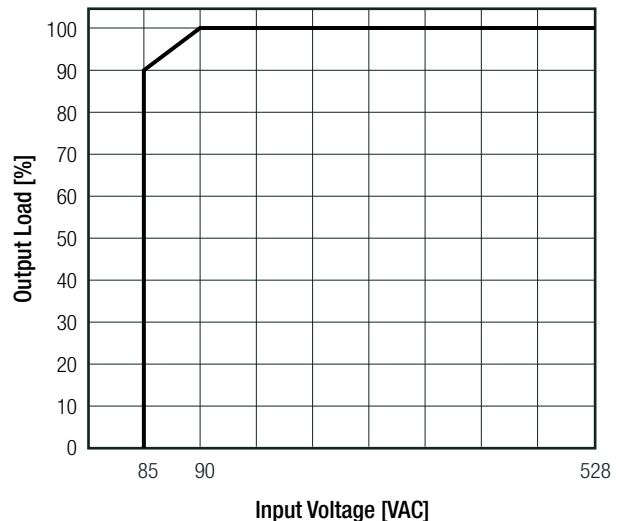
Parameter	Condition		Value
Operating Temperature Range <sup>(8)</sup>	@ natural convection 0.1m/s	full load	-40°C to +60°C
		refer to „Derating Graph <sup>(8)</sup> “	-40°C to +80°C
Maximum Case Temperature			+100°C
Temperature Coefficient			0.05%/K
Thermal Impedance	0.1m/s airflow		16K/W
Operating Altitude	according to 61010-1		5000m
Pollution Degree	according to 61010-1		PD3
Operating Humidity	non-condensing		5% - 95% RH max.
Vibration	according to MIL-STD-202G		10-500Hz, 2G 10min./1cycle, 60min. each along x,y,z axes
Design Lifetime		+25°C	105 x 10 <sup>3</sup> hours
		+60°C	40 x 10 <sup>3</sup> hours
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	>1726 x 10 <sup>3</sup> hours
		+40°C	>1585 x 10 <sup>3</sup> hours

**Derating Graph** <sup>(8)</sup>

(@ Chamber and natural convection 0.1m/s)



**Line Derating**



**Notes:**

Note8: The 12Vout and 15Vout were submitted for safety file (190415125GZU-001) for full load operation up to T<sub>AMB</sub>= +50°C only

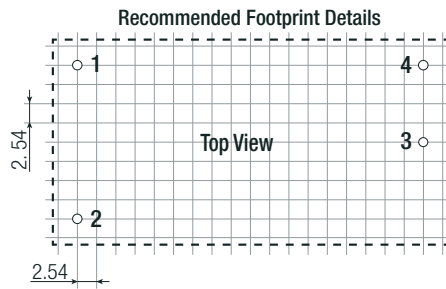
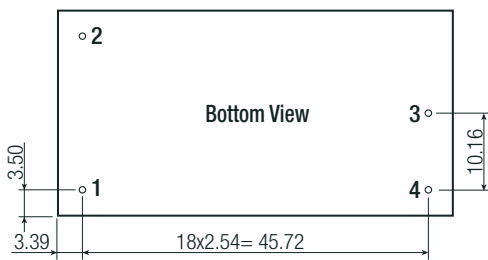
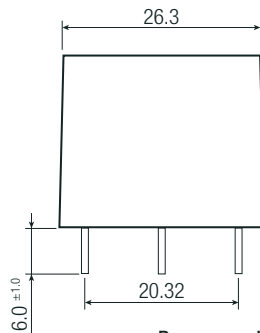
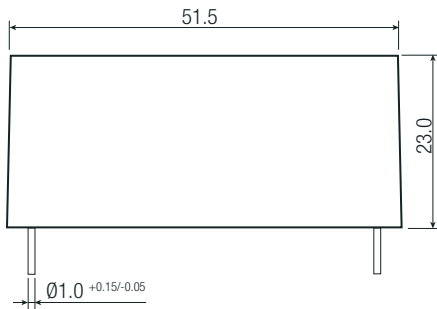
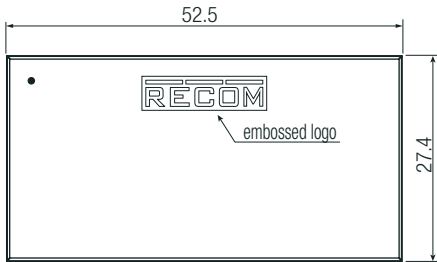
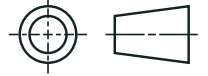
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	Report / File Number	Standard
Audio/video, information and communication technology equipment. Safety requirements (LVD)		IEC62368-1:2014 2nd Edition EN62368-1:2014 + A11:2017
Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements	190415122GZU-001	UL61010-1, 3rd Edition 2012 CSA C22.2 No. 61010-1, 3rd Edition:2012
Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements	190415125GZU-001	EN61010-1:2010
Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements (CB Scheme)		IEC61010-1:2010 + A1:2016 3rd Edition
EAC	RU-AT.03.67361	TP TC 004/020, 2011
RoHS2		RoHS-2011/65/EU + AM-2015/863
EMC Compliance		
Condition	Standard / Criterion	
Low-voltage power supplies DC output - Part 3: Electromagnetic compatibility	LCS180508025BE	IEC/EN61204-3:2018, Class B
Electromagnetic compatibility of multimedia equipment – Emission Requirements <sup>(9)</sup>		EN55032:2015, Class B
Electromagnetic compatibility of household appliances, electric tools and similar apparatus - Emission Requirements		EN55014-1:2006+A2:2011
Information technology equipment - Immunity characteristics - Limits and methods of measurement		EN55024:2010+A1:2015
Electromagnetic compatibility of household appliances, electric tools and similar apparatus - Immunity Requirements		EN55014-2:2015
ESD Electrostatic discharge immunity test	Air: ±2, 4, 8, 15kV, Contact: ±2, 4, 6, 8kV	EN61000-4-2: 2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10V/m, 80MHz-1GHz 3V/m, 1.5GHz-2GHz 1V/m, 2GHz-2.7GHz	EN61000-4-3: 2006 + A1:2009, Criteria A
Fast Transient and Burst Immunity	AC In Port: ±2.0kV (5-100kHz) DC Out Port: ±2.0kHz	EN61000-4-4:2012, Criteria A EN61000-4-4:2012, Criteria B
Surge Immunity	AC IN Port: L-N ±0.5, 1, 2, 4kV DC Out Port: ±0.5kV	EN61000-4-5:2019, Criteria A EN61000-4-5:2014+A1:2017, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	10Vrms	EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	50Hz, 30A/m	EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Voltage Dips 100% Voltage Dips 60% Voltage Dips 30% Voltage Dips 20% Voltage Interruptions > 95%	EN61000-4-11:2004+A1:2017, Criteria B EN61000-4-11:2004+A1:2017, Criteria C EN61000-4-11:2004+A1:2017, Criteria C EN61000-4-11:2004+A1:2017, Criteria C EN61000-4-11:2004+A1:2017, Criteria C
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013
<b>Notes:</b>		
Note9: If output is connected to GND, please contact RECOM tech support for advice		

DIMENSION AND PHYSICAL CHARACTERISTICS		
Parameter	Type	Value
Material	case potting PCB baseplate	black plastic, (UL94 V-0) polyurethane, (UL94 V-0) FR4, (UL94 V-0) plastic, (UL94 V-0)
Dimension (LxWxH)		52.5 x 27.4 x 23.0mm
Weight		58g typ.
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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### Dimension Drawing (mm)



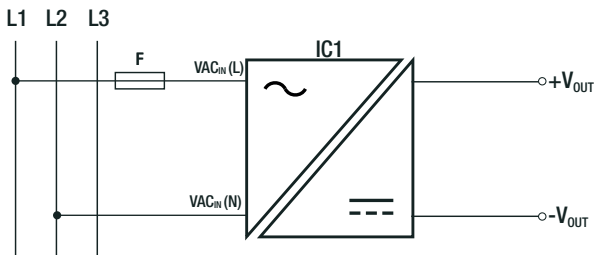
### Pin Connections

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

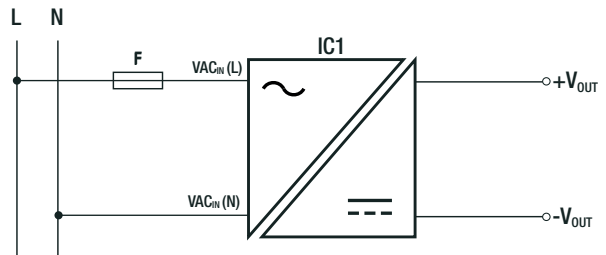
Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

### INSTALLATION AND APPLICATION

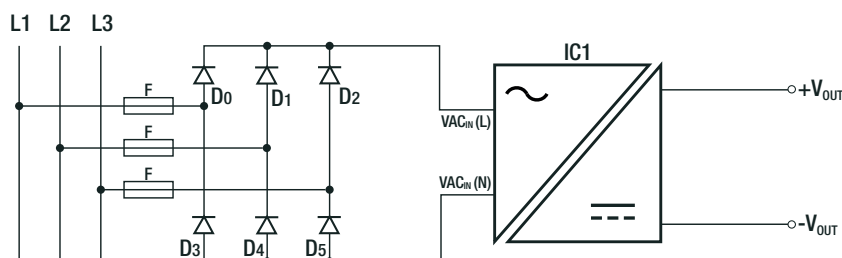
#### Phase to Phase Application



#### Standard L to N Application



#### Phase Redundancy B6U Application



**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	490.0 x 56.0 x 40.0mm
Packaging Quantity		15pcs
Storage Temperature Range		-40°C to +85°C
Storage Humidity	non-condensing	20% to 90% RH max.

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