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Technical Data Sheet

RMOD400-EW Series / Plug & Play E-Mobility

400W / Extra-Wide Input 33.6V - 125VDC

RECOM DC/DC Converter

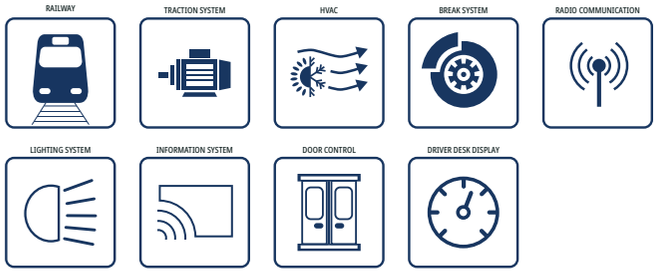
FEATURES

- On-Board DC/DC Converter
- E-Mobility and industry vehicles
- Very wide input voltage range for 48V / 80V / 96V
- Plug & Play, ready to use
- Chassis mount and base plate cooled
- Full power at ambient temperature up to 85°C
- Water and dust proof (IP69K), robust and reliable
- High and extremely constant efficiency
- Parallel operation without active current sharing
- High power density
- 2 years warranty



Dimensions (LxWxH): 203.0 x 115.0 x 61.0mm (8.0 x 4.53 x 2.4 inch)
1700g (3.75 lbs)

APPLICATIONS



SAFETY & EMC

CE UKCA cULus E196683 RoHS2+ compliant 10 from 10 Reach compliant

DESCRIPTION

The RMOD families are extremely robust plug & play modules which are used to generate the low voltage network from a vehicle's traction battery. The ultra-wide input voltage range up to 125VDC covers all common battery voltages in the off-highway vehicle (OHV) segment. Thanks to the waterproof and dust proof housing construction, the devices can be connected mechanically and thermally directly to the chassis, i.e., at any point on the vehicle, and will therefore operate reliably even under the most adverse conditions. This solution is ideal for electric vehicles with nominal 48V…96V battery-powered systems in "Off-Highway E-Mobility Applications" such as Material Handling, Forklift trucks, Golf cars, AGVs, Loaders, Construction vehicles, Airport equipment, People mover, Special vehicles, Transporters, Tractors, etc.

SELECTION GUIDE

Part Number	Input Voltage Range [VDC]	Output Voltage nom. [VDC]	Output Current max. [A]	Efficiency typ. (1) [%]	Output Power max. [W]
RMOD400-80-13SEW	33.6-125	13	30.8	80	400

Note1: Efficiency is tested at nominal input and 50%-100% +25°C ambient

MODEL NUMBERING

RMOD400-80-13SEW

- 400 — max. Output Power
- 80 — nom. Input Voltage
- 13 — nom. Output Voltage
- SEW — Single

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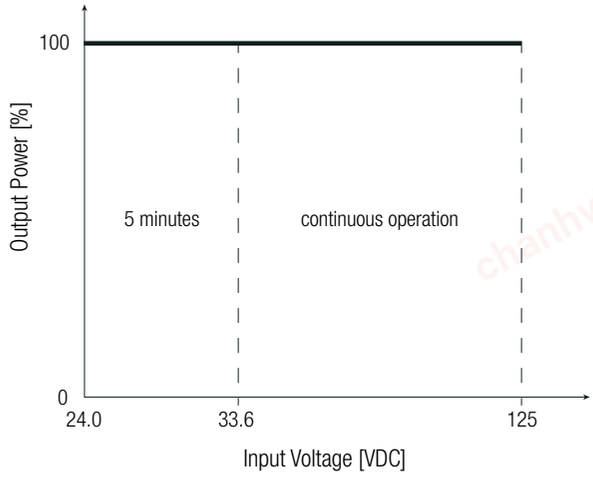
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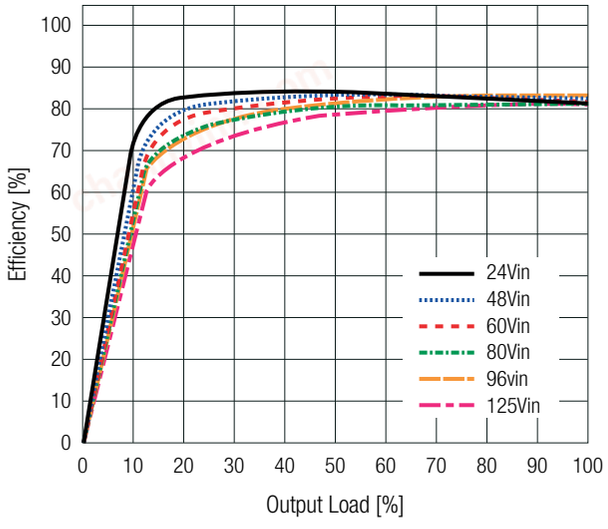
BASIC CHARACTERISTICS (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Parameter	Conditions		Min.	Typ.	Max.
Input Voltage Range	refer to **„Input Voltage Range“**	nom. V_{IN}= 48, 80, 96VDC	33.6VDC		125VDC
		Extendend range: 5 minutes max.	24VDC		33.6VDC
Input Current					22A
Inrush Current					1.5A²s
Quiescent Current	nom. V_{IN}= 80VDC				45mA
Typical Output Voltage	V_{IN}= 24-33.6VDC		12.5VDC		
	V_{IN}= 33.6-125VDC			13VDC	
Minimum Load			0%		
Start-up Time				150ms	500ms
Rise Time				50ms	
Internal Operating Frequency	MAIN power stage			130kHz	
	auxiliary			300kHz	
Output Ripple and Noise					500mVp-p

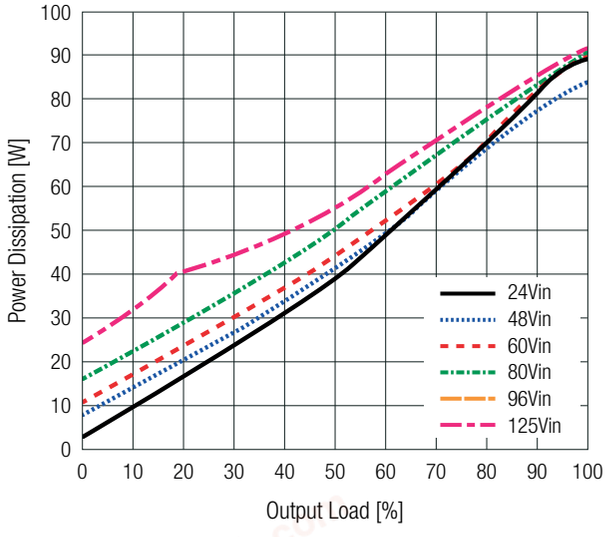
Input Voltage Range



Efficiency vs. Load



Power Dissipation vs. Load



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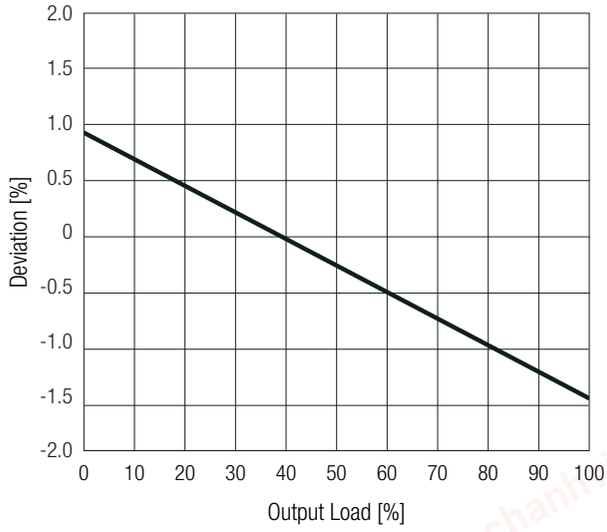
400W / Extra-Wide Input 33.6V - 125VDC

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

Parameter	Conditions		Value
Output Accuracy			±4.0% max.
Line Regulation	low line to high line, full load	V_{IN}= 33.6-125VDC	±1.0% max.
		V_{IN}= 24-33.6VDC and 96-125VDC	±3.0% max.
Load Regulation	10-90% load		4.0% typ.
Transient Response	10-90% load, V_{IN}= 33.6-125VDC		0.65VDC
	recovery time		100ms typ.

Deviation vs. Load
(nom. V_{IN})



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

Parameter	Type		Value
Short Circuit Protection (SCP)	auto recovery		current limitation
Input Reverse Polaritiy Protection	active protected		-100VDC max.
Input Short Term Over Voltage	adapted to 96VDC	according to ISO 21780 10.3	152VDC for 40ms 132VDC for 600ms
Input Long Term Over Voltage		according to ISO 21780 10.6	140VDC for 60min
Decrease and Increase of Supply Voltage		according to ISO 21780 10.8	88 - 0 - 88VDC for 21min
Over Current Protection (OCP)	auto recovery		40.5A typ.; current limitation
Over Temperature Protection (OTP)			yes
Isolation Voltage [2]	I/P to O/P; I/P to case; O/P to case; 1 minute		2.5kVDC
Isolation Resistance			10MΩ min.
Insulation Grade			basic

Note2: For repeated 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	Conditions	Value
Operating Ambient Temperature Range [3]	refer to **„Thermal Consideration“**	-35°C to +85°C
Operating Altitude		3000m
Pollution Degree		PD3
IP Rating		IP69K
MTBF	according to SR-332; T_{AMB}= +50°C	1000 x 10^3 hours

Note3: For operation above +70°C ambient, take care about sufficient cooling (never exceed max. allowed base plate temperature = 70°C)

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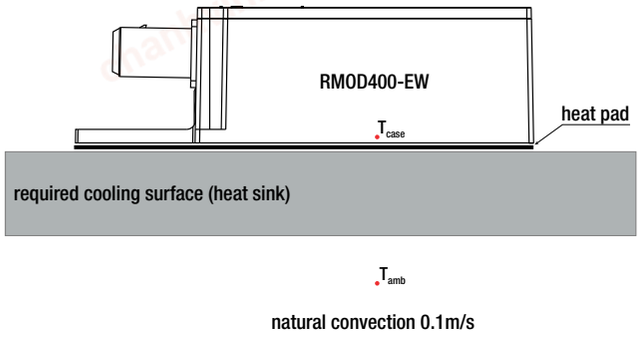
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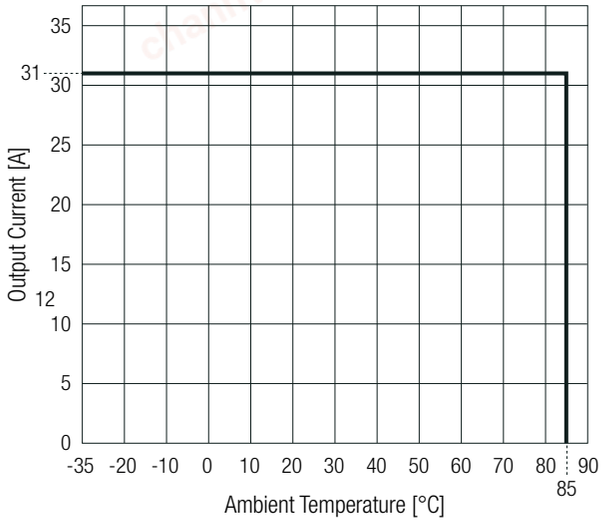
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ENVIRONMENTAL (measured @ T_{AMB}= 25°C, nom. V_{IN}, full load and after warm-up unless otherwise stated)

Thermal Consideration





The module can be used in enclosed applications with full load, as long as the cooling is sufficient to keep the baseplate temperature at T_{CASE} below 70°C. The surrounding temperature should not exceed 85°C.

ENVIRONMENTAL

Parameter	Condition	Standard
Temperature Change	duration: 240 hours and 20 cycles minimum; time at -35°C/85°C <30 minutes	EN60068-2-14
Constant Temperature- warm	duration: 96 hours, ambient: 85°C	EN60068-2-2
Temperature Shock	duration: 20 cycles; operation mode: in operation test temperature: 85°C test duration: 1hour fully tempered + 15 minutes transfer duration: < 5 seconds test medium: water 0°C, 5% dissolved salt content time under water: 5 minutes water volumes: at least 5 times the component volume no water ingress	EN60068-2-14
Humidity/Heat Cycle	max. air temperature: 55°C; number of cycles: 6 operation mode: 1 hour in operation 1 hour without function air humidity: 93%; cycles duration: 24 hours temperature change ≥ 5K/min; minimum air temperature 25°C	EN60068-2-30
Vibrations, Sinusoidal	shock load: 10g; frequency range: 10-500Hz length of time subject to load: 3x9 hours; number of cycles: 50 shock form: sinusoidal; operation mode: operational	EN60068-2-6
Continuous Shock	shock load: 10g, duration: 16ms number of impacts: 10000 shocks/axis	EN60068-2-29
Shock	shock load: 30g, duration: 6ms length of time subject to load: 3x6 directions	EN60068-2-27
Salt Spray	at 35°C for 4 hours	EN60068-2-11

SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Part1: Safety requirements 2nd Edition	E196683	UL62368-1:2014 2nd Edition CAN/CSA-C22.2 No. 62368-1-14 2nd Edition
Audio/Video, information and communication technology equipment - Part1: Safety requirements 2nd Edition		IEC62368-1:2014 2nd Edition EN62368-1:2014+A11:2017
RoHS2		RoHS 2011/65/EU + AM2015/863

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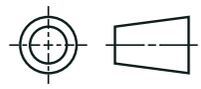
SAFETY & CERTIFICATIONS

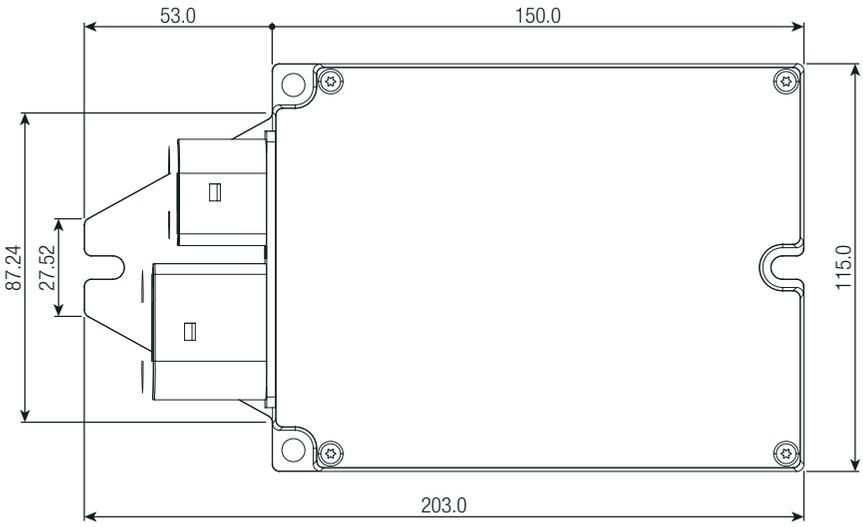
EMC Compliance	Condition	Standard
Industrial trucks - Electromagnetic compatibility		EN12895
Vehicles, boats and internal combustion engines - Radio disturbance characteristics - Limits and methods of measurement for the protection of on-board receivers		CISPR25 / EN55025
Fast Transient and Burst Immunity		EN61000-4-4
Road vehicles - Test methods for electrical disturbances from electrostatic discharge		ISO 10605
Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 2: Absorber-lined shielded enclosure		ISO 11452-2
Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 4: Harness excitation methods		ISO 11452-4
Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy - Part 8: Immunity to magnetic fields		ISO 11452-8

DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case	aluminum
Dimension (LxWxH)		203.0 x 115.0 x 61.0mm 8.0 x 4.53 x 2.4 inch
Weight		1700g typ. 3.75 lbs

Dimension Drawing (mm)





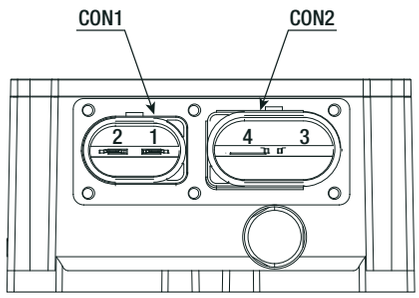
Connector Information

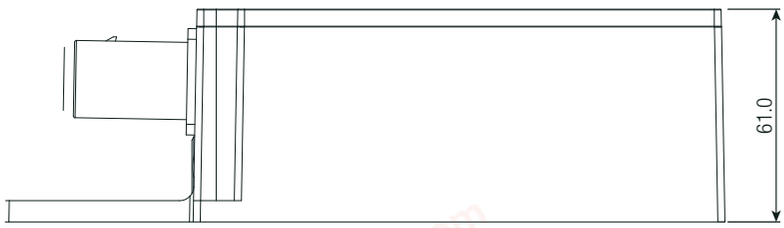
Connector	#	Function
DC Input CON1	1	$+V_{IN}$
	2	$-V_{IN}$
DC Output CON2	3	$-V_{OUT}$
	4	$+V_{OUT}$

FC= fixing centers

Compatible Connector

Connector	Housing
DC Input CON1	FEP 42122900
DC Output CON2	FEP 42161000





Tolerance: ±0.5mm

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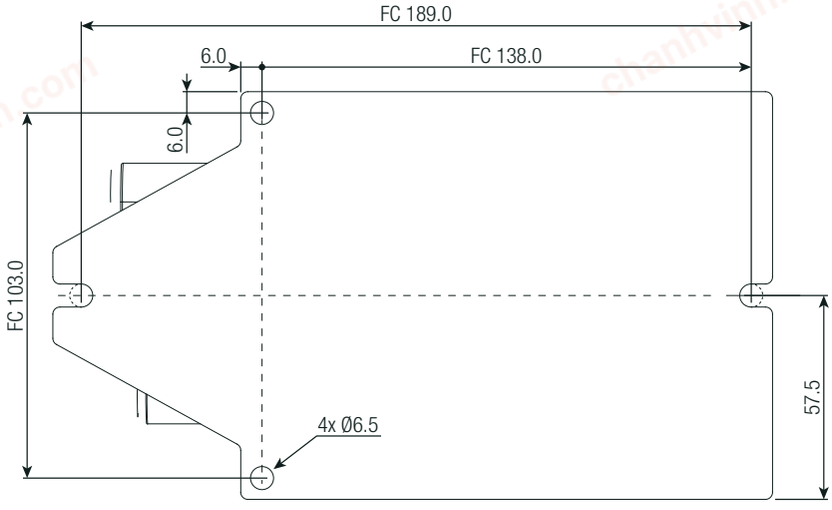
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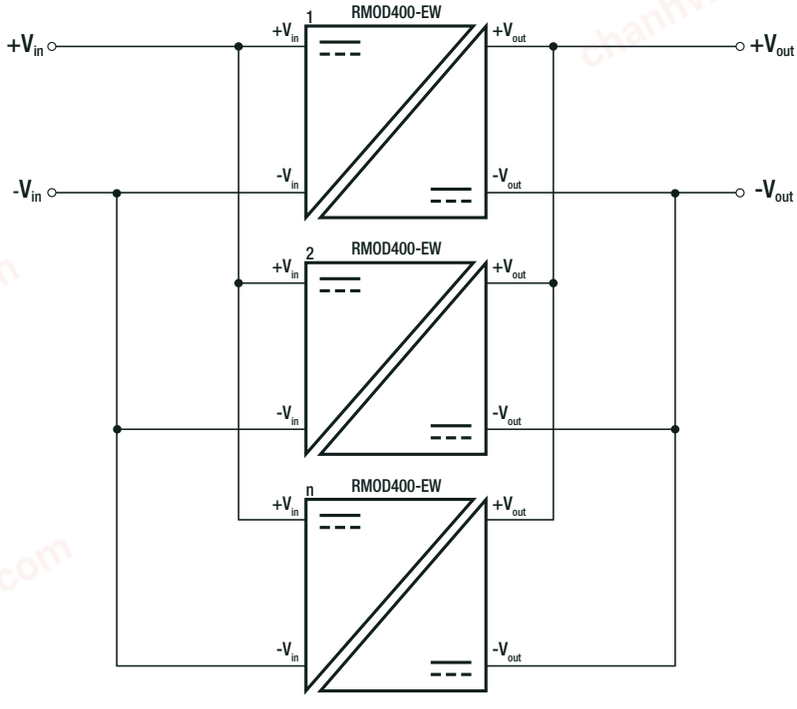


Tolerance: ±0.5mm

INSTALLATION & APPLICATION

Parallel Operation

Parallel operation is possible with all combinations of DC/DC converter versions providing they have the same rated output voltage.
There is no active current sharing and therefore the units connected in parallel could be contributing different amounts to the total load current.



PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	cardboard box	788.0 x 594.0 x 99.0mm
Packaging Quantity		10pcs
Storage Temperature Range		-40°C to +85°C
Storage Humidtiy		95% max.

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