

Features

Regulated Converter

- Wide range input: 85-264VAC
- 130W peak power
- OVC III rating
- 2MOPP medical certified, B and BF ready
- 4000m operating altitude
- Class B EMC filter built-in

RECOM
AC/DC Converter

RACM130E-K

**130 Watt
Open Frame
2"x4" or
Enclosed**



Description

The RACM130E-K AC/DC power supply series provides up to 130W output to drive dynamic loads and is certified to safety standards for the medical, ITE, industrial and household markets. With an industry-standard 2"x4" footprint, variants are available as an open card or with an enclosure. Input is wide-range for nominals from 100 to 240Vac, the output is tightly regulated and easy system integration is enabled by a wide compliance margin to EMC standard EN55032 class B. On-board dual fuses are included and the product includes immunity to surges for installation Class 3 and Over-Voltage Category OVCIII. Certifications are maintained to 4000m altitude and with a wide operating temperature range, the series is one of the most versatile on the market.

Selection Guide

Part Number	Input Voltage Range [VAC]	nom. Output Voltage [VDC]	Output Current ⁽¹⁾ [A]	Output Power [W]	Efficiency typ. ⁽²⁾ [%]
RACM130E-12SK ⁽²⁾	85-264	12	10.8	130	86
RACM130E-15SK ⁽²⁾	85-264	15	8.66	130	88
RACM130E-24SK ⁽²⁾	85-264	24	5.42	130	88
RACM130E-36SK ⁽²⁾	85-264	36	3.61	130	88
RACM130E-48SK ⁽²⁾	85-264	48	2.71	130	88

Notes:

Note1: Refer to "Thermal Derating for externally provided forced air"

Note2: Efficiency is tested at nominal input and full load at +25°C ambient



Model Numbering



Notes:

Note3: "/OF" = standard open frame version

"/ENC" = standard enclosed version

Ordering Examples:

RACM130E-12SK/OF	12Vout	Single	open frame	2" x 4"
RACM130E-15SK/ENC	15Vout	Single	enclosed	2.4" x 4.6"



ANSI/AAMI ES60601-1 Ed. 3.1 certified
CSA/CAN-C22.2 No. 60601-1:14 certified
IEC/EN60601-1 certified
IEC62368-1 certified
IEC/EN60335-1 certified
IEC/EN61558-2-16 certified
IEC/EN61558-1 certified
EN55032 compliant
EN55035 compliant

Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

BASIC CHARACTERISTICS

Parameter	Condition		Min.	Typ.	Max.
Nom. Input Voltage	50/60Hz		100VAC		240VAC
Operating Range ^(4,5)	47-63Hz		85VAC		264VAC
	DC		120VDC		370VDC
Input Current	115VAC				2.5A
	230VAC				1.5A
Inrush Current	cold start	115VAC			30A
		230VAC			60A
No load Power Consumption	@230VAC			200mW	
ErP Standby Mode Conformity (Output Load Capability)	115/230VAC	P _{IN} = 0.5W		0.2W	
		P _{IN} = 1W		0.6W	
Input Frequency Range	AC Input		47Hz		63Hz
Minimum Load			0%		
Power Factor	115VAC			0.5	
	230VAC			0.4	
Start-up Time				200ms	
Rise Time				20ms	
Hold-up Time	115VAC			16ms	
	230VAC			70ms	
Internal Operating Frequency	100% load at nominal Vin			65kHz	
Output Ripple and Noise ⁽⁶⁾	20MHz BW				1% of Vout

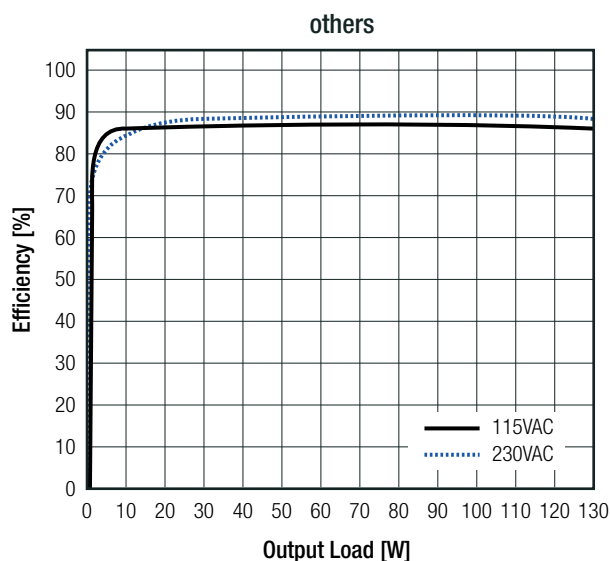
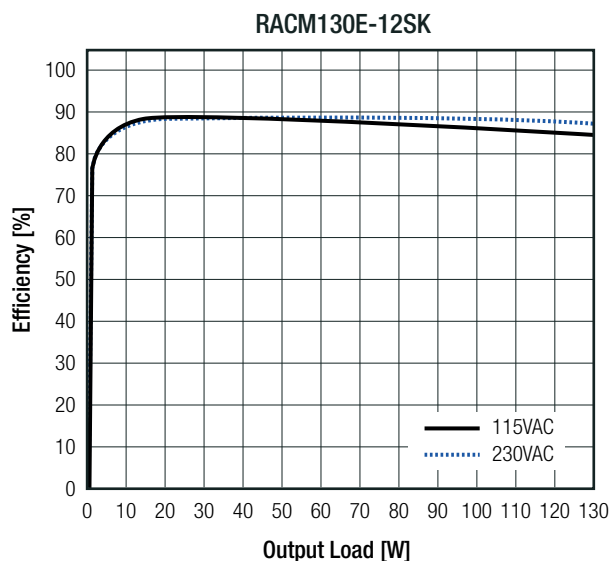
Notes:

Note4: The products were submitted for safety files at AC-Input operation

Note5: Refer to “Line Rating” & “PEAK LOAD CAPABILITY”

Note6: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

Efficiency vs. Load



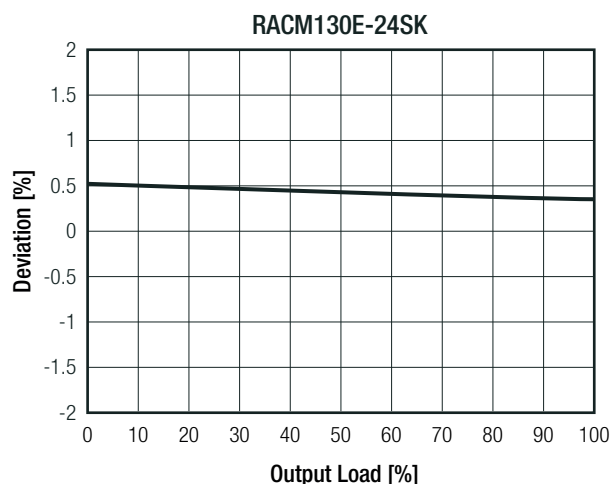
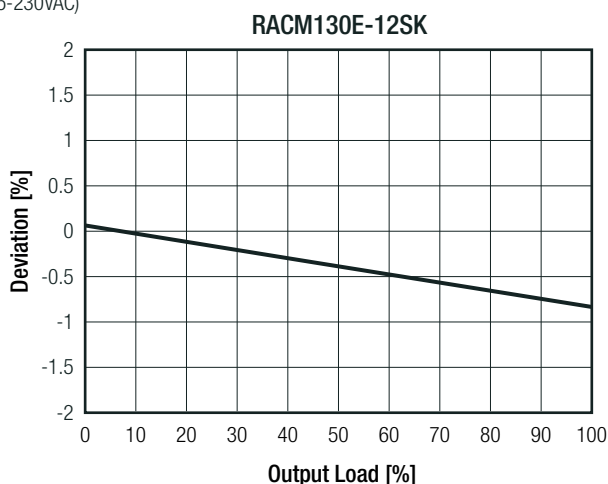
Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

REGULATIONS

Parameter	Condition	Value
Output Accuracy		±2.0% typ.
Line Regulation	low line to high line, full load	±0.5% typ.
Load Regulation ⁽⁷⁾	10% to 100% load	1.0% typ.
Transient Response	25% load step change	4.0% max.
	recovery time	500µs max.

Notes:

Deviation vs. Load
(@ 115-230VAC)



PROTECTIONS

Parameter	Type		Value
Internal Input Fuse	L and N (dual fusing)		T4A, slow blow type
Short Circuit Protection (SCP)			hiccup, auto recovery
Over Voltage Protection (OVP)			120% - 180%, auto recovery
Over Voltage Category	according to 61558-2-16		OVCIII (up to 2000m)
	according to 60601-1		OVCII
Over Current Protection (OCP)			110% - 180%, auto recovery
Isolation Voltage ⁽⁸⁾	I/P to O/P	1 minute	4kVAC
Isolation Resistance	I/P to O/P, V _{iso} = 500VDC		1GΩ min.
Isolation Capacitance	I/P to O/P, 100kHz/0.1V		100pF max.
Touch Current	264VAC/63Hz	NC	<100µA
		SFC	<500µA
Insulation Grade			reinforced
Means of Protection	≤300Vrms working voltage		2MOPP

Notes:

Note8: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Specifications (measured @ $T_a = 25^\circ\text{C}$, nom. V_{in} , 130W @ 1m/s airflow and after warm-up unless otherwise stated)

ENVIRONMENTAL

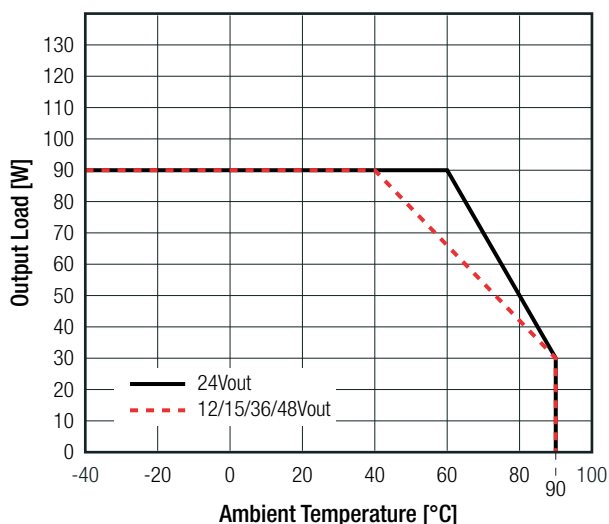
Parameter	Condition	Value
Operating Temperature Range	with derating @ natural convection 0.1m/s	-40°C to $+90^\circ\text{C}$
Temperature Coefficient		$\pm 0.05\%/K$
Operating Altitude	according to 60601-1	4000m (OVCII)
	according to 61558-2-16	2000m (OVCIII)
Operating Humidity	non-condensing	5% - 95% RH max.
Pollution Degree		PD2
Vibration	according to MIL-STD-202G	10-500Hz, 5G 10min./1cycle, period 60min. along x,y,z axes
MTBF	according to MIL-HDBK-217F, G.B.	$T_{AMB} = +25^\circ\text{C}$
		$T_{AMB} = +40^\circ\text{C}$
Design Lifetime	230VAC/50Hz and full load at $+25^\circ\text{C}$	$> 30 \times 10^3$ hours

Still air convection cooled ratings

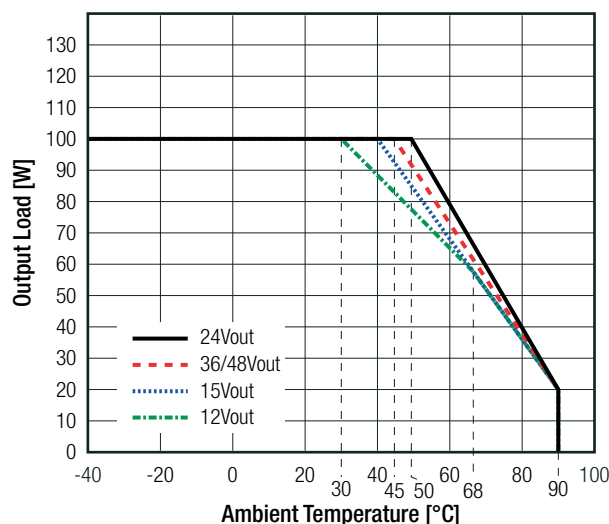
RACM130E-K/OF

(@ natural convection 0.1m/s)

100VAC



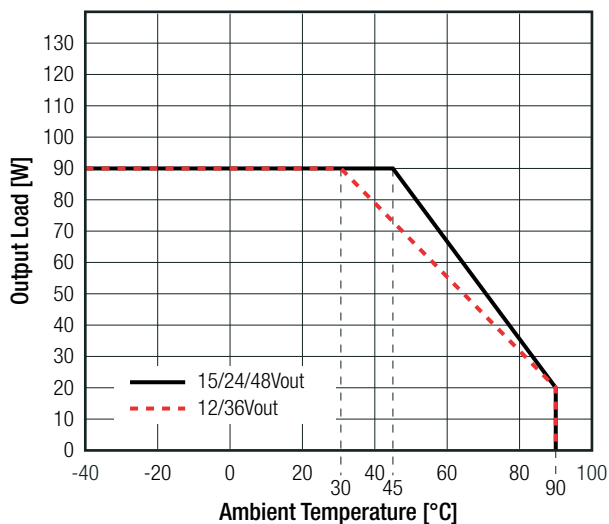
120-240VAC



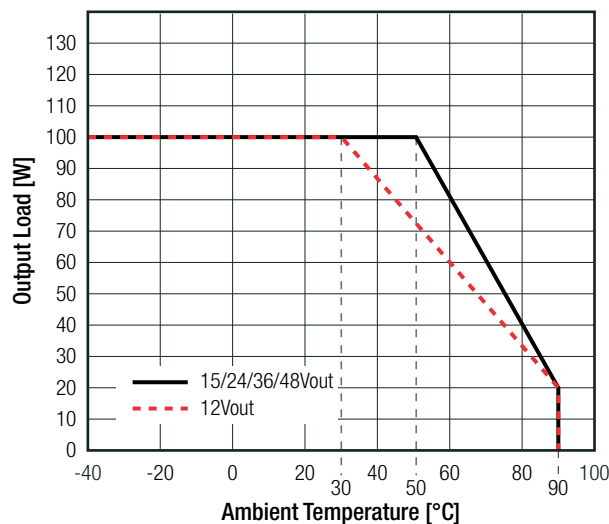
RACM130E-K/ENC

(@ natural convection 0.1m/s)

100VAC



120-240VAC



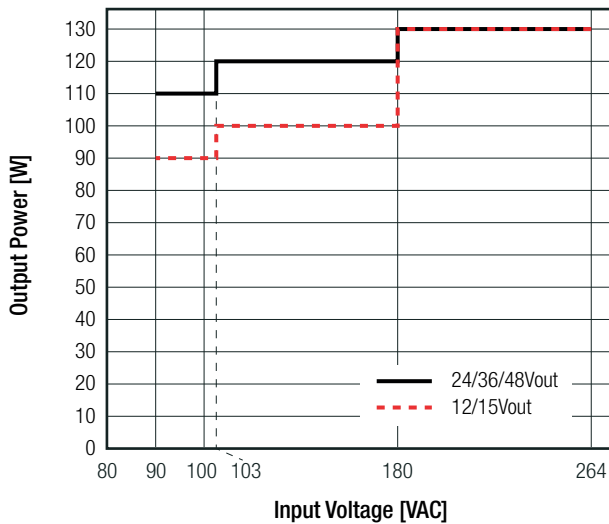
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Specifications (measured @ $T_a = 25^\circ\text{C}$, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

Thermal Derating for externally provided forced air

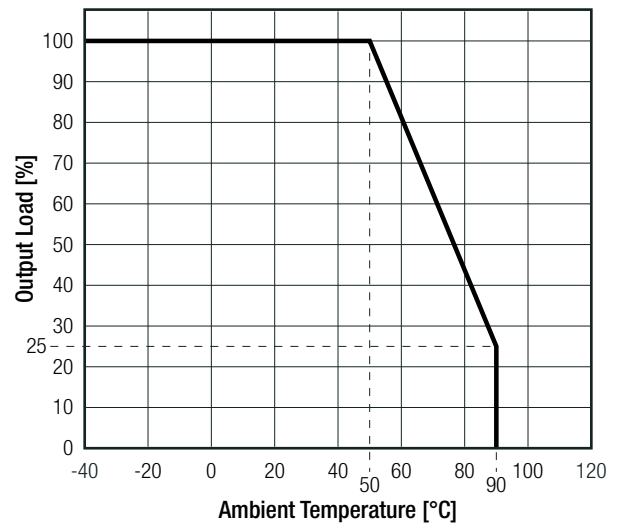
Line Rating

(@ 1m/s airflow; valid for "/OF" and "/ENC" versions)

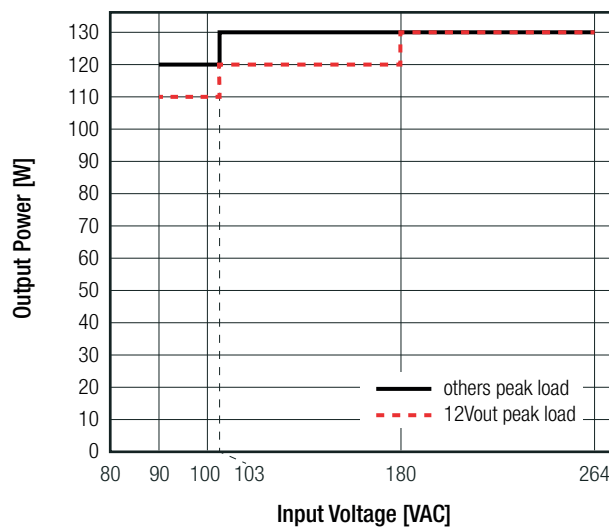


Thermal Derating

(valid for "/OF" and "/ENC" versions)



PEAK LOAD CAPABILITY (@ 0.1 m/s natural convection; valid for "/OF" and "/ENC" versions)



Calculation for recovery power:

P_p = peak output power ($\leq 130\text{W}$) [W]

P_r = recovery output power [W]

t_1 = peak time set (10s max.) [s]

t_2 = recovery time (min. $3 \times t_1$) [s]

k = safety factor 1.2 []

$$P_r = \frac{100 \times (t_1 + t_2) - (P_p \times t_1)}{t_2 \times k}$$

Practical Example (RACM130E-24SK/OF):

Take the RACM130E-24SK/OF at 230VAC input Voltage and full load at $T_{AMB} = 25^\circ\text{C}$, with natural convection.

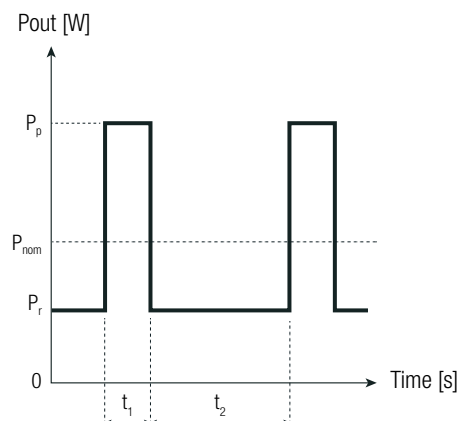
$P_p = 130\text{W}$

$t_1 = 10\text{s}$

$t_2 = 30\text{s}$

$k = 1.2$

$$P_r = \frac{100 \times (10 + 30) - (130 \times 10)}{30 \times 1.2} = 75\text{W}$$



Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

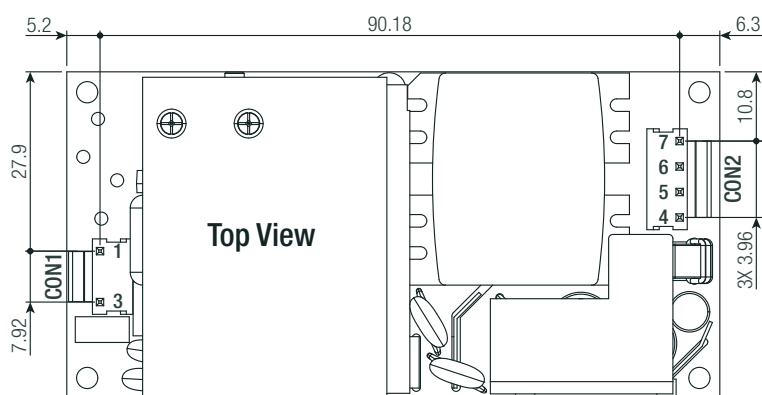
SAFETY AND CERTIFICATIONS		
Certificate Type (Safety)	Report Number	Standard
Medical electrical equipment Part 1: General requirements for basic safety and essential performance	E511305-D1002-1/A0/C0-UL	CAN/CSA-C22.2 No. 60601-1:14, 3rd Edition ANSI/AAMI ES60601-1:2005 + A2:2020
Medical electrical equipment Part 1: General requirements for basic safety and essential performance		IEC60601-1:2005 + AM1:2012 3rd Edition EN60601-1:2006 + A12:2014
Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme)	085-220335301-000	IEC62368-1:2018 3rd Edition
Household and similar electrical appliances – Safety – Part 1: General requirements (LVD)	4393463.50	IEC60335-1:2010 + C1:2016 5th Edition EN60335-1:2012 + A15:2021
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100 V Part 2: Particular requirements (CB Scheme)	085-220335401-000	IEC61558-2-16:2009 + A1:2013 1st Edition
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100 V Part 2: Particular requirements	64.250.22.03354.01	EN61558-2-16:2009 + A1:2013
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme)	085-220335401-000	IEC61558-1:2017 3rd Edition
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme)	64.250.22.03354.01	EN IEC 61558-1:2019
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	JYTAB-R01-2100249	EN/IEC61204-3:2018
ESD Electrostatic discharge immunity test	Contact: $\pm 4\text{kV}$	EN61000-4-2:2009, Criteria B
Radiated, radio-frequency, electromagnetic field immunity test	10V/m (80-1000MHz) 3V/m (1400-2000MHz) 1V/m (2000-2700MHz)	EN61000-4-3:2006, Criteria A
Fast Transient and Burst Immunity	AC Port: L-N 2kV	EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: L-N 0,5, 1kV	EN61000-4-5:2014, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 10Vrms (0.15-80MHz)	EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	30A/m	EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Dips: 100% (0.5, 1.0P), 30%, 20% 60% Interruptions: 100%	EN61000-4-11:2004, Criteria A EN61000-4-11:2004, Criteria B EN61000-4-11:2004, Criteria B
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013
EMC Compliance (EN55032)	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	JYTAB-R01-2100250	EN55032:2015
Electromagnetic compatibility of multimedia equipment - Immunity requirements		EN55035:2017
ESD Electrostatic discharge immunity test	Contact: $\pm 2, 4\text{kV}$	EN61000-4-2:2009, Criteria B
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 1kV	EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: L-N 0,5, 1kV	EN61000-4-5:2014, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 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 and Interruptions	Dips: 100%, 30% Interruptions: 100%	EN61000-4-11:2004, Criteria A EN61000-4-11:2004, Criteria B
Limits of Harmonic Current Emissions		EN61000-3-2:2014
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013

Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

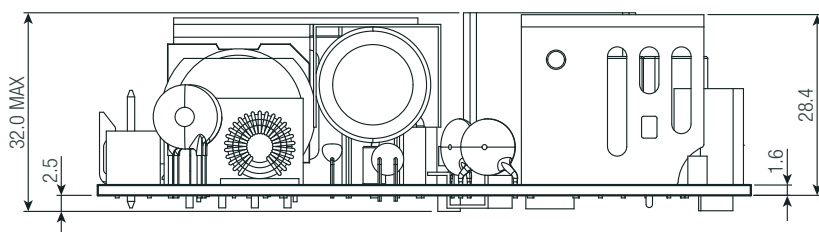
DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	PCB	FR4, (UL94-V0)
	baseplate / case ("/ENC)	aluminum
Dimension (LxWxH)	"/OF" Version	101.6 x 50.8 x 32.0mm
	"/ENC" Version	118.3 x 62.7 x 38.7mm
Weight	"/OF" Version	200g typ.
	"/ENC" Version	260g typ.

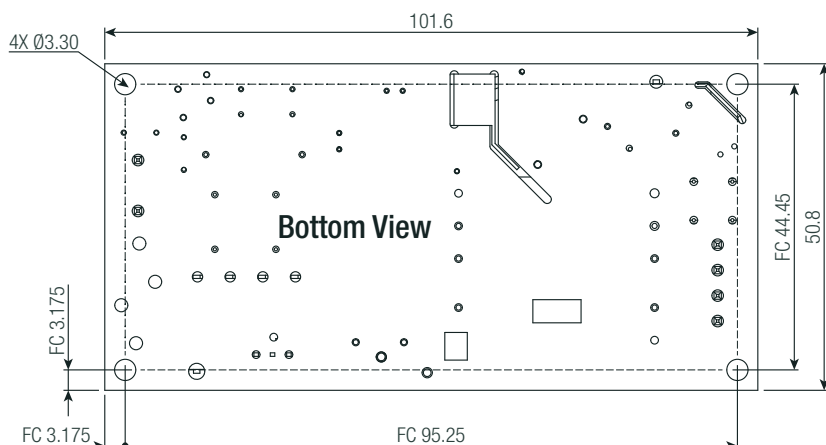
Dimension Drawing "/OF"(mm)



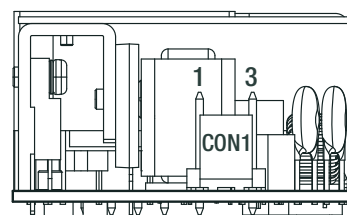
Side View



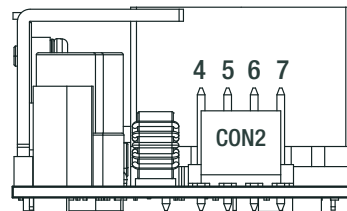
Bottom View



AC Input Side View



DC Output Side View



Connector Information

#	Function	Terminal
AC Input (CON1)		
1	VAC in (N)	3 Pins (Pin2 removed)
3	VAC in (L)	with 3.96mm pitch
DC Output (CON2)		
4,5	+VDC out	4 Pins
6,7	-VDC out	with 3.96mm pitch

FC= fixing centers

Compatible Connector

Housing

Molex 41695 Series or equivalent

Crimp Terminal

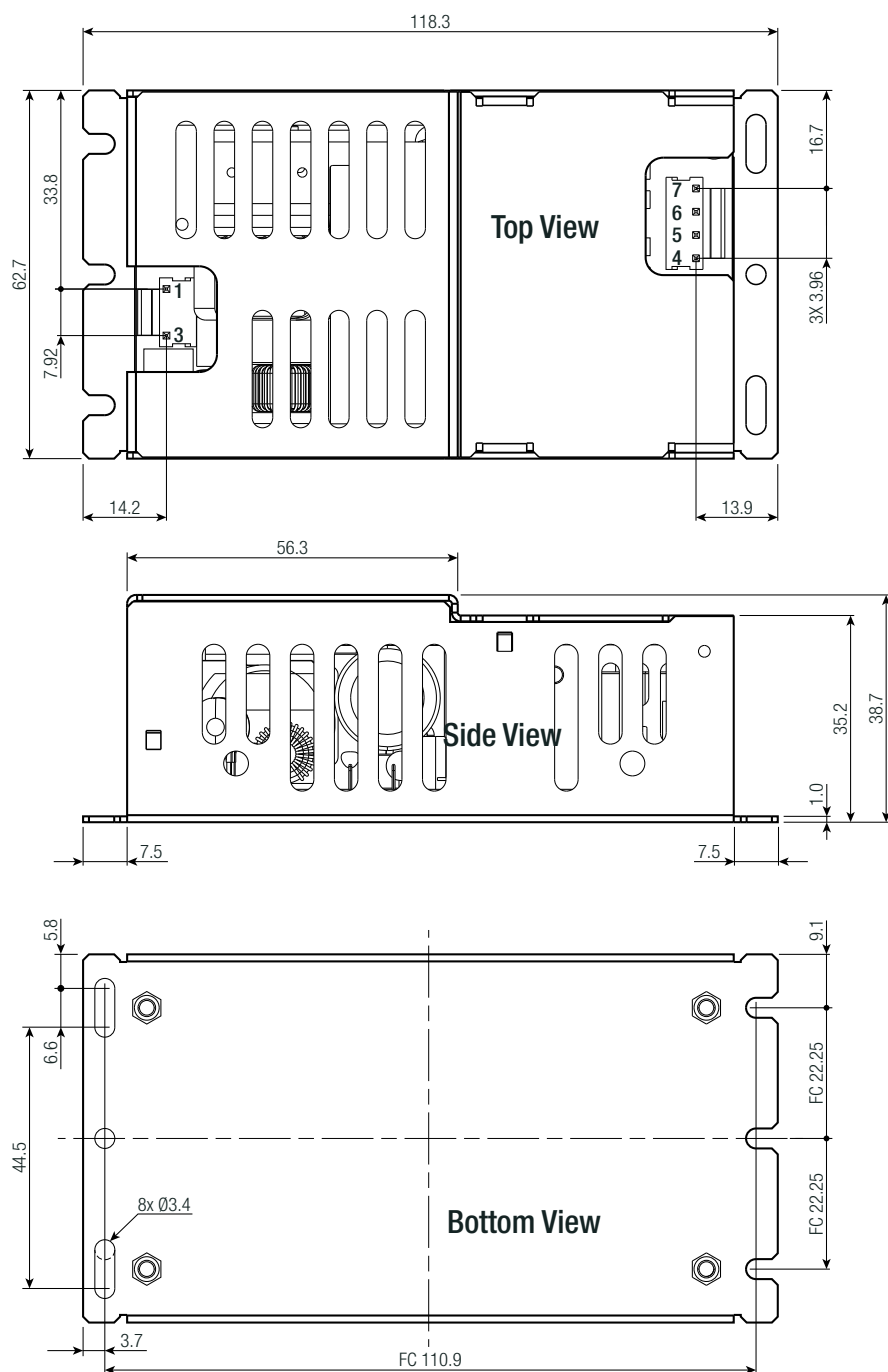
Molex 2478 Series or equivalent

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

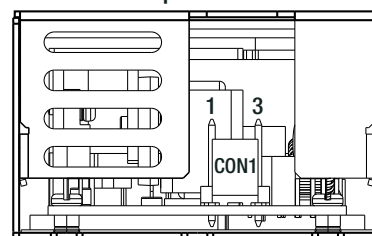
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Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

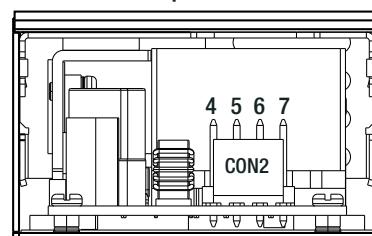
Dimension Drawing "/ENC"(mm)



AC Input Side View



DC Output Side View



Connector Information

#	Function	Terminal
AC Input (CON1)		
1	VAC in (N)	3 Pins (Pin2 removed)
3	VAC in (L)	with 3.96mm pitch
DC Output (CON2)		
4,5	+VDC out	4 Pins
6,7	-VDC out	with 3.96mm pitch

FC= fixing centers

Compatible Connector

Housing

Molex 41695 Series or equivalent

Crimp Terminal

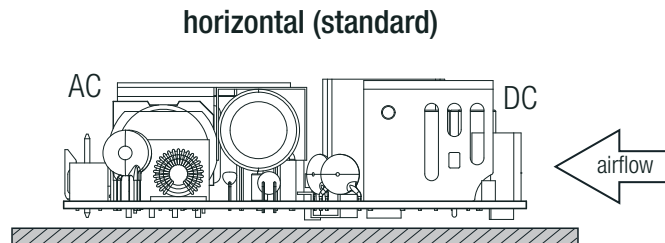
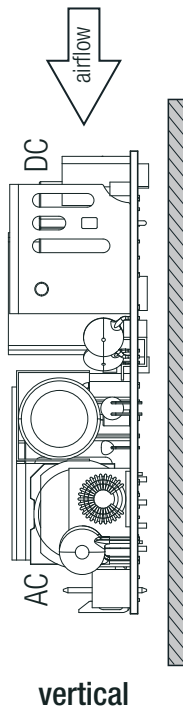
Molex 2478 Series or equivalent

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

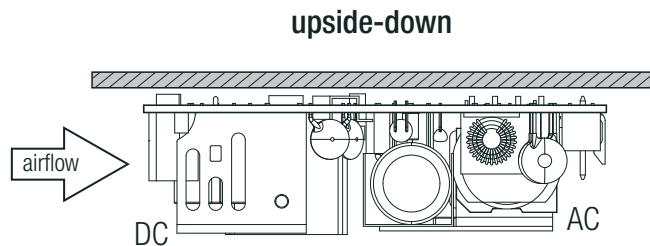
Specifications (measured @ $T_a = 25^\circ\text{C}$, nom. Vin, 130W @ 1m/s airflow and after warm-up unless otherwise stated)

APPLICATION AND INSTALLATION

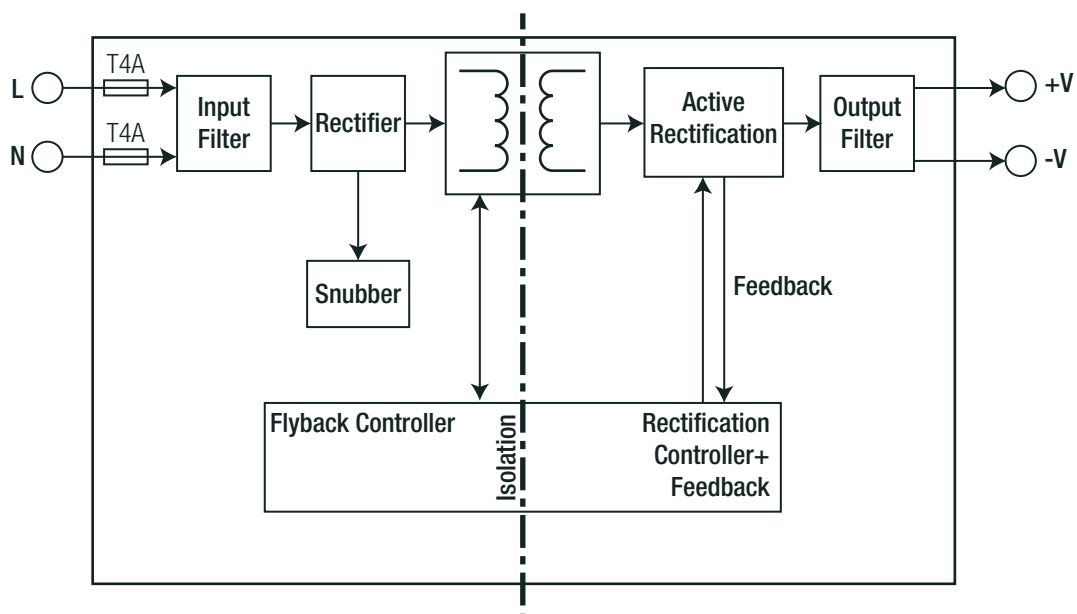
Mounting



If module is mounted vertical or upside-down with natural convection cooling, the power must be derated $\geq 10\%$.



Blockdiagram ("OF")

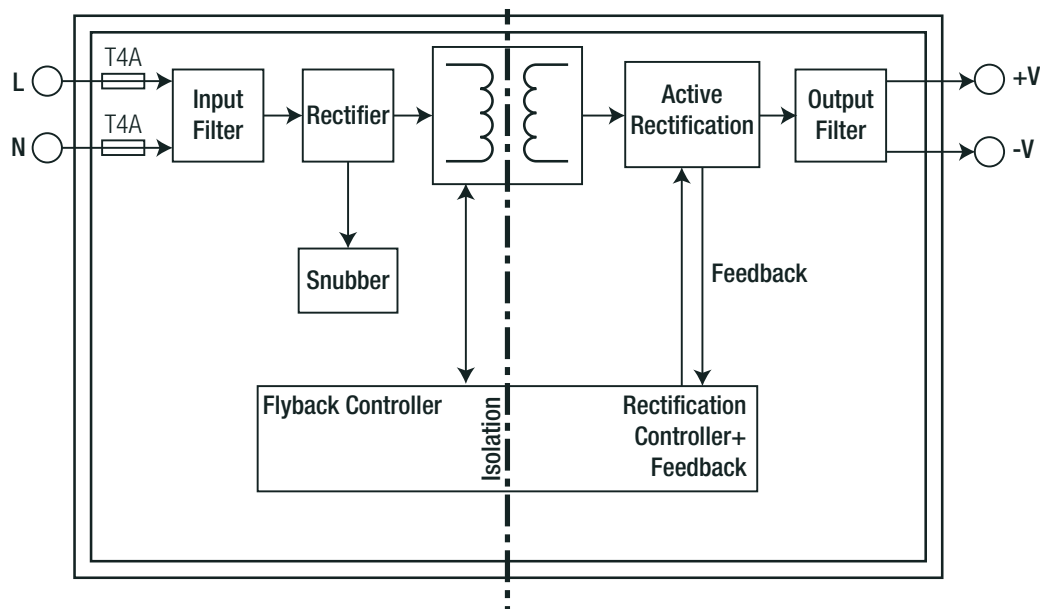


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Specifications (measured @ Ta= 25°C, nom. Vin, 130W @1m/s airflow and after warm-up unless otherwise stated)

APPLICATION AND INSTALLATION

Blockdiagram (“/ENC”)



PACKAGING INFORMATION

Parameter	Type		Value
Packaging Dimension (LxWxH)	“/OF” type	tray	365.0 x 210.0 x 56.0mm
	“/ENC” type		435.0 x 370.0 x 94.0mm
Packaging Quantity	“/OF” type		9pcs
	“/ENC” type		18pcs
Storage Temperature Range			-40°C to +90°C
Storage Humidity	non-condensing		95% max.

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