

**Hawker industrial batteries for
rail applications:**

Energy solutions with system

**evo rail
batteries**

**perfect rail
batteries**

**Ni-Cd rail
batteries**

**powerbloc
batteries**



EnerSys[™]

Power/Full Solutions[™]



System solutions for worldwide applications

Hawker rail - Batteries for rail applications

Hawker is part of the EnerSys group, one of the world's leading manufacturers of industrial batteries. Our development is future-focused. All of our products are manufactured by the latest production methods. Our production plants have, at considerable expense, in the last few years been brought up

to a technological standard which many people think of as exemplary. For us the global support of our customers with project planning and customer service is a matter of course. We advise, plan, set up projects and supply complete energy systems. Hawker has been certified by many quality assurance systems. That

calls for a high quality standard which is valid worldwide and is acknowledged by our customers. The same applies to environmental protection, to which we attach especial importance in the manufacture of batteries.

Worldwide performance (number of plants)



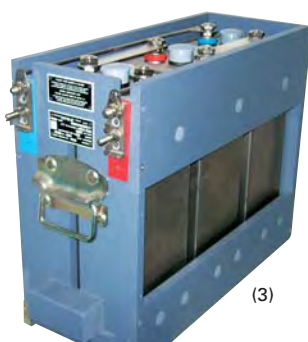
Truth to our corporate aim has over the decades also made us into an internationally acknowledged contact in the rail battery applications sector. Our customers appreciate our skill at problem solving and set us problems which can be solved economically only by a lot of experience and know-how. For example, the on-board power supply

(control, lighting, ventilation etc.) on railway vehicles must always be assured, i.e. even in maintenance and emergency operation. Diesel locomotives depend on safe, powerful starting energy. Hawker batteries for railway vehicles ensure that people arrive safely and punctually. They offer a high degree of reliability and safety for all kinds of

applications. That is why Hawker - under various names such as Oldham, Varta, GAZ - has been a reliable partner to European and international rail companies and their original equipment manufacturers for over 100 years.



(1)



(3)



(4)



(5)



(2)

Hawker as system supplier ■

Hawker is a reliable, expert systems supplier and, as required, offers complete battery systems comprising battery, battery container and corresponding charging technology to meet OEM performance specifications. Whether it be evo rail batteries (1) perfect rail

batteries (2), VARTA Ni-Cd single-cells (3) with pocket plate technology or sinter technology (4), powerbloc batteries (5), we have the right product in our product range.

High reliability in many applications ■

- In city traffic: Suburban railway and underground train, as lighting, emergency current supply, auxiliary battery
- Regional traffic: Railway passenger carriage, lighting, emergency current supply
- Long-distance traffic: Railcars with internal combustion engine as a diesel starter battery, electric railcars as auxiliary battery and modern long-distance trains as an emergency power supply or for diesel starting.



Hawker evo rail batteries : the maintenance free solution ■



Hawker evo rail rail vehicle batteries in crate design - in accordance with the DIN standard and in special versions - are fitted with maintenance-free, Gel tubular-plate cells approved

for application in railway vehicles. The battery trays are of polypropylene, polyethylene or plastic-coated steel and are resistant to high mechanical stresses at different ambient temperatures. Because of their design the battery trays are particularly low maintenance and easy to handle and clean.

Advantages

- no water refilling required during the whole operational life. As a result, failures during water refilling.
- no electrolyte leakage, as the electrolyte is fixed in the gel. As a result, no insulation faults, no dirty surfaces and no damage to the environment
- Very little self-discharge
- suitable for medium, partly cyclical loads
- robust cell construction in tubular-plate design
- cells and batteries homologated by different european railways organisations
- compatible as spare battery for train lighting and Diesel start
- problem-free, cost-conscious cell replacement
- fully insulated, maintenance-free fastening technology

Hawker perfect rail batteries : the low maintenance solution ■



Hawker perfect rail rail vehicle batteries in crate design - in accordance with the DIN standard and in special versions - are fitted with low-maintenance, low-antimony tubular-plate cells approved for application in railway vehicles. The battery connections ensure problem-free and easy battery replacement.

Advantages

- high operational reliability
- robust cell construction in tubular-plate design
- cells and batteries homologated by many of the european railways organisations
- Shock- and vibration resistant
- high mechanical load capacity at the most varied temperatures
- compatible as spare battery for train lighting and Diesel start
- battery trays of polypropylene, polyethylene or plastic-coated steel
- problem-free, cost-conscious cell replacement
- fully insulated, maintenance-free fastening technology
- optimum cleaning thanks to smooth battery surface
- low maintenance thanks to Hawker aquamatic, the automatic water refill system
- capable of carrying high current thanks to flexible connectors with adapted cross-section
- long brass terminal inserts
- optimum connector/terminal contacting
- robust, electrically efficient connection technology



Cell construction ■

Hawker evo rail cells are maintenance-free

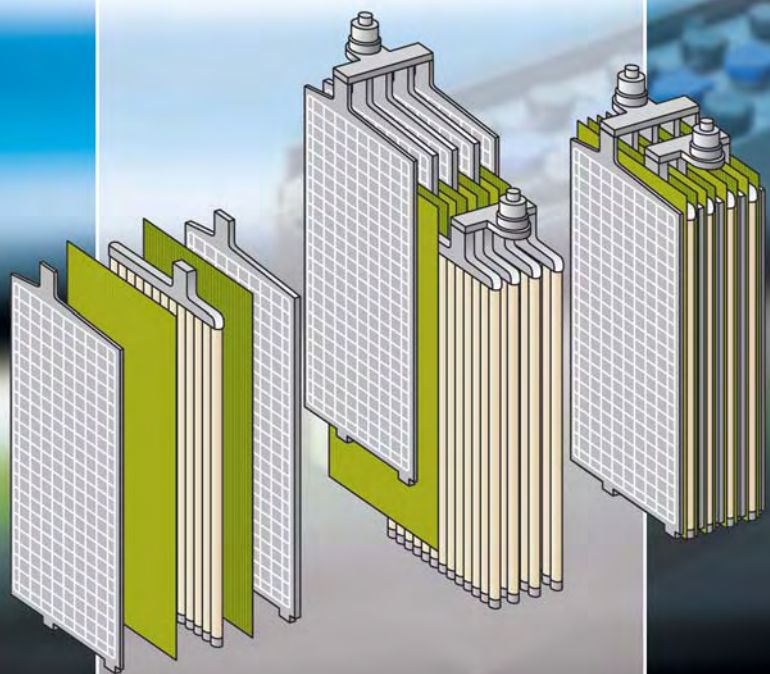
Hawker cells for rail batteries are approved by most European railway companies and have been used for different railway applications for decades. Hawker evo rail cells in tubular-plate design are maintenance-free for their entire operational lives; no refilling with water is necessary. Thanks to the electrolyte immobilised in a gel, the internal oxygen cycle and a specially adapted charging characteristic, water loss during charging is so minimised that a supply of electrolyte is guaranteed for the entire operational life of the battery. Our cells are available in various sizes.

Hawker perfect rail cells are low maintenance

Lead tubular low maintenance cells (with liquid electrolyte) in the Hawker perfect rail series are of the proven PzS cell design. The positive electrodes are designed as tubular plates, the negative electrodes as pasted plate grids. The separators are of the microporous type. Cell box and lid are of high-impact, temperature-resistant polypropylene and are welded to prevent electrolyte leakage. On request cell boxes and lids are available in a flame-retardant design. These cells are available both in the special dimensions (W = 237 mm), to DIN 43579, and in the dimensions to DIN EN 60254 Part 2, Series L (W = 198 mm) or Series E (W = 158 mm).

The design of the terminals ensures that no electrolyte can leak out of the cells.

The cells are connected by means of fully insulated and flexible connectors to DIN EN 50272-3. Its practical design makes the battery easy to clean. Diagnostic holes in the cell lid enable the temperature and density of the electrolyte to be measured. The Hawker aquamatic water refill system enables the cells to be filled at a central point via a hose system. The aquamatic vent plugs automatically ensure an optimum filling level. Correct temperature-adapted charging can be optionally ensured by means of temperature sensors.











Hawker Ni-Cd rail for extreme environmental conditions and long service lifetime

Hawker Ni-Cd rail batteries with pocket plate electrodes in steel or plastic cases have a proven design and reliability to give maximum service life. With more than 75 years of experience in the design and manufacturing Ni-Cd batteries for rail application our team is able today to provide our customers with any tailored made solution. Hawker Ni-Cd rail batteries are used all over the world but especially in regions where extreme environmental conditions can be found. Since decades they have successfully been used in countries like Russia or Mongolia where they have to deal with extreme low temperatures and on the other hand in Egypt or Hong Kong where temperatures can be very high.

Hawker Ni-Cd rail batteries are manufactured in accordance with our high quality standard meeting all international standards such as the IEC 60623, ISO 9001 and ISO 14001.

Unique features:

- excellent resistance against electrical and mechanical stress
- no risk of terminal decompose or sudden death due to plate construction
- extremely long lifetime
- operational temperature range between - 40°C and + 50°C
- extremely long storage life – for several years in a discharged state under correct conditions
- robust construction – hard-wearing and insensitive to faults in maintenance

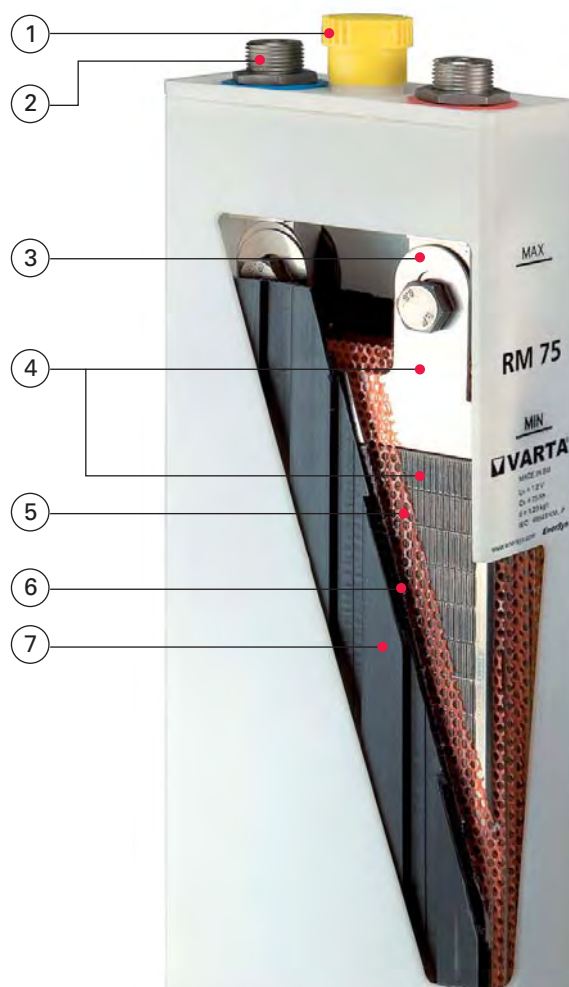
Ni-Cd battery type	Range of capacity Ah	Application		
		Engine starting	Emergency power supply	Low voltage system back-up
H type for high rates of discharge	10 - 800			
M type for medium rates of discharge	11 - 1250			
L type for medium rates of discharge	11 - 1500			

No. Function

- Gas drying or flame arresting vent**
- Safety terminal**
Redundant leak protection minimises carbonat formation.
- Electrode edge**
Connected to pole bolt by screwing or welding.
- Electrode frame**
Consisting of electrode edge and side bars. Seals the plates and works as current collector.

No. Function

- Corrugated perforated plastic separator.**
Insulates the plates and allows free circulation of electrolyte.
- Horizontal pockets**
Formed by perforated steel strips infolding thr active material.
- Distance plate**
Prevents movement of the electrode pack.





evo rail



perfect rail



Battery chargers ■

On request Hawker also supplies the needed chargers adapted to the rail application and the used battery technology. They ensure an optimum battery charging. Battery charging profiles, adapted to the benchmark battery values, set by Hawker must be provided for maintenance free evo rail batteries to obtain an optimum operational life. Hawker recommends a temperature controlled charging characteristic for all battery systems. Charging profiles correspond to IU and IU0U characteristics. Depending on the charger type NTC, PTC or other temperature sensors can be used on the batteries.

Maintenance chargers, charging rooms and battery handling systems:

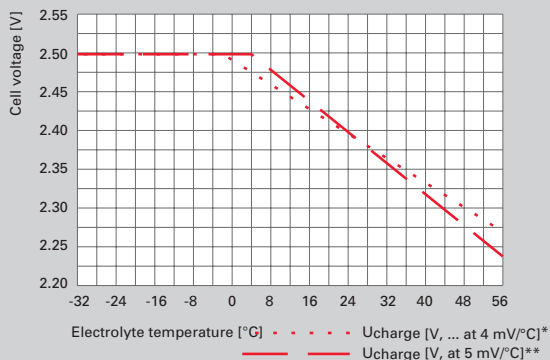
As part of our complete solutions including also battery handling systems, our series of high frequency chargers offer the best advantages for genuine adaptation for the various battery series, for the maintenance in charging rooms. Hawker offers the engineering for complete battery maintenance and charging rooms (with battery stands, handling systems, ventilation etc.) according to the local standards.

All production plants in the EnerSys group have been certified to ISO 9001:2000 for quality system and to ISO 14001 2004 for environmental management system.

Visit us at www.enersys-hawker.com to find the contacts for your country or to obtain more detailed information.

Charging voltage curve

as a function of electrolyte temperature and vehicle voltage limit



*with temperature measurement on the battery

**with temperature measurement in the battery container





Wherever in Europe you do business, Hawker can support you with rail power energy. The Hawker branded battery range, matched chargers and systems provide trouble free performance under the most demanding service conditions. Our strategically located manufacturing plants are efficient and responsive with a culture of continuous improvement and added value for our business partners.

Hawker has an enviable position in technology leadership and with significant investment in research and development we intend to stay at the leading edge in product innovation. Hawker evolution batteries and Hawker HF chargers, Lifeplus and Powertech have set new standards in maintenance free solutions. Our team of development engineers is driven by the desire to build the best energy solutions and works closely with our customers and suppliers to identify development opportunities. Our bias for rapid innovation means we get new products to market fast.

Hawker's integrated sales and service network across Europe is dedicated to providing our customers with the best solutions and after-sales support for their business. Whether you require 1 battery or a complete fleet of batteries, chargers, a battery handling system and a state of the art fleet management system, you can count on us. As part of EnerSys the world's largest industrial battery manufacturer, we are dedicated to being the best.



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