MELCHER™

RCM500/1000 Series

500/1000 W DC-DC Converters





The RCM500 and RCM1000 Series converters are reliable power supplies for railway and transportation systems. They are optimized for 72 or 110 V railway batteries. The output delivers 24 V with 500 or 1000 W. The converters are designed for chassis mounting and exhibit a closed housing with cooling openings.

Many options are available, such as an output ORing FET for redundant operation, output voltage adjustment, interruption time of 10 ms, shutdown input, and a monitoring relay (change-over contact).

FEATURES

- Optimized for 72 V or 110 V railway batteries
- Output voltage 24 V
- Closed housing for chassis mounting
- Extremely high efficiency and high power density
- Low inrush current
- 3 connectors: Input, output, auxiliary (option)
- Overtemperature, overvoltage, overcurrent, and short-circuit protection
- Many options available
- Compliant to EN 50155, EN 50121-3-2, AREMA
- RoHS-compatible for all 6 substances
- Fire and smoke: compliant to EN 45545 and NFPA 130
- 5 year warranty
- Safety-approved to the 3rd edition of IEC/EN 62368-1 and UL/CSA 62368-1

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RCM500/1000 Series

500/1000 W DC-DC Converter

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MODEL SELECTION

Table 1: Standard models

Input voltage					Output		Power	Efficiency [2]	Model	Options
$V_{i\,min}$ [1] [V]	$V_{i\,cont}$ [V]			$V_{i\,max}$ [1] [V]	$V_{o\,nom}$ [V]	$I_{o\,nom}$ [A]	$P_{o\,nom}$ [W]	η_{typ} [%]		
43.2	50.4	(72)	90	110	24	21	500	96	72RCM500-24	D, M, Q, F, K
					24	42	1000	96	72RCM1000-24	
66	77	(110)	137.5	154	24	21	500	96.4	110RCM500-24	
					24	42	1000	96.4	110RCM1000-24	

[1] Short time; see table 2 for details.
[2] Efficiency at T_A = 25 °C, $V_{i\,nom}$, $I_{o\,nom}$, $V_{o\,nom}$.

Part Number Description

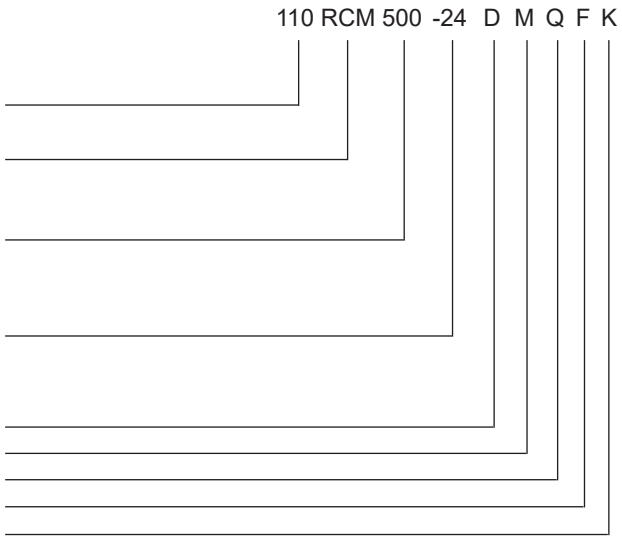
Operating input voltage $V_{i\,cont}$ (continuously):
- 50.4 – 90 VDC 72
- 77 – 137.5 VDC 110

Series ..... RCM

Output power:
- 500 W 500
- 1000 W 1000

Nominal output voltage:
- 24 V ..... -24

Auxiliary functions and options:
- Out OK, output voltage adjust, shutdown [1] ..... D
- Interruption time ..... M
- ORing FET ..... Q
- Fuse built-in ..... F
- Pluggable Connectors ..... K



[1] Opt. D requires the auxiliary connector.

Note: The sequence of options must follow the order above.

Note: All models are RoHS-compliant for all six substances.

Available combinations of options:

72/110RCMxxx-24 (K)
72/110RCMxxx-24D (K)
72/110RCMxxx-24DF (K)
72/110RCMxxx-24DMQ (K)
72/110RCMxxx-24DMQF (K)

Example: 110RCM500-24DMQ: DC-DC converter, input voltage range 77 to 137.5 V continuously, output providing 24 V /21 A, monitoring relay, output voltage adjust, shutdown input, active current sharing, interruption time 10 ms, integrated ORing FET, RoHS-compliant for all six substances.

Product Marking

Type designation, applicable safety approval and recognition marks, CE mark, pin allocation, and product logo.

Input voltage range and input current, nominal output voltage and current, degree of protection, batch no., serial no., and data code including production site, version (modification status) and date of production.

FUNCTIONAL DESCRIPTION

The input voltage is fed via an efficient input filter and a step-up converter (switching with 2 × 110 kHz) to the high-efficient DC-DC converter operating at a switching frequency of approximately 90 kHz. The built-in overvoltage limiter protects against input voltage surges.

The inrush current is limited by an electronic circuitry. A VDR resistor protects against external surges.

If there is no external circuit breaker, the converter can be ordered with built-in fuse (opt. F). This fuse is not accessible.

The circuitry to provide the interruption time (opt. M) is located after the input filter together with the reverse polarity protection formed by a FET.

The rectification on the secondary side is provided by synchronous rectifiers, in order to keep the losses as low as possible. The output voltage control logic is located on the secondary side and controls the FETs of the DC-DC converter via insulated drivers.

An auxiliary converter supplies all circuits with a stable bias voltage.

An output ORing FET is available (opt. Q) and allows for a redundant power supply system.

Opt. D encompasses an additional signal connector to allow for output voltage adjustment, active current sharing, primary shutdown, and an output voltage monitor activating a relay with change-over contact.

The converter is mounted onto a base plate which acts as cooling plate. An additional heatsink for natural convection cooling is available as accessory. A thermal protection on the input and output side prevents from overheating.

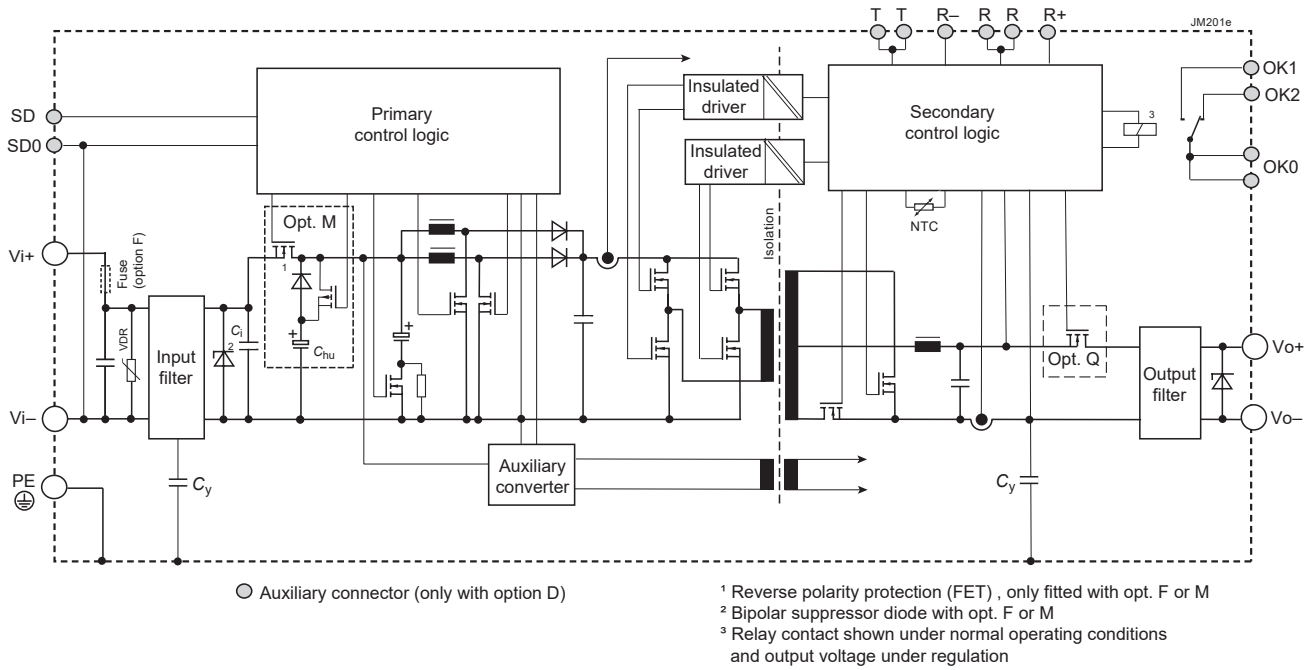


Fig. 1
Block diagram

ELECTRICAL INPUT DATA

General conditions:
- T_A = 25 °C, unless specified.

Table 2a: Input data of RCM500 models

Model			72RCM500-24			110RCM500-24			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	
V_i	Operating input voltage	I_o = 0 – $I_{o\,max}$ $T_{A\,min}$ – $T_{A\,max}$	50.4	(72)	90	77	(110)	137.5	V
$V_{i\,2s}$	for ≤ 2 s	without shutdown	43.2		100.8	66		154	
$V_{i\,nom}$	Nominal input voltage			72			110		
$V_{i\,abs}$	Input voltage limits	3 s without damage	0		108	0		165	
I_i	Typical input current	$V_{i\,nom}$, $I_{o\,nom}$		7.3			4.8		A
$P_{i\,0}$	No-load input power	$V_{i\,min}$ – $V_{i\,max}$, I_o = 0		2.5	4		2.5	4	W
$P_{i\,SD}$	Idle input power	$V_{i\,min}$ – $V_{i\,max}$, V_{SD} = 0 V		2	3		2	3	
C_i	Input capacitance [1]			7			7		µF
R_i	Input resistance			14			14		mΩ
$I_{inr\,p}$	Peak inrush current [2]	V_i = $V_{i\,max}$, $P_{o\,nom}$			25			25	A
$t_{inr\,d}$	Duration of inrush current				2			2	ms
t_{on}	Start-up time	0 → $V_{i\,min}$, $P_{o\,nom}$			1000			1000	
	Start-up time after removal of shutdown	$V_{i\,min}$, $P_{o\,nom}$ V_{SD} = 0 → 5 V		300	500		300	500	

Table 2b: Input data of RCM1000 models

Model			72RCM1000-24			110RCM1000-24			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	
V_i	Operating input voltage	I_o = 0 – $I_{o\,max}$ $T_{A\,min}$ – $T_{A\,max}$	50.4	(72)	90	77	(110)	137.5	V
$V_{i\,2s}$	for ≤ 2 s	without shutdown	43.2		100.8	66		154	
$V_{i\,nom}$	Nominal input voltage			72			110		
$V_{i\,abs}$	Input voltage limits	3 s without damage	0		108	0		165	
I_i	Typical input current	$V_{i\,nom}$, $I_{o\,nom}$		15			9.5		A
$P_{i\,0}$	No-load input power	$V_{i\,min}$ – $V_{i\,max}$, I_o = 0		3	4		3	4	W
$P_{i\,SD}$	Idle input power	$V_{i\,min}$ – $V_{i\,max}$, V_{SD} = 0 V		2.5	3		2.5	3	
C_i	Input capacitance [1]			7			7		µF
R_i	Input resistance			14			14		mΩ
$I_{inr\,p}$	Peak inrush current [2]	V_i = $V_{i\,max}$, $P_{o\,nom}$			25			20	A
$t_{inr\,d}$	Duration of inrush current				4			6	ms
t_{on}	Start-up time	0 → $V_{i\,min}$, $P_{o\,nom}$			1000			1000	
	Start-up time after removal of shutdown	$V_{i\,min}$, $P_{o\,nom}$ V_{SD} = 0 → 5 V		300	500		300	500	

[1] Not smoothed by the inrush current limiter at start-up (for inrush current calculation)
[2] Initial peak current caused by charging EMI suppression capacitors is disregarded from inrush current considerations.

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Input Transient and Reverse Polarity Protection

A VDR resistor and a symmetrical input filter form an effective protection against input transients, which typically occur in many installations, but especially in battery-driven mobile applications.

If the input voltage has the wrong polarity, the incorporated reverse diode will cause the external input circuit breaker or fuse to trip. With option M or F (incorporated fuse), an active reverse-polarity protection circuit prevents from any damage.

Input Under-/Overvoltage Lockout

If the input voltage is out of range, an internally generated signal disables the converter to avoid any damage.

Efficiency

See fig. 2 for efficiency curves of selected models.

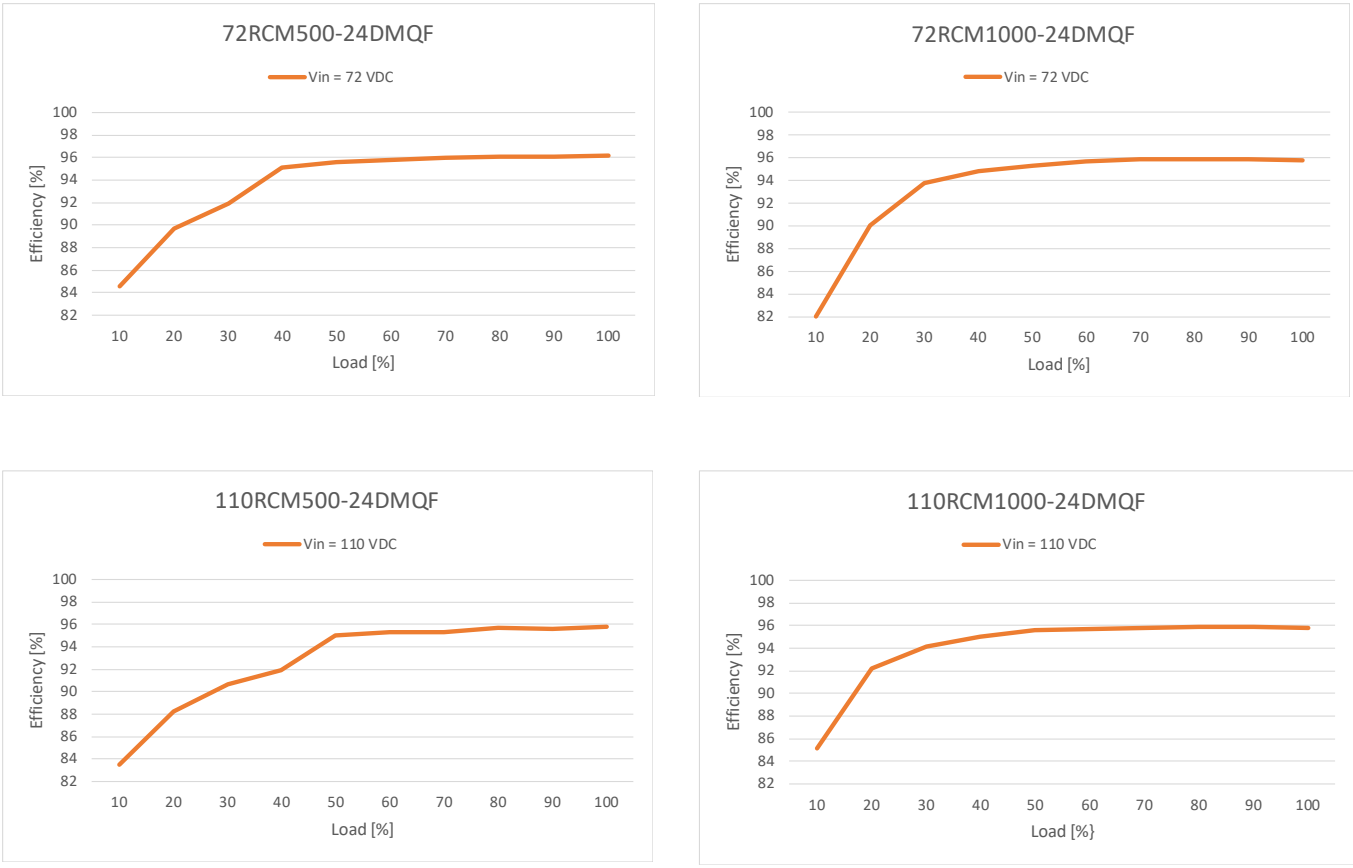


Fig. 2
Typical efficiency versus output load

ELECTRICAL OUTPUT DATA

General conditions:

- T_A = 25 °C, unless T_C is specified
- R input not connected

Table 3: Output data

Model / Characteristics			Conditions	72/110RCM500-24 min	72/110RCM500-24 typ	72/110RCM500-24 max	72/110RCM1000-24 min	72/110RCM1000-24 typ	72/110RCM1000-24 max	Unit
V_o	Output voltage [1]		$V_{i\,nom}$, 0.5 $I_{o\,nom}$	23.76	24	24.24	23.76	24	24.24	V
V_{ow}	Worst case output voltage		$V_{i\,min} - V_{i\,max}$ $T_{C\,min} - T_{C\,max}$, 0 - $I_{o\,nom}$	23.28		24.72	23.28		24.72	V
$V_{o\,droop}$	Output voltage droop				- 10			- 5		mV/A
$V_{o\,L}$	Overvoltage shutdown [6]				28			28		V
$V_{o\,P}$	Overvoltage protection [2]			28.5	30	31.5	28.5	30	31.5	V
$I_{o\,nom}$	Nominal output current		$T_{C\,min} - T_{C\,max}$		21			42		A
$I_{o\,L}$	Output current limit					23			45	A
v_o	Output noise [3]	Switching frequency	$V_{i\,nom}$, $I_{o\,nom}$ BW = 20 MHz			240			240	mV_{pp}
		Total incl. spikes				480			480	mV_{pp}
v_{od}	Dynamic load regulation	Voltage deviation [5]	$V_{i\,nom}$, 0.1↔0.9 $I_{o\,nom}$			1000			1000	mV_{pp}
t_d [4]		Recovery time				5			5	ms
α_{vo}	Temperature coefficient of v_o (NTC)		0 - $I_{o\,nom}$, $T_{C\,min} - T_{C\,max}$	- 0.02		0	- 0.02		0	%/K

[1] If the output voltage is increased above $V_{o\,nom}$ through R-input control, the output power should be reduced accordingly, so that $P_{o\,max}$ and $T_{C\,max}$ are not exceeded.
[2] Breakdown voltage of the incorporated suppressor diode at 1 mA . Exceeding this value might damage the suppressor diode.
[3] Measured according to IEC/EN 61204 with a probe described in annex A
[4] Recovery time until V_o returns to ±1% of V_o; see fig. 3.
[5] No overshoot at switch on.
[6] Output overvoltage shutdown by an electronic circuitry, with automatic recovery.

Output Voltage Regulation

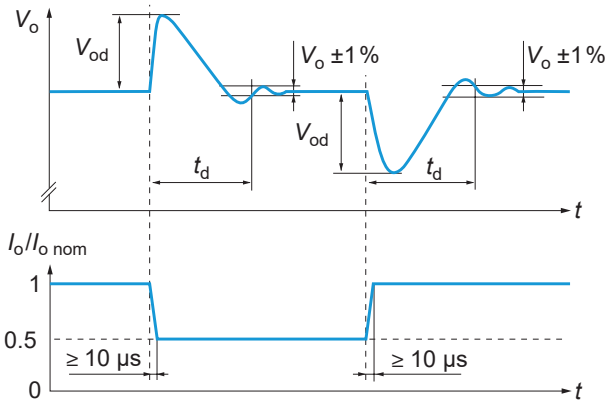


Fig. 3
Typical dynamic load regulation of output voltage

Output Current Limitation

The output is continuously protected against open-circuit (no load) and short-circuit by an electronic current limitation with rectangular characteristic; see fig. 4.

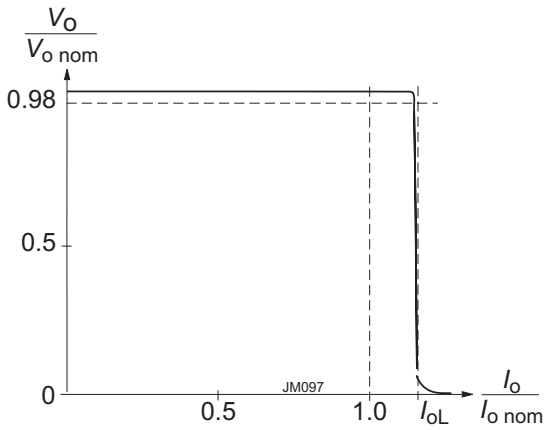


Fig. 4
Rectangular current limitation

Series, Parallel Connection, Redundancy

The outputs of several RCM Series converters may be connected in series.

Note: If the sum of the output voltages is greater than 60 V, it cannot be considered being SELV (Safety Extra Low Voltage) according to the safety standards. but the voltage may exceed the SELV level.

The outputs RCM Series converters may be connected in parallel. In order to ensures proper current sharing, the load lines should have equal length and section. The output voltage exhibits a slight droop characteristic, which facilitates current sharing. In addition, the output voltage tends to be lowered with increasing temperature.

Converters with option D exhibit an additional pin T to provide active current sharing by simply interconnecting all T- pins. For redundant systems, we recommend option Q, which exhibits ORing diodes built by FETs, in order to keep the losses to a minimum. Figure 5 shows a system with 3 parallel-connected converters forming a redundant system. The output voltage is increased by the resistor R_{ext2} (as an example). The OK signals, connected in series, allow for monitoring all 3 converters.

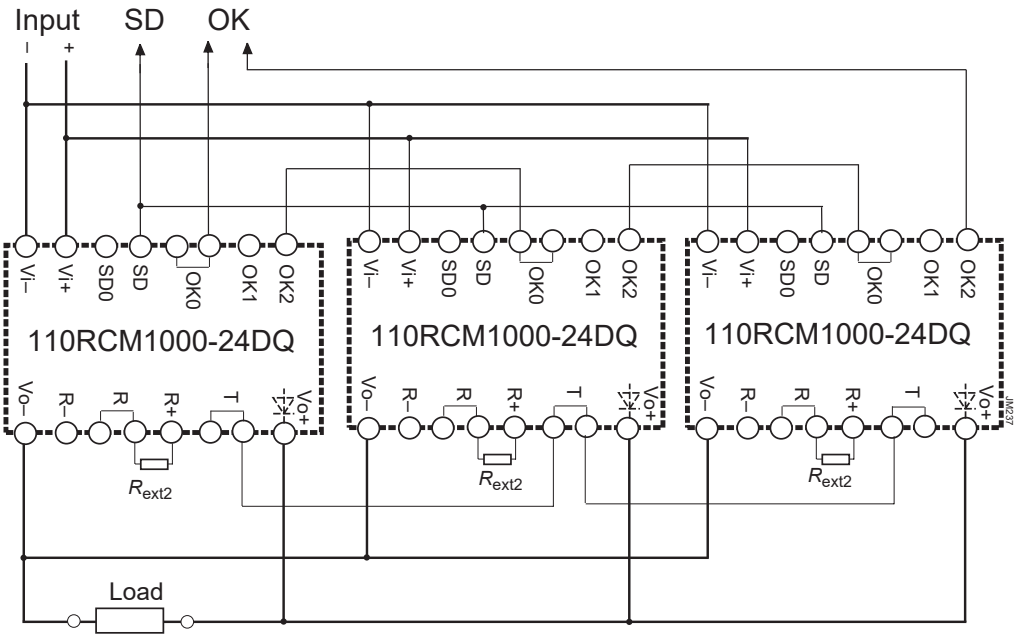


Fig. 5
Parallel connection of 3 converters

Thermal Considerations and Protection

A temperature protection is incorporated in the primary and secondary control logic each. It generates an internal inhibit signal, which disables the converter in case of overtemperature. The converter automatically recovers, when the temperature drops below the limit; see fig. 6. The relationship between T_A and T_C depends heavily upon the conditions of operation and the integration into a system.

Caution: The installer must ensure that under all operating conditions T_C remains within the limits stated in table 7. For installation without external heatsink it is recommended to use forced air or reduced output power.

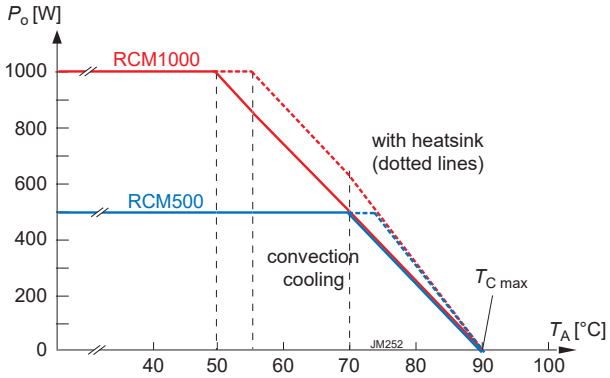


Fig. 6
Typical output power derating versus temperature; vertical mounting position, free convection cooling.

LED Indicator

Each converter exhibits a green LED “Out OK”, signaling that the output voltage is inside the specified range.

DESCRIPTION OF OPTIONS

Option D: Output Monitor, Output Adjust, Shutdown

Option D consists of several auxiliary functions (R, OK, SD, T) and encompasses an additional auxiliary connector.

Output Voltage Adjust (R)

Note: With open R-input, $V_o = V_{o\,nom}$.

The converter allows for adjusting the output voltage in the range of 80 to 105% of $V_{o\,nom}$. The adjust is accomplished by an external resistor R_{ext1} or R_{ext2}, connected to input R; see fig. 7.

Depending on the value of the required output voltage, the resistor shall be connected:

either: Between the pins R and R– to adjust the output voltage to a value below $V_{o\,nom}$:

$$R_{ext1} \approx 4\ k\Omega \bullet \frac{V_o}{V_{o\,nom} - V_o} - 15.8\ k\Omega$$

Note: $R_{ext1} = 0\ \Omega$ reduces V_o to 80%.

or: Between the pins R and R+ to adjust the output voltage to a value greater than $V_{o\,nom}$:

$$R_{ext2} \approx 4\ k\Omega \bullet \frac{(V_o - 2.5\ V)}{2.5\ V \bullet (V_o/V_{o\,nom} - 1)} - 682\ k\Omega$$

Note: $R_{ext2} = 0\ \Omega$ increases V_o to 105%.

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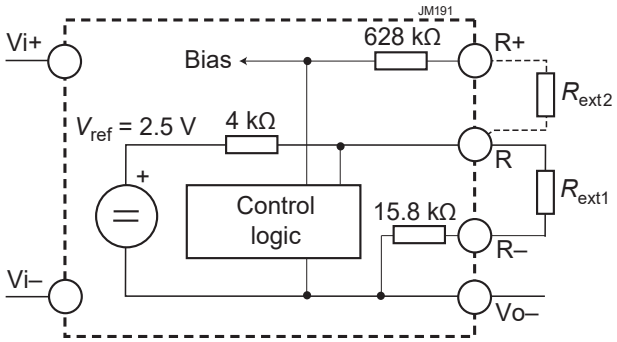


Fig. 7
Output voltage control via R-input

Output Voltage Monitor (OK)

The output voltage V_o is monitored. When V_o is in range, a relay with a changeover contact connected to the auxiliary connector is activated, and OK0 is connected with OK2.

Note: The trigger levels are typ. ±5 % of V_{onom} (with open R-input).

Data of relay contacts: 0.4 A / 150 VDC.

Primary Shutdown (SD)

The output of the converter may be enabled or disabled by a logic signal (e.g. CMOS) applied between the shutdown pin SD and SD0 (= Vi–). If the shutdown function is not required, pin SD can be left open-circuit. Voltage on pin SD:

Converter operating:	12 V to $V_{i\,max}$ or open-circuit
Converter disabled:	–2 to +2 V

The output response is shown in Fig. 8a

Note: In systems consisting of several converters, this feature may be used to control the activation sequence by logic signals or to enable the power source to start up, before full load is applied.

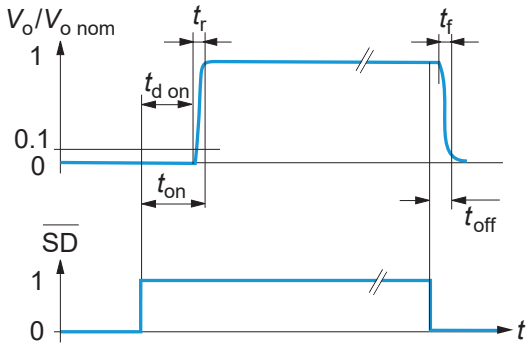


Fig. 8a
Typical output response to the SD-signal.

Option M: Interruption Time

The interruption time t_{hu} is specified in the railway standard EN 50155:2017 clause 5.1.1.4: Class S2 is 10 ms. It is measured at $V_{B\ nom}$ (nominal battery voltage) for interruption and short-circuit of the input. After such an event, the system is ready for the next event after 10 s. Fig. 8b shows the output voltage V_o, if option M is fitted. Option M encompasses a backrush protection formed by a FET device.

For less critical applications, option M is not required (class S1). Such units have a slightly better efficiency.

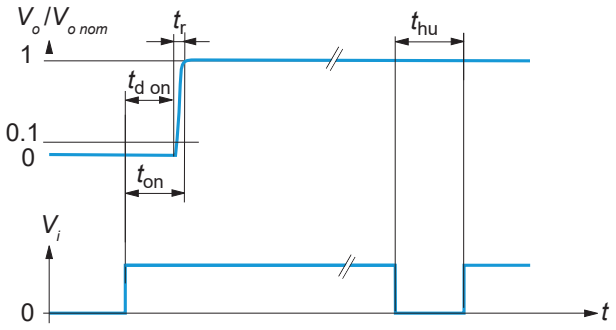


Fig. 8b
Typical output response to V_i If option M is not fitted, t_{hu} = 0 ms.

Option Q: ORing FET for Redundant Systems

Two parallel connected converters are separated with ORing diodes (built by FETs). If one converter fails, the remaining one still delivers the full power to the loads. If more power is needed, the system may be extended to more parallel converters (n+1 redundancy).

Current sharing must be ensured by load lines of equal section and length. In addition, a slight droop characteristic of the outputs and a negative temperature coefficient are helpful as well.

To keep the losses as small as possible, the ORing diode is replaced by a FET.

Note: In the case of a failing converter, the output voltage is maintained by the redundant converters. However, the failing item should be identified and replaced. We recommend the Out OK function (option D).

Option F: Incorporated Fuse

The railway standard EN 50155 does not recommend fuses in converters. Consequently, the installer should preview an external fuse or circuit breaker.

However, when this is not possible, we offer an incorporated fuse (option F) with active reverse polarity protection formed by a FET device. The fuse is not accessible and will not trip, unless the converter is really defect. The type of the incorporated fuses is specified in table 4. Such fuses are also recommended for external fuses.

Table 4: Recommended external fuses (same as with option F)

Converter	Specification	Ordering number
72RCM500-24	15 A fast acting	Littlefuse 0505015.MX52 LEP
110RCM500-24	15 A fast acting	Littlefuse 0505015.MX52 LEP
72RCM1000-24	2x 25 A fast acting	Littlefuse 0505025.MX52 LEP
110RCM1000-24	25 A fast acting	Littlefuse 0505025.MX52 LEP

Option K: Pluggable Connectors

This option allows the use of preassembled pluggable connectors; for details see *Accessories*.

Note: Female connectors must be ordered separately.

Current Share Function in Parallel Operation (T)

Just interconnect the T-pins of all converters to balance their output currents. Only a single-wire connection is needed.

ELECTROMAGNETIC COMPATIBILITY (EMC)

Electromagnetic Immunity

Table 5: Electromagnetic immunity (type tests). Corresponds or Exceeds EN50121-3-2:2016 and AREMA.

Phenomenon	Standard	Level	Coupling mode [1]	Value applied	Waveform	Source imped.	Test procedure	In oper.	Perf. crit. [2]
Electrostatic discharge (to case)	IEC/EN 61000-4-2	4	contact discharge	6000 V_p	1/50 ns	330 Ω 150 pF	10 pos. & 10 neg. discharges	yes	A
			air discharge	8000 V_p					
Electromagnetic field	IEC/EN 61000-4-3	x	antenna	20 V/m	AM 80% / 1 kHz	N/A	80 – 800 MHz	yes	A
			antenna	20 V/m	AM 80% / 1 kHz	N/A	800 – 1000 MHz	yes	A
				20 V/m [3]			1400 – 2000 MHz		
				5 V/m			2000 – 2700 MHz		
				3 V/m			5100 – 6000 MHz		
Electrical fast transients/burst	IEC/EN 61000-4-4	3	capacitive, o/c	±2000 V_p	bursts of 5/50 ns; 2.5/5 kHz over 15 ms; burst period: 300 ms	50 Ω	60 s positive 60 s negative transients per coupling mode	yes	A
		3	i/c, +i/–i direct						
Surges	IEC/EN 61000-4-5	3	i/c	±2000 V_p	1.2 / 50 µs	42 Ω 0.5 µF	5 pos. & 5 neg. surges per coupling mode	yes	A
			+i/–i	±1000 V_p					
			i/c, +i/–i	±2000 V_p		12 Ω 9 µF			B
Conducted disturbances	IEC/EN 61000-4-6	3	i, o, signal wires	10 VAC (140 dBµV)	AM 80% / 1 kHz	150 Ω	0.15 – 80 MHz	yes	A
Power frequency magnetic field	IEC/EN 61000-4-8	3		300 A/m			60 s in all 3 axis	yes	A

[1] i = input, o = output, c = case
[2] A = normal operation, no deviation from specs.; B = normal operation, temporary loss of function or deviation from specs possible
[3] Tested value 20 V/m is required by AREMA; 10 V/m is valid for EN50121-3-2

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Electromagnetic Emissions

The conducted emissions (fig. 9) have been tested according to EN 55011, group 1, class A (similar to EN 55032), much better values than requested by EN 50121-3-2:2016, table 2.1. The limits in fig. 9 apply to quasipeak values, which are always lower then peak values.

Radiated emissions have been tested as per EN 55011, group 1, class A, similar to EN 61000-6-4+A1:2011, table 1. The test was executed with horizontal and vertical polarization; the worse result is shown in fig. 10.

Note: The highest frequency of the internal sources of EUT is less than 108 MHz. Hence, Radiated Measurement was made up to 1 GHz. Non-accredited measurement up to 6 GHz are available on request.

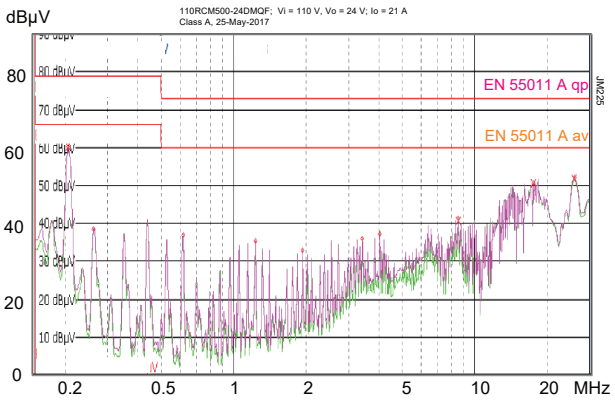


Fig. 9a
110RCM500-24: Typ. conducted disturbances at the input (V_i=110 V, $I_{i\,nom}$, resistive load, quasi peak and average).

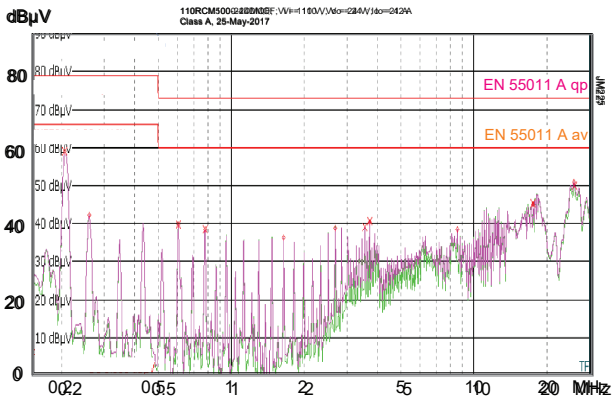


Fig. 9b
110RCM1000-24: Typ. conducted disturbances at the input (V_i=110 V, $I_{i\,nom}$, resistive load, quasi peak and average).

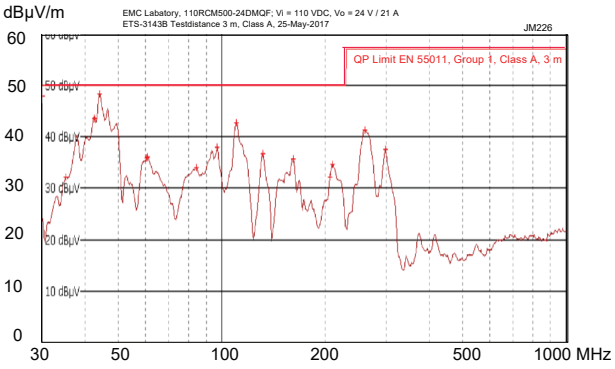


Fig. 10a
110RCM500-24: Typ. radiated disturbances in 3 m distance (V_i = 110 V, $I_{i\,nom}$, resistive load, quasi peak).

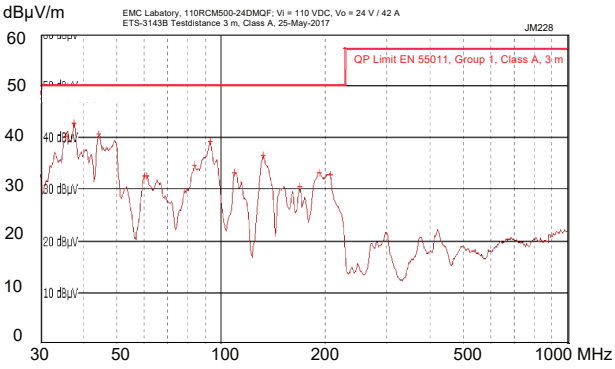


Fig. 10b
110RCM1000-24: Typ. radiated disturbances in 3 m distance (V_i = 110 V, $I_{i\,nom}$, resistive load, quasi peak).

Radio disturbance and immunity have been tested as per EN 55016-2-3:2017 with meeting EMV-06, Issue 2.0, Appendix E within the range shown in table below.

Table 6: EMV-06, Issue 2.0, Appendix E frequency bands and achieved test results.

Band	Frequences		Result
	Start	Stop	
H	457.4 MHz	458.3 MHz	**PASS**
I	467.4 MHz	468.3 MHz	**PASS**
GSM-R UL	873 0 MHz	880.0 MHz	**PASS**
GSM-R DL	918.0 MHz	925.0 MHz	**PASS**
L-AG	419.7 MHz	419.8 MHz	**PASS**
L-VDV	429.7 MHz	429.8 MHz	**PASS**

IMMUNITY TO ENVIRONMENTAL CONDITIONS

Table 7: Mechanical and climatic stress. Air pressure 700 – 1200 hPa

Test method		Standard	Test Conditions		Status
Ad	Low temperature start-up test	EN 50155:2017, clause 13.4.4 IEC/EN 60068-2-1	Temperature, duration: Performance test:	- 40 °C, 2 h +25 °C	Not operating
Be	Dry heat test, cycle A	EN 50155:2017, clause 13.4.5 IEC/EN 60068-2-2	Temperature: Duration:	70 °C 6 h	Operating perf. crit. A
Db 2	Cyclic damp heat test	EN 50155:2017, clause 13.4.7 IEC/EN 60068-2-30	Temperature: Cycles (respiration effect): Duration:	55 °C and 25 °C 2 2x 24 h	Not operating
Ka	Salt mist test sodium chloride (NaCl) solution	EN 50155:2017, clause 13.4.10 IEC/EN 60068-2-11	Temperature: Duration:	35 $^{\pm 2}$ °C 48 h	Converter not operating
	Functional random vibration test	EN 50155:2017 clause 13.4.11.4 EN 61373:2010 clause 8, class B, body mounted [1]	Acceleration amplitude: Frequency band: Test duration:	0.1 g_n = 1.01 m/s^2 5 – 150 Hz 30 min (10 min in each axis)	Operating perf. crit. A
	Simulated long life testing	EN 50155:2017 clause 13.4.11.2 EN 61373:2010 clause 9, class B, body mounted [1]	Acceleration amplitude: Frequency band: Test duration:	0.58 g_n = 5.72 m/s^2 5 – 150 Hz 15 h (5 h in each axis)	Not operating
	Shock test	EN 50155:2017 clause 13.4.11.3 EN 61373:2010 clause 10, class B, body mounted [1]	Acceleration amplitude: Bump duration: Number of bumps:	5.1 g_n 30 ms 18 (3 in each direction)	Operating perf. crit. A
	Vibration sinusoidal	AREMA Part. 11.5.1 class C, D, E, I, J	Displacement amplitude: Acceleration amplitude: Frequency: Test duration:	0.3" (5 – 10 Hz) 0.07" (5 – 20 Hz) 1.5 g_n = 14.7 m/s^2 (10 – 200 Hz) 5 – 200 Hz 12 h (4 h in each axis)	Operating perf. crit. A
	Mechanical shock	AREMA Part. 11.5.1 class C, D, E, I, J	Acceleration amplitude: Bump duration: Number of bumps:	10 g_n = 98 m/s^2 11 ms 18 (3 in each direction)	Operating perf. crit. A

[1] Body mounted = chassis of a railway coach

Temperatures

Table 8: Temperature specifications, valid for an air pressure of 700 – 1200 hPa (700 – 1200 mbar)

Model			RCM500 EN 50155:2017 Class OT4			RCM1000 EN 50155:2017 Class OT2			Unit
Characteristics		Conditions	min	max	10 min	min	max	10 min	
T_A	Ambient temperature	Converter operating	- 40	70	85	- 40	55 [2]	70	° C
T_C	Case temperature [1]		- 40	90			80/90 [3]		
T_S	Storage temperature	Not operational	- 55	85		- 55	85		

[1] Measured at the measurement point T_C; see Mechanical Data.
[2] RCM1000 can be operated at higher temperature with reduced output power.
[3] Maximum case temperature for 110RCM1000 models is 80° C, maximum case temperature for 72RCM1000 models is 90° C.

Reliability

Table 9: MTBF

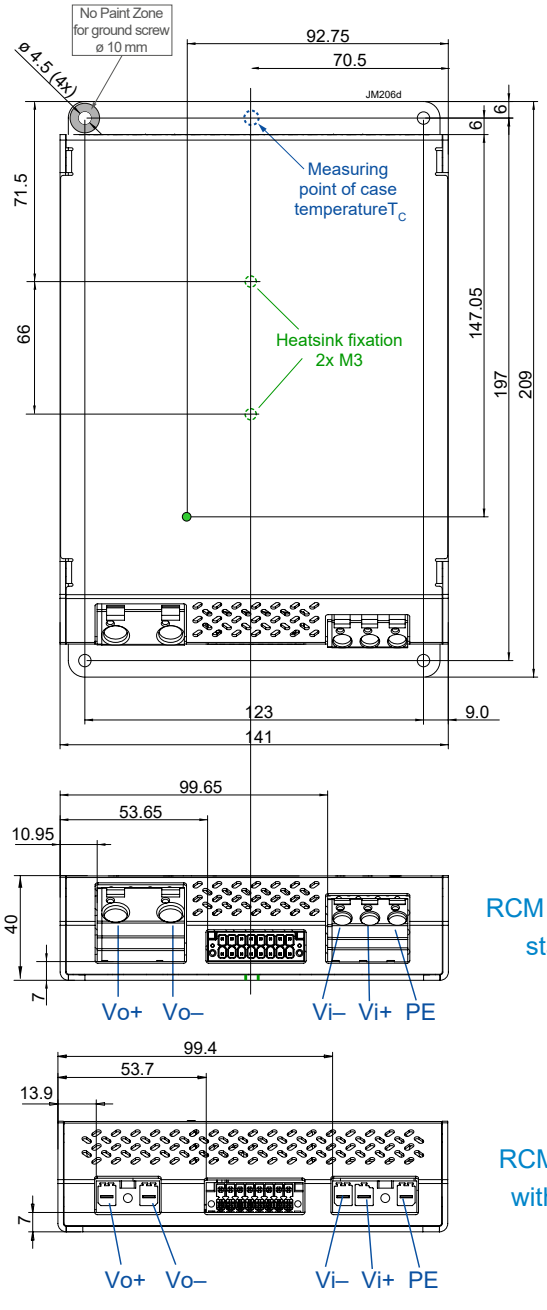
Calculation method	Model	MTBF
According to IEC 61709 / SN-29500	110RCM500-24DMQF	1 040 000 h
	110RCM1000-24DMQF	822 000 h

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MECHANICAL DATA

Dimensions in mm.



RCM500/1000 standard

RCM500/1000 with option K

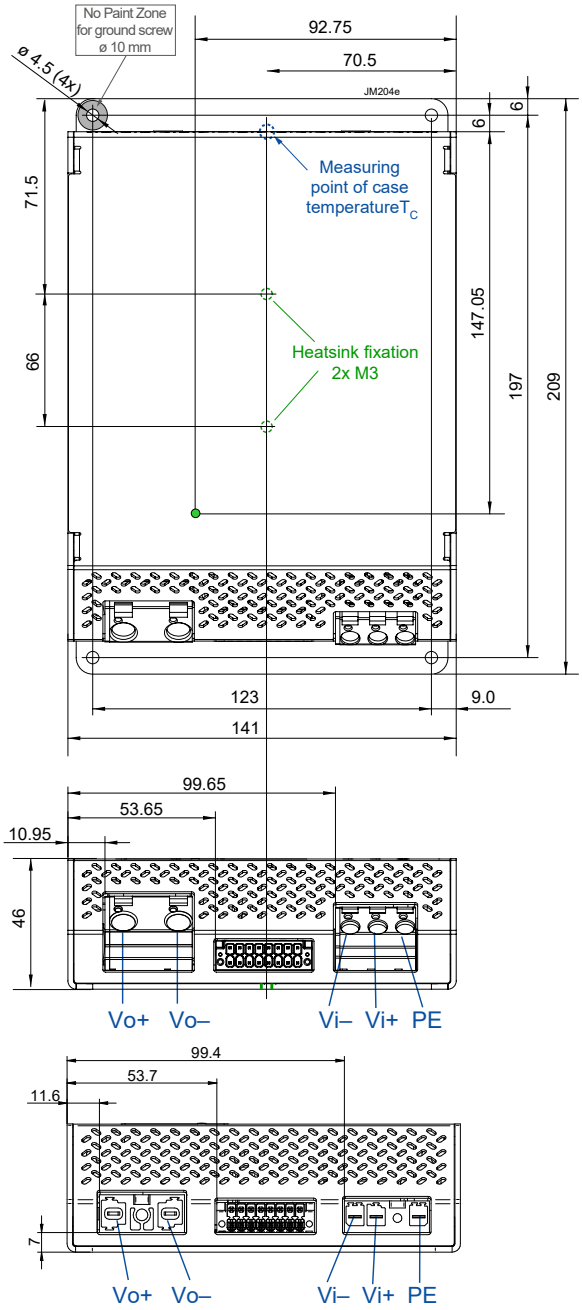


Fig. 11
Case for RCM500 (RCM03),
Aluminum, EP powder-coated; 1160 g.

Fig. 12
Case for RCM1000 (RCM04),
Aluminum, EP powder-coated; 1250 g.

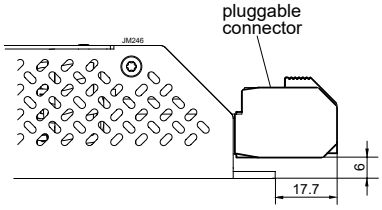


Fig. 13
Case detail for RCM500/1000 with option K

European Projection

SAFETY AND INSTALLATION INSTRUCTION

CONNECTORS AND PIN ALLOCATION

- Input connector, 3 pins: Wago 745-353: Vi+, Vi–, PE;
  wire sections:
  RCM500/1000: 0.2 – 6 mm², 24 – 10 AWG;
  with option K: Weidmüller 1048500000
- Output connector, 2 pins: Wago 745-652/006-000: Vo+, Vo;
  wire sections:
  RCM500/1000: 0.2 – 16 mm², 24 – 06 AWG
  RCM500 with option K: Weidmüller 1048390000
  RCM1000 with option K: Weidmüller 1156650000
- Auxiliary connector: Phoenix Contact 1874043, pin allocation see fig. 14.

Pin 1

R+	R–	T	n.c.	OK1	OK2	n.c.	SD
R	R	T	n.c.	OK0	OK0	n.c.	SD0

Fig. 14
Auxiliary connector pin allocation

Installation Instruction

These converters are components, intended exclusively for inclusion by an industrial assembly process or by a professionally competent person. Installation must strictly follow the national safety regulations in respect of the enclosure, mounting, creepage distances, clearances, markings and segregation requirements of the end-use application.

Connection to the system shall only be effected with cables with suitable section (primary and secondary connector in cage clamp technique).

The auxiliary connector shall be connected via the suitable female connector; see *Accessories*.

Other installation methods may not meet the safety requirements. Check that PE is safely connected to protective earth.

No fuse is incorporated in the converter (except for option F). An external circuit breaker or a fuse in the wiring to one or both input pins.

Do not open the converters, or the warranty will be invalidated. Make sure that there is sufficient airflow available for convection cooling and that the temperature of the bottom plate is within the specified range. This should be verified by measuring the case temperature at the specified measuring point, when the converter is operated in the end-use application. $T_{C\ max}$ should not be exceeded. Ensure that a failure of the converter does not result in a hazardous condition.

Standards and Approvals

The RCM Series converters are approved according to the 3rd edition of IEC/EN 62368-1 and UL/CSA 62368-1.

They have been evaluated for:

- Class I equipment
- Building in
- Double or reinforced insulation based on 250 VAC or 240 VDC between input and output, and between input and OK signals (relay contacts)
- Pollution degree 2 environment

The converters are subject to manufacturing surveillance in accordance with the above mentioned safety standards and with ISO 9001:2015, IRIS ISO/TS 22163:2017 certified quality and business management system.

Cleaning Liquids and Protection Degree

The converters are not hermetically sealed. In order to avoid possible damage, any penetration of liquids shall be avoided.

The converters correspond to protection degree IP 20.

Please read our datasheet & drawing disclaimer here.

Railway Applications

The RCM Series converters have been designed observing the railway standards EN 50155:2021, EN 50121-3-2:2016, EN 50124-1:2017 and AREMA. All boards are coated with a protective lacquer.

The converters comply with the fire & smoke standard EN 45545:2016, HL1 to HL3.

Insulation Test

The electric strength test is performed in the factory as routine test in accordance with EN 62911, EN 50155:2021 and AREMA. It should not be repeated in the field, and the Company will not honor warranty claims resulting from incorrectly executed electric strength tests.

Table 10: Isolation

Characteristics		Input to		Output to Case	OK contacts to			Unit
		Output [1]	Case + Output		Input	Case	Outputs	
Electric strength test	Factory test 10 s	4.2	2.86	2.86	2.86	2.86	2.86	kVDC
	AC test voltage equivalent to factory test	3.0	2.0	2.0	2.0	2.0	2.0	kVAC
Insulation resistance		>300 [2]	>300 [2]	>300	>300	>300	>300	MΩ
Creepage distances		5.0	3.5	3.5	3.5	3.5	3.5	mm

[1] Pretest of subassemblies in accordance with IEC/EN 62368-1
[2] Tested at 500 VDC

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ACCESSORIES

Female Connector

A suitable 16 pin female connector is available; see fig. 15.

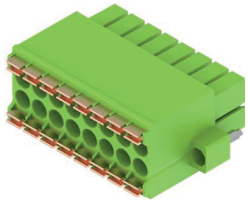


Fig. 15
Female connector 16 pins, HZZ00146-G (Phoenix Contact 1790357)

For converters RCM500/1000 with option K, use (see fig. 16):

- HZZ00303-G (3 poles, Weidmüller 1060580000) for RCM500/1000
- HZZ00302-G (2 poles, Weidmüller 1060550000) for RCM500
- HZZ00304-G (2 poles, Weidmüller 1156600000) for RCM1000

Wire section: 0.5 – 10 mm², 24 – 8 AWG



Fig. 16
Female connectors for RCM500/1000 with option K

Additional Heatsink

A suitable heat sink (HZZ00149-G) for free air cooling is available, if cooling by wall or a chassis mounting is not possible; see fig. 17.

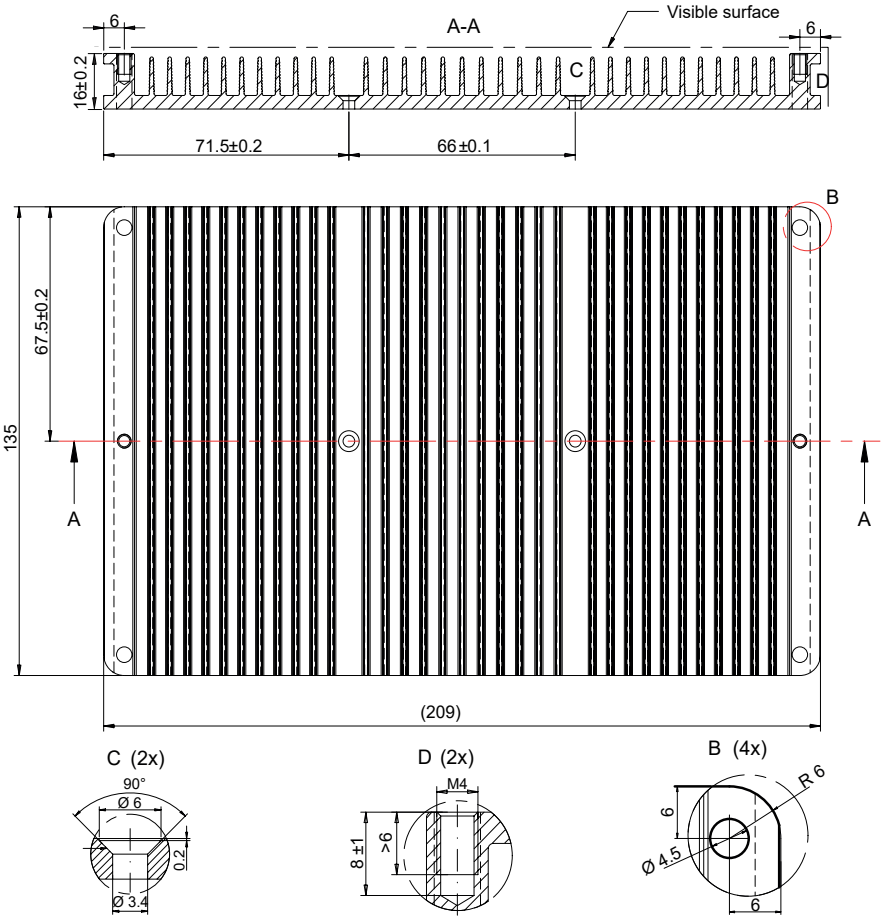


Fig. 17
Additional heatsink for RCM500 and RCM1000 (HZZ00149-G)
Weight 530 g

Content: Heatsink + 2 screws (M3 x 6 mm)

NUCLEAR AND MEDICAL APPLICATIONS - These products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

TECHNICAL REVISIONS - The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.