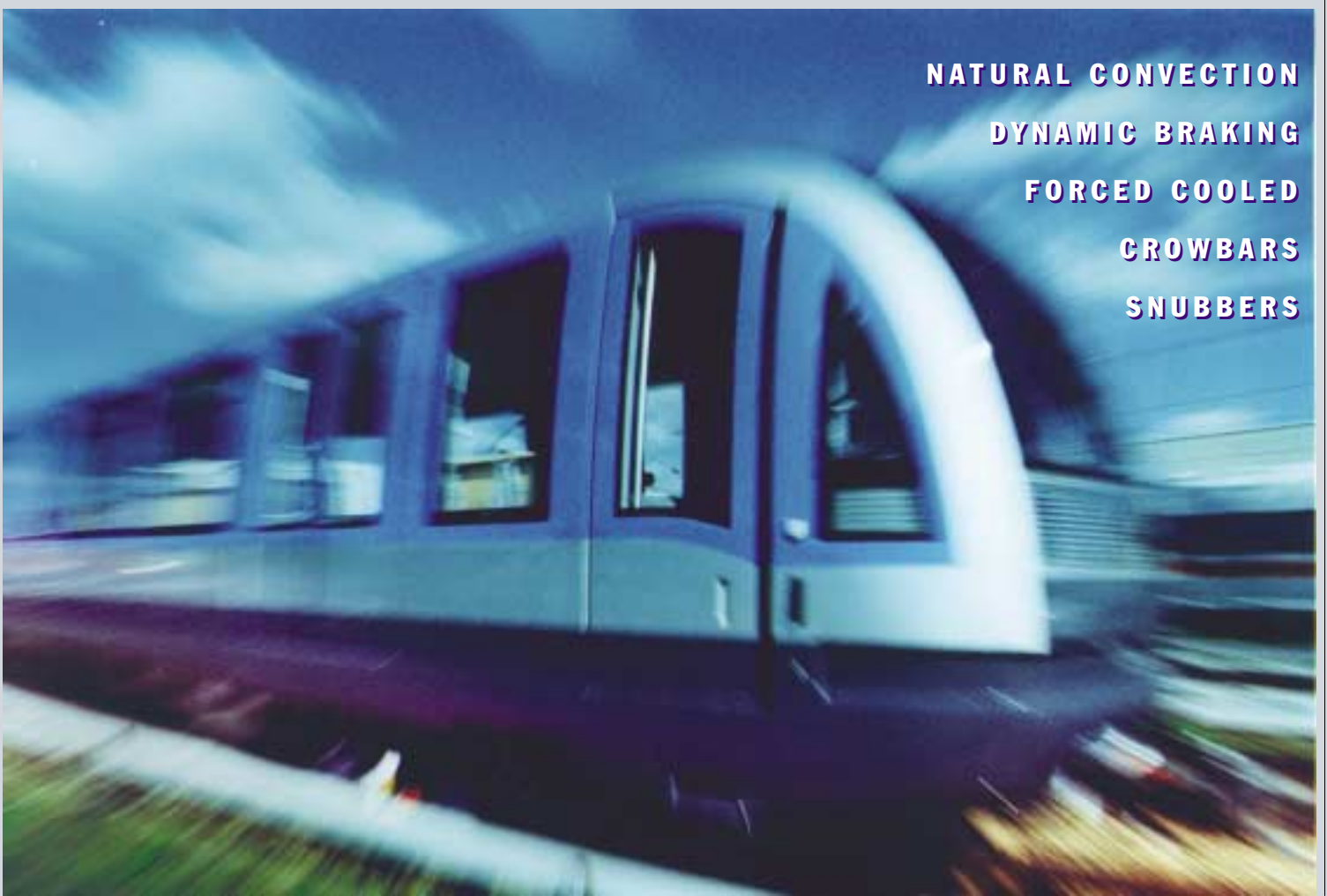




## **POWER RESISTORS FOR TRANSPORTATION**

A photograph of a train in motion, blurred to convey speed. The train is dark-colored with large windows. The background is a bright, overcast sky. The overall color palette is dominated by blues and greys.

**NATURAL CONVECTION  
DYNAMIC BRAKING  
FORCED COOLED  
CROWBARS  
SNUBBERS**

# CAPABILITIES

**The Transit business unit of Cressall Resistors promotes a “total engineering” approach to the design and manufacture of transportation power resistors.**

## APPLICATIONS

Typical applications addressed by Cressall Transit include mining and quarrying cars, railgrinding cars, electric buses, trams, trolley buses, mass transit vehicles, light rail cars, EMUs, DEMUs, mainline electric locomotives and DE locomotives.

Typical duties include dynamic braking resistors, crowbar resistors, snubbing resistors, field-diverting resistors and many special-duty resistors required in transportation applications.

## EXPERTISE

Resistors used in transportation systems must meet specific performance criteria. Their performance must therefore be predictable... from the beginning of the design process. Cressall's engineers use design tools that include specialised thermal analysis programs complemented by programs for predicting airflow and thermal performance.

Our ongoing product development programme ensures that we are always ready to anticipate and meet the emerging needs of the transportation industry.

## DESIGN

Resistors used in transit applications often have to endure very severe operating environments: they are exposed to ice, snow, rain, dust and track-side debris and must tolerate the substantial mechanical vibrations that the vehicle imposes upon them. In the design of our resistors, we are careful to select only those materials that are tolerant of all these factors - and of high temperatures, high voltages and thermal cycling.

## UNDERSTANDING

We strive to reach the best solution not merely for our immediate client but also for the end user. In so doing, some compromises may be necessary and the best overall solution can be reached only with a thorough understanding of the requirements of both the client and the end-user.

In order that we can achieve the best possible understanding of a particular application, we strongly advocate discussion of all the pertinent performance parameters - with all parties involved in the project chain. This "co-operative involvement" approach has paid many dividends... by shortening development times, improving original design concepts and, ultimately, lowering "life cycle" costs for our clients.

## EXPERIENCE

Cressall Transit's expertise and problem-solving capability has accumulated from over 70 years' experience in the design and manufacture of electrical power resistors for specialised duties.



# CRESSALL RESISTORS

## TRANSIT



**ML Series Metrocars, Lisbon, Portugal:  
224 braking resistors @ 1.25-1.7MW**



**GI Metrocars, Guangzhou, China:  
84 braking resistors @ 1.5MW**



**Supertrams, Sheffield, UK:  
52 braking resistors @ 488kW**



**ALP 44 Locomotives, New Jersey, USA:  
19 braking resistors @ 1.536MW**



**Class 3900 Locomotives, Queensland,  
Australia: 80 braking resistors @ 2MW**

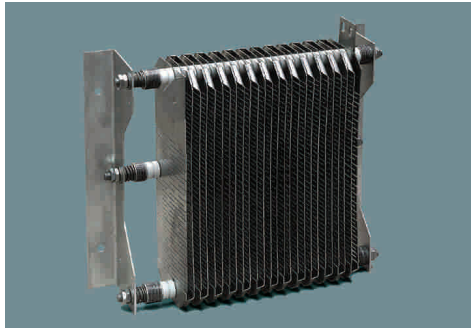


**M21 Series Tramcars, Gothenburg,  
Sweden: 86 braking resistors @ 393kW**

# PRODUCTS

The portfolio of "tractionised" power resistors offered by Cressall Transit emanates from three fundamental family types: Heavy Grid, High Temp and Eurostyle.

## HEAVY GRID RESISTORS



Resistors of this family type are generally used in short duration, high power dynamic braking applications. Heavy Grid resistors are designed to operate at temperatures of up to 900°C.

- Very high thermal capacity
- Modular, efficient space utilisation
- Robust, open construction

The design concept is modular and allows significant flexibility in size, resistance, resistance material and levels of secondary insulation. The method of mounting the resistor elements permits free thermal expansion and the entire assembly is supported on robust end brackets.

## HIGH TEMP RESISTORS

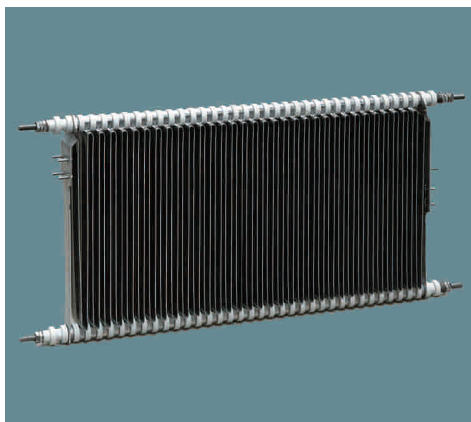


The High Temp family of resistors is designed for use in extreme operational conditions including severe shock and vibration, adverse weather, corrosive environments, extremes of temperature and high overload margin. High Temp elements are designed to operate at temperatures of up to 1000°C.

- Modular, requires minimal space relative to power capacity
- Large dissipating area for continuous duty
- Durable, corrosion-resistant construction

The resistor elements and insulating components are arranged to present the best possible heat transfer to the cooling air with minimal impedance to natural convection. The element shape and spacing are also receptive to forced cooling with exceptionally high rates of heat transfer.

## EUROSTYLE RESISTORS



The Eurostyle family of resistors was developed to satisfy market demands for lightweight, long life cycle, modular resistors capable of operating at up to 900°C continuously.

- Minimal component count
- No inter-element welding
- Double primary insulation

This resistor construction offers high thermal dissipation in a small space with minimal mounting hardware. A major feature is the absence of inter-element welded joints, the element being formed from a single continuous strip formed into a serpentine shape. The design accommodates high overload capacities by maximising the combination of active weight and surface area with an ability to sustain high temperatures.

## COMMITTED TO EXCELLENCE

From its offices and manufacturing units in Norfolk, England, Cressall Transit serves the locomotive, heavy rail, train and light railway marketplaces throughout the world.

We promote a wide-ranging expertise and experience in executing complete turnkey projects - from conceptual design of natural convection and forced cooled braking resistors, temperature detection and electrical interfacing schemes to comprehensive testing and onsite commissioning.

Based on a track record of technical excellence and high quality design, the company's ensuing market success and sustained growth have continued to generate confidence within the user base and this has resulted in Cressall Transit's current position as a leading player in the field of designing and supplying braking resistors.

## COMMITTED TO QUALITY

Over many years, Cressall Transit has accrued an enviable reputation for quality. The focus of its engineering team is to achieve the optimum balance between cost and long-term performance for each individual application, thereby minimising the overall life-cycle costs.

Operational safety is a crucial facet of any equipment supplied for the public transportation sector. Our policy, therefore, is total quality and total reliability in all aspects of manufacture and operation.

The company is committed to a totally integrated Quality Assurance programme to ensure that consistent design, manufacture, testing and life cycle support functions are performed at every level. Approval and certification is to ISO 9001:1994.

## COMMITTED TO SUCCESS

Cressall Resistors' commitment to long-term technical and business development is embodied within the Transit business unit.

It has equipped itself to meet the braking resistor requirements of the worldwide transportation marketplace today... and for the foreseeable future.

Cressall Transit has access to the world's largest range of resistor products. These cater for the majority of needs, but some specific applications merit purpose-designed resistors and resistor elements. The design of these specialised resistors requires creative thinking within the constraints of quantifiable and objective performance requirements.

A combination of experience and innovation ensures that our products meet the rigorous demands of the transportation industry throughout the world. At Cressall, we specialise in developing the best design for each specific type of application.

Our continuing success in this industry has established us as one of the world's most dependable "solutions" suppliers.