

SynQor[®]

RailQor[®]

RAIL TRANSPORTATION ISOLATED DC-DC CONVERTERS



Railway Power Supply



RAIL TRANSPORTATION ISOLATED DC-DC CONVERTERS

DC-DC CONVERTER KEY PERFORMANCE HIGHLIGHTS

SynQor's RailQor® line of DC-DC converters is designed to provide isolated DC power in the transportation industry for such electronics as LED displays, audio amplifiers, safety monitors, lighting, and communications systems under the European Standard EN 50155. These converters use SynQor's synchronous rectifier based technology to achieve extremely efficient industry leading performance. Due to the difficult environmental conditions the transportation market poses on power supplies, SynQor has designed the RailQor line for optimal performance in the most demanding applications.

RAILQOR INPUT/OUTPUT RATINGS

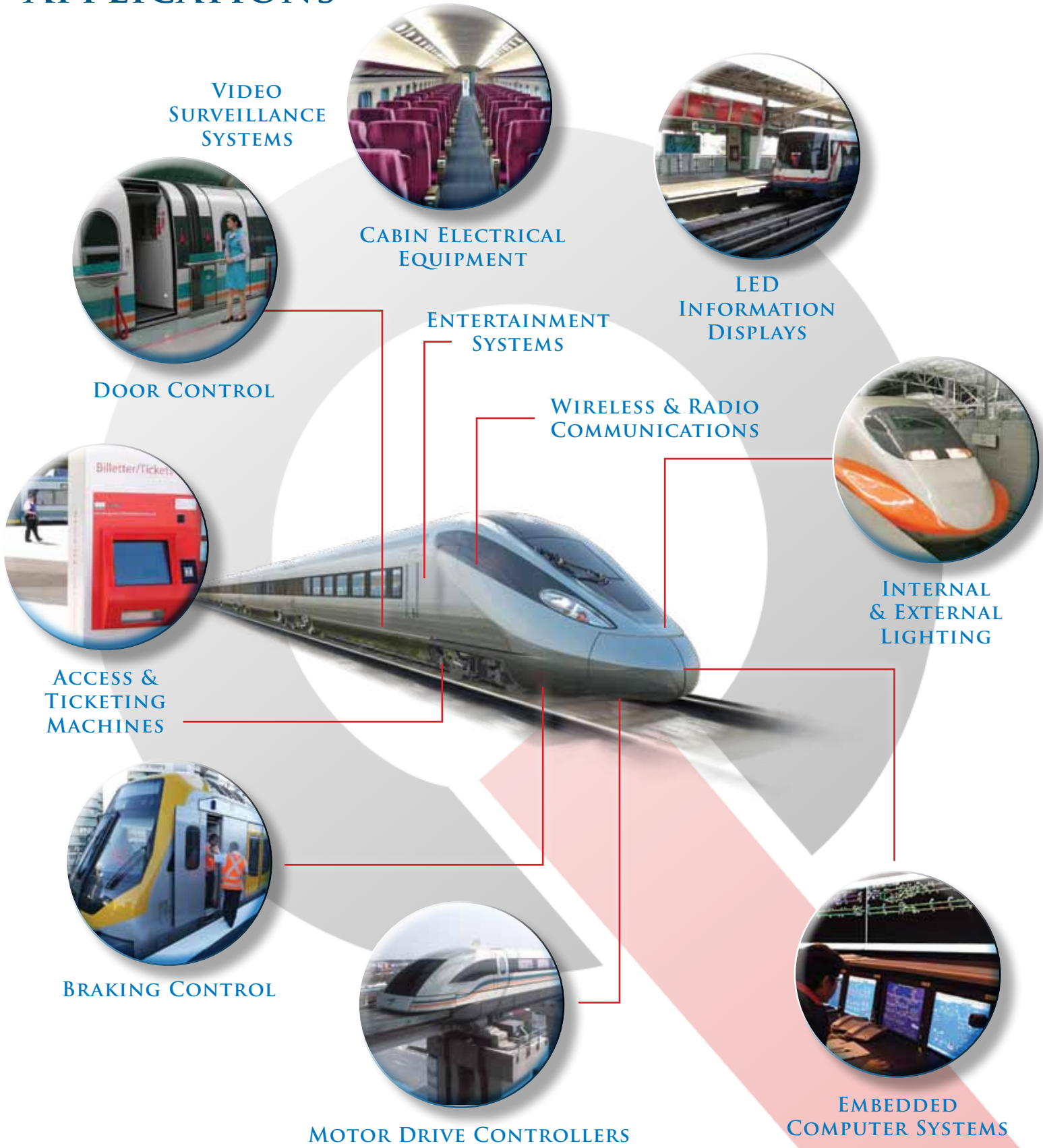
Family	Output Voltage	3.3V	5V	12V	15V	24V	48V	Package Size / Power Level
2:1 Input Ratio		110V (66V - 160V) Continuous Input Range, 200V Transient						
RQ1B	Max. Iout / Power Out	15A / 50W	10A / 50W	4.1A / 49W	3.3A / 50W	2A / 48W		QUARTER-BRICK / MEGA
			25A / 125W	12A / 144W	10A / 150W	6A / 144W	3A / 144W	QUARTER-BRICK / TERA
			48A / 240W	21A / 252W	17A / 255W	10A / 240W	5.2A / 250W	HALF-BRICK / PETA
			60A / 300W	27A / 324W	21.7A / 326W	13.6A / 326W	6.8A / 326W	HALF-BRICK / EXA
2:1 Input Ratio		72V (42V - 110V) Continuous Input Range						
RQ72	Max. Iout / Power Out		10A / 50W	4.1A / 49W	3.3A / 50W	2A / 48W		QUARTER-BRICK / MEGA
			25A / 125W	12A / 144W	10A / 150W	6A / 144W	3A / 144W	QUARTER-BRICK / TERA
			46A / 230W	21A / 252W	17A / 255W	10.4A / 250W	5.2A / 250W	HALF-BRICK / PETA
4:1 Input Ratio		18V (9V - 36V) Continuous Input Range, 40V Transient						
RQ18	Max. Iout / Power Out		10A / 50W	4.1A / 49W	3.3A / 50W	2A / 48W		QUARTER-BRICK / MEGA
			20A / 100W	8A / 96W	7A / 105W	4A / 96W	2A / 96W	QUARTER-BRICK / TERA
			36A / 180W	15A / 180W	12A / 180W	7.5A / 180W	3.7A / 178W	HALF-BRICK / PETA
4:1 Input Ratio		90V (34V - 160V) Continuous Input Range, 200V Transient						
RQ90	Max. Iout / Power Out		10A / 50W	4.2A / 50W	3.3A / 50W	2.1A / 50W	1A / 48W	QUARTER-BRICK / MEGA
			24A / 120W	10A / 120W	8A / 120W	5A / 120W	2.5A / 120W	QUARTER-BRICK / TERA
12:1 Input Ratio		68V (12V - 155V) Continuous Input Range, 170V Transient						
RQ68	Max. Iout / Power Out		5.3A / 27W	2.3A / 28W	1.8A / 27W	1.1A / 26W		QUARTER-BRICK / MEGA
			10.6A / 53W	4.4A / 53W	3.5A / 53W	2.2A / 53W		HALF-BRICK / GIGA
			20A / 100W	8.4A / 101W	6.7A / 101W	4.2A / 101W	2.1A / 101W	HALF-BRICK / EXA
			30A / 150W	12.5A / 150W	10A / 150W	6A / 144W	3A / 144W	HALF-BRICK / ZETA
Family	Output Voltage	40V					Package Size / Power Level	
2:1 Input Ratio		24V (18V - 45V) Continuous Input Range, 50V Transient						
RQ24	Max. Iout / Power Out	12.5A / 500W					HALF-BRICK ZETA	

EN 50155 REQUIREMENTS AND RAILQOR FEATURES

EN50155 Requirements		
Nominal	Continuous Input	Transient Input
24V	17V – 30V	14V – 34V
72V	50V – 90V	43V – 101V
110V	77V – 137V	66V – 160V
72V – 110V	50V – 137V	43V – 160V
24V – 110V	17V – 137V	14V – 160V

RailQor Capabilities		
Family	Continuous Input	Transient Input
RQ18	9V – 36V	9V – 40V (100ms)
RQ72	42V – 110V	42V – 110V
RQ1B	66V – 160V	66V – 200V (100ms)
RQ90	34V – 160V	34V – 200V (100ms)
RQ68	12V – 155V	12V – 170V (100ms)

APPLICATIONS





TECHNICAL SUPPORT

SynQor understands the need for rapid development of new projects in the transportation industry and provides excellent support for new designs incorporating the RailQor product lines. Concerns regarding EN 50155 compliance, transient and surge suppression to meet RIA 12, design for optimal thermal performance and other techniques are described in our RailQor datasheets and in technical papers available at www.synqor.com.

RAILQOR PART NUMBERING GUIDE

Family	Cont. Vin	Output Voltage	Package Size	Series	Thermal Design	Max. Output Current	Enable Logic	Pin Length	Features
RQ	18: 9 - 36V 24: 18 - 45V 68: 12 - 155V 72: 42 - 110V 90: 34 - 160V 1B: 66 - 160V	033: 3.3V 050: 5V 120: 12V 150: 15V 240: 24V 480: 48V	Q: Quarter-brick H: Half-brick	G: Giga M: Mega P: Peta T: Tera E: Exa Z: Zeta	C: Encased D: Encased, Non-threaded Baseplate V: Encased, Flanged Baseplate	60: 60A 48: 48A 46: 46A 36: 36A 25: 25A 21: 21A 15: 15A 12: 12A 10: 10A 08: 8A 07: 7A 06: 6A 05: 5A 04: 4A 02: 2A 01: 1A	N: Negative	R: 0.180"	S: Standard F: Full Feature (HE/HZ only)

Part Numbering Example: RQ24400HZC13NRF-G For valid part numbers, refer to the website or contact your local sales representative or distributor.

APPLICATION NOTES

- **“RailQor EN 50155 / RIA-12 Compliance & Evaluation Board Application Note”** – Addresses the input voltage requirements of the European Railway Standards EN50155 and RIA-12 and how to meet them using SynQor’s RailQor DC-DC converters. The RailQor converters are designed to meet or exceed EN50155 input static and transient DC voltage requirements. Since some equipment is being designed to also comply with RIA-12 surges and transients, those requirements are discussed as well, along with the supplemental circuitry needed to meet those requirements.
- **“EMI Characteristics”**
– An overview of EMI with suggestions for external filtering solutions and suggested layout and grounding practices.
- **“Input System Instability”**
– Describes the phenomena of input instability in DC-DC converters and the preferred solution for correcting it.

DATASHEET APPLICATION INFORMATION

- How to lay out a board for optimal thermal performance with RailQor product
- Circuits for driving the enable pin
- How to trim the converter to compensate for resistive drops between supply and load

RAILQOR QUALIFICATION TESTING

Testing Type	Units	Test Conditions
Vibration	5	EN 61373:1999 Category I, Class B, Body mounted
Life Test	30	95% rated Vin and load, units at derating point, 1000 hours
Cold	5	EN 60068-2-1:2007
Dry Heat	5	EN 60068-2-2:2007
Mechanical Shock	5	EN 61373:1999 Category I, Class B, Body mounted
Temperature Cycling	5	-40°C to 100°C, unit temp. ramp 15°C/min., 500 cycles
Power/Thermal Cycling	5	Toperating = min to max, Vin = min to max, full load, 100 cycles
Design Marginality	5	Tmin-10°C to Tmax+10°C, 5°C steps, Vin = min to max, 0-105% load
Damp Heat, Cyclic	5	EN 60068-2-3:2005
Solderability	15	Pins MIL-STD-883, method 2003

Note: Governing Standard BS EN 50155:2007 Railway applications - Electronic equipment used on rolling stock

The RailQor converter series is composed of next-generation, board-mountable, isolated, fixed switching frequency DC-DC converters that use synchronous rectification to achieve extremely high power conversion efficiency, even at low output power levels. The Quarter-brick 25W-50W Mega Series power dissipation is so low that no heatsink is necessary to operate at 85°C in an enclosed environment without airflow. Each module is supplied completely encased to provide protection from the harsh environments seen in many industrial and transportation applications.

OPERATIONAL

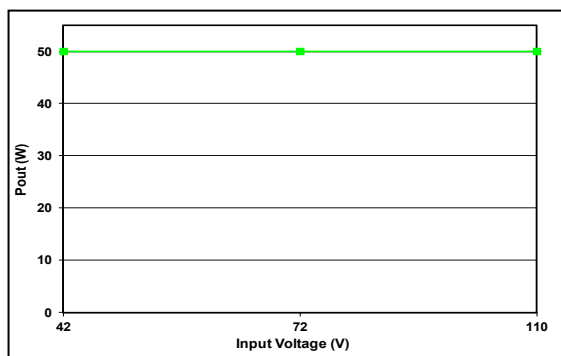
- High efficiency at full load up to 93%
- Quarter-brick 25-50W Mega Series has no derating in environments with zero airflow and ambient temperatures up to 85°C with no heatsink.
- Input voltage ranges: 9-36V, 18-45V, 12-155V, 42V-110V, 34V-160V and 66V-160V
- Input voltage ranges fully cover the requirements of EN 50155
- Full power operation at baseplate temperature range from -40°C to 100°C.
- Output power up to 500W
- Fixed frequency switching, low output noise
- No minimum load requirement
- Encased module to provide protection from harsh environments and available with optional flanged style baseplate.

MECHANICAL

- Industry standard pin-out configuration
- Flanged baseplate available
- Industry standard footprint:
Half-brick: 2.4" x 2.5"
Quarter-brick: 1.5" x 2.4"

PROTECTION/CONTROL

- Input under-voltage lockout
- Output current limit and short circuit protection
- Active back bias limit prevents damage to converter
- Output over-voltage protection
- Thermal shutdown



Typical RailQor quarter-brick 50W encased converter (no heatsink) maximum output power derating over input voltage at 85°C and natural convection airflow.

GENERAL SPECIFICATIONS

- Operating Temperature -40°C to +100°C
- Output Voltage Set Point $\pm 1.0\%$
- Output Voltage Ripple <1% of Vout (typ.)
- Switching Frequency 240 - 350kHz
- Transient Response <7% of Vout (typ.)
- Output Voltage Trim Range +10% to -20%
- Isolation Voltage Up to 3000Vdc
- EN50155 Compliance
- RIA 12 Compliance with external circuit

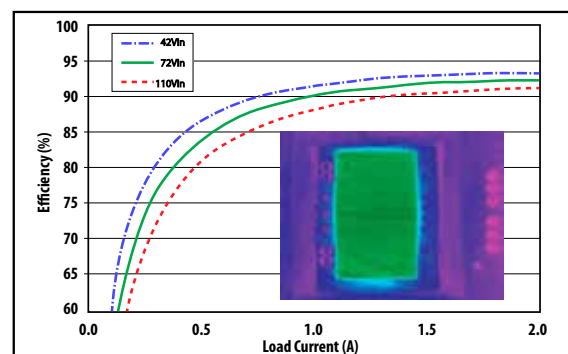
SAFETY

RQ1B, RQ72, RQ68 & RQ90

- Reinforced Insulation
- Up to 3000V, 100M Ω input-to-output isolation
- CAN/CSA C22.2 NO. 60950-1
- UL 60950-1
- EN 60950-1
- EN45545-2 R24/R25 Compliant

RQ18, RQ24

- Basic Insulation
- 2250V, 30M Ω input-to-output isolation
- CAN/CSA C22.2 NO. 60950-1
- UL 60950-1
- EN 60950-1
- EN45545-2 R24/R25 Compliant



Efficiency at nominal output voltage vs. load current for minimum, nominal, and maximum input voltages at 25°C of a typical RailQor quarter-brick 50W converter.



Advancing The Power Curve®

Headquartered in Boxborough, Massachusetts, at the location of its manufacturing operations with additional design center facility in Dallas, Texas and sales/marketing offices throughout the World, SynQor quickly became the technology, quality and service leader for high efficiency DC-DC converters. SynQor is a privately owned U.S. ISO 9001 company. SynQor converters feature a patented two-stage power topology that greatly improves efficiency and optimizes the power dissipated by the converter. SynQor's rugged DC-DC converters, AC-DC converters, filters and power supply systems are designed for a wide range of industrial and military applications including those required to withstand harsh environments: railway and transportation systems, industrial motion control, information displays, factory automation, critical military and power generation systems.



SynQor Headquarters

155 Swanson Road Boxborough, MA 01719-1316

Phone: 978-849-0600 Fax: 978-849-0602

Toll Free (USA): 888-567-9596

E-mail: Power@synqor.com

www.SynQor.com



SynQor®