DC-DC Converter

RCL Series

Features

- Wide 62 to 200VDC input range
- Single, Dual & Triple outputs
- Robust with very high MTBF
- Short circuit & overload protection
- Enclosure packaging
- Convenient mounting
- Operating range 0 to 70^{0}C
- 5 year warranty

Suitable for Vehicle & Rail applications. Suitable for 72V and 120V nominal rolling stock and fixed installations. For applications which also call for 24V nominal input, refer to E100 Series.

AS/NZS ISO 9001 BUREAU VERITAS Certification

SPECIFICATIONS

INPUT SPECIFICATIONS	RCLS0028	RCLS0024	RCLS0012
Input Voltage Range	62 - 200V DC		
Inrush Current	40A max (cold start at 200V DC)		
Input current at Maximum Continuous Load	2A max		
Voltage Transients and Surges	Comply with BRB/RIA Specification No. 13 and IEC 255-4 class 3		

OUTPUT SPECIFICATIONS – SINGLE OUTPUT MODELS			
Nominal Output Voltage	28V	24V	12V
Maximum Continuous Current (See Environment)	4.2A	5.0A	10A
Surge Current (1 Minute - See Environment)	5.1A	6.0A	12A
Minimum Current for ± 3% Regulation	0.5A	0.5A	2A
Minimum Current for + 7% - 3% Regulation	0.1A	0.1A	0.3A
Minimum Current for +12%- 3% Regulation	0A	0A	0A
Continuous Output Power (Ta < 35 ° C) See Environment	120W		
Surge Output Power (Ta < 35 ° C) See Environment	120W		
Line and Load Regulation	±3%		
Overload Protection	Approx. 110% of surge power		
Short Circuit Protection	Indefinite		
Output Ripple and Noise (See Note 1)	<1% P-P		

OUTPUT SPECIFICATIONS – DUAL OUTPUT MODELS	RCLD15	RCLD12
Nominal Output Voltage	15V, 15V	12V
Maximum Continuous Current (See Environment)	4.0A, 4.0A	5A, 5A
Surge Current (1 Minute - See Environment)	5.0A	6A
Minimum Current for ± 3% Regulation on Output #2	0.5A	1A
Minimum Current for + 7% - 3% Regulation on Output #2	0.1A	0.3A
Minimum Current for +12%- 3% Regulation on Output #2	0A	0A
Continuous Output Power (Ta < 35 ° C) See Environment	120W	
Surge Output Power (Ta < 35 ° C) See Environment	120W	
Line and Load Regulation	± 3%	
Overload Protection	Approx. 110% of surge power	

Short Circuit Protection	Indefinite		
Output Ripple and Noise (See Note 1)	<1% P-P		
OUTPUT SPECIFICATIONS – TRIPLE OUTPUT MODEL	**RCLT0512**		
Nominal Output Voltage	**5V**	**+12V**	**-5V**
Maximum Continuous Current (See Environment)	**10A**	**4A**	**0.1A**
Surge Current (1 Minute - See Environment)	12A	6A	0.1A
Minimum Current for ± 3% Regulation	0A	0.5A	0
Minimum Current for + 7% - 3% Regulation	0.1A	0.1A	0
Continuous Output Power (Ta < 35 ° C) See Environment	**100W**		
Surge Output Power (Ta < 35 ° C) See Environment	**100W**		
Line and Load Regulation	**± 0.5%**	**± 3%**	**1%**
Overload Protection	Approx. 110% of surgepower		
Short Circuit Protection	Indefinite		
Output Ripple and Noise (See Note 1)	<1% P-P		

GENERAL SPECIFICATIONS, ALL MODELS

Efficiency at maximum continuous load	**83% TO 87%**
Dielectric Strength Type Test Input/output	2KVRMS, 1 Min
Dielectric Strength Type Test Input/Chassis	2KVRMS, 1 Min
Dielectric Strength Type Test Output/Chassis	130VRMS, 1Min
Dielectric Strength Production test (100%) Input/output	2kVRMS, 5 Sec

Note 1: Differential output ripple and noise shall be measured at the output terminals on the PCB.Measuring equipment shall have a bandwidth of 20 MHz with probes capable of 200 MHz bandwidth. This requires that the probe earth lead be replaced with a low inductance lead.

ENVIRONMENT

Operating Temperature Range	0° C to 70° C
Maximum Operating Temperature at 5A continuous or 6A Surge without external heat sink	35° C
Maximum continuous current de-rating above 35° C without external heat sink	-0.075A/° C
Maximum temperature at middle of base with external heat sink	75° C
Storage temperature range	-40° C to 85° C
Relative Humidity	0% to 95% non-condensing
Cooling	Natural Convection
If the power supply is to be operated above 35°C ambient at maximum continuous load, an external heat sink, which may be the mounting surface, should be used. This heat sink should be sized so that the temperature at the centre of the base does not exceed 75°C at maximum continuous load. Silicone thermal compound is recommended between the base of the power supply and this heat sink/mounting surface to minimise thermal resistance. (Refer to "Example On External Heat Sink Sizing").	
If the mounting surface cannot serve as a heat sink, the maximum ambient temperature at which the rated continuous load can be drawn is 35°C. Above 35°C and without a heat sink; the maximum continuous current is de-rated linearly to 60W at 70°C maximum. The surge loads are de-rated linearly to 50% max. at 70°C.	

MODEL OPTIONS

There are three different options: RCLxxxxx, RCLxxxxx-CLY and RCLxxxxx-EMD. The only difference between the 3 models is the termination. The 'Standard' option (without –CLY or –EMD) is a 4-pole screw type terminal. The option "-CLY" uses open type spade terminals for quick connect lugs and "-EMD" employs Wago cage clamp terminals assembled on a DIN rail.

MECHANICAL SPECIFICATIONS

Option	In "mm"			In "Inches"		
	L	W	H	L	W	H
Standard	170	110	55	6.7	4.33	2.16
-CLY	160	110	85	6.3	4.33	3.34
-EMD	160	110	120	6.3	4.33	4.72

MTBF

Demonstrated Mean Time Before Failure on a sample size of 900 in a typical operating environmenton railway rolling stock over a two year sample period and typical average load of 24V / 3.5A : >1,200,000 Hours.

EXAMPLE ON EXTERNAL HEATSINK SIZING

Typically, these converters will be mounted on a steel bulkhead, which will provide additional heat sink capacity at no extra cost. The converter, in this example, is required to operate at a **continuous** load of **5A** at an ambient temperature of **50°C**. The appropriate size of heat sink is determined as follows:

Power Output = 5A*24V = 120W

Power Dissipation = (120 * (1 - efficiency))/efficiency
= (120 * 0.14)/.86 = 19.5W

Thermal resistance base to heat sink = 0.2° C/W this is typical with a flat surface and silicone heat sink compound.

Maximum Heat sink Temperature = Max base temp - (Thermal res base to sink * Diss)
= 75° C - (0.2° C/W * 19.5W
= 71.1° C

Approximate heat sink area = (850 * Dissipation)/(Temp Sink - Temp Ambient)
= (850 * 19.5)/(71.1 - 50)
= 786 square centimetres.