GINO AG

Elektrotechnische Fabrik

MOBILITY

PRODUCT CATALOGUE

GINO ESE

TYPICAL APPLICATIONS
OF BRAKING RESISTORS

The mobility application area of GINO AG can be subdivided into three groups: railway vehicles, trolley and electric buses, and dump trucks. The rated power and voltage range of the resistors used covers up to 5000 kW and 3 kV DC respectively.

RAILWAY VEHICLES

State-of-the-art railway vehicles are equipped with three-phase motors with acceleration, speed and braking controlled and regulated by power electronics.

When braking, the kinetic energy of the vehicle is converted into electrical energy, fed back into the electricity grid if possible and fed into the regeneration system. This, however, requires a receptive grid at all times, otherwise only the grid voltage will increase and there will be no braking effect.

Alternatively, the braking energy can be converted into heat with a braking resistor.

They are used as additional brakes for mains regeneration, to relieve the mechanical brake and as emergency brake. Electric braking is wearless and can be optimised for control, so that there are no abrupt changes in braking deceleration that are perceived as unpleasant by the passenger.

There are several options for installation of a braking resistor in railway vehicles: In addition to the common method of mounting the resistor on the roof of the vehicle **–roof resistor–** it is also possible to mount it under the vehicle **–underfloor resistor–** or in the engine room of a locomotive **–tower resistor.**

Due to the large amounts of heat to be dissipated, braking resistors require efficient cooling. Depending on the available installation space and the braking power that needs to be dissipated, a distinction is made between **natural cooled** and **forced cooled** braking resistors.

TROLLEY AND ELECTRIC BUSES

Mobility is changing. The demand for ecologically innovative and environmentally friendly means of transport is growing enormously. More and more trolley and electric buses can be found in cities. These also use braking resistors from GINO AG. If the energy produced during braking can no longer be stored or fed back, it can be dissipated via the resistor. Additionally, this takes the strain off the mechanical brakes and reduces wear.

DUMP TRUCKS

GINO AG produces the braking resistors for the largest diesel-electric dump trucks using the reliable 3PQ4 resistor system.
These vehicles are operated in mining areas all over the world under the toughest conditions. Fully loaded vehicles can reach a total weight of over 600 tonnes. In order to bring such a colossus to a standstill from top speeds, braking power of up to five megawatts is required.

For this application, GINO AG uses 3PQ4 technology, which is wearless, low-maintenance and offers very high power reserves in the limit range due to the permissible strip temperature of 850 °C.

Some of these vehicles also use motor control resistors. These limit the operating voltage of the fan motors. In order to be able to adapt them to the specific conditions of the vehicle properly, they are equipped with a number of taps. For this, the reliable EN technology are used as well.

BRAKING RESISTORS
EXAMPLES FOR RAILWAY VEHICLES

Roof resistor (natural cooled)

Resistor system:	3PQ4
Application:	Electric multiple unit
Place of operation:	Poland
Maximum power:	533 kW
Continuous power:	320 kW
Nominal voltage:	3000 V DC
Resistance value:	6.3 Ω

Roof resistor (forced cooled)

Resistor system:	EN
Application:	Rack railway
Place of operation:	USA
Maximum power:	2 x 320 kW
Continuous power:	2 x 200 kW
Nominal voltage:	750 V DC
Resistance value:	2 x 1.12 Ω

Underfloor (natural cooled)

Resistor system:	3PQ4
Application:	Metro railway vehicle
Place of operation:	United Kingdom
Maximum power:	2 x 473 kW
Continuous power:	2 x 70 kW
Nominal voltage:	750 V DC
Resistance value:	2 x 1.0 Ω

Underfloor (forced cooled)

Resistor system:	EN
Application:	Electric multiple unit
Place of operation:	Germany
Maximum power:	524 kW
Continuous power:	125 kW
Nominal voltage:	1500 V DC
Resistance value:	2.5 Ω

Tower resistor (forced cooled)

Resistor system:	EN
Application:	Locomotive
Place of operation:	Europe
Continuous power:	2 x 600 kW
Nominal voltage:	1500 V DC
Resistance value:	2 x 4.0 Ω

BRAKING RESISTORS
EXAMPLES OF TROLLEY AND ELECTRIC BUSES

Roof resistor (natural cooled)

Resistor system:	EN
Application:	Electric bus
Place of operation:	Europe
Maximum power:	250 kW
Continuous power:	35 kW
Nominal voltage:	600 V DC
Resistance value:	1.2 Ω

Roof resistor (natural cooled)

Resistor system:	3PQ4
Application:	Trolleybus
Place of operation:	Europe
Maximum power:	2 x 220 kW
Continuous power:	2 x 50 kW
Nominal voltage:	750 V DC
Resistance value:	2 x 1.3 Ω

Roof resistor (natural cooled)

Resistor system:	EN
Application:	Trolleybus
Place of operation:	Poland
Maximum power:	480 kW
Continuous power:	60 kW
Nominal voltage:	1000 V DC
Resistance value:	0.983 Ω

BRAKING RESISTORS
EXAMPLES FOR DUMP TRUCKS

Side-in frame (forced cooled)

Resistor system:	3PQ4
Application:	Gridbox / Dump truck
Place of operation:	Worldwide
Power:	235 kW
Nominal voltage:	2000 V DC
Resistance value:	0.236 Ω

Gridbox (forced cooled)

Resistor system:	3PQ4
Application:	Dump truck
Place of operation:	Worldwide
Power:	2 x 600 kW
Nominal voltage:	3000 V DC
Resistance value:	2 x 2.65 Ω
Paint:	Grey-black

Gridbox (forced cooled)

Resistor system:	EN
Application:	Dump truck
Place of operation:	Worldwide
Maximum power:	4 x 810 kW
Continuous power:	4 x 700 kW
Nominal voltage:	2300 V DC
Resistance value:	4 x 3.0 Ω
Paint:	Signal-white
Altitude:	up to 5200 m

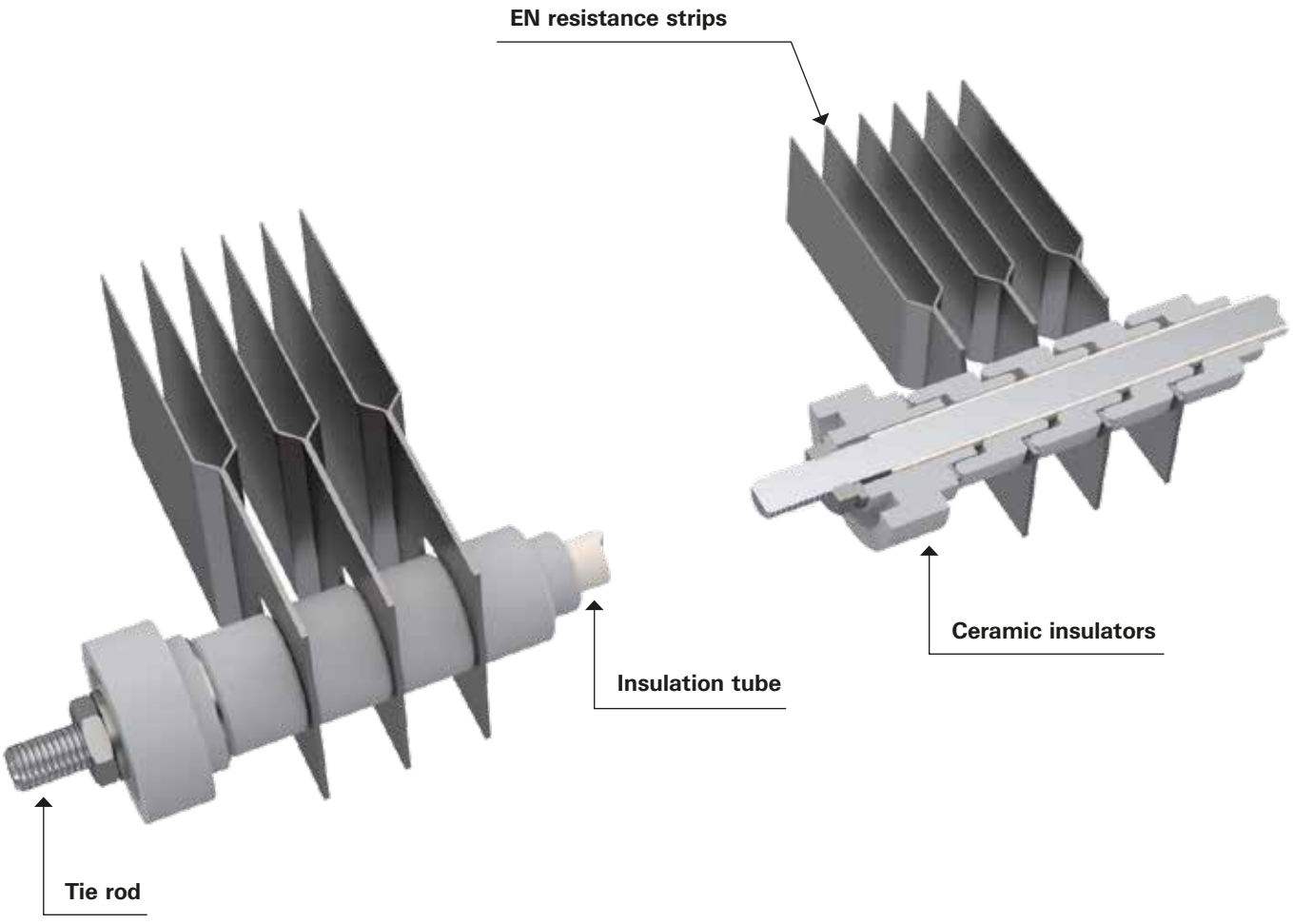
RESISTOR SYSTEMS
MADE IN GERMANY

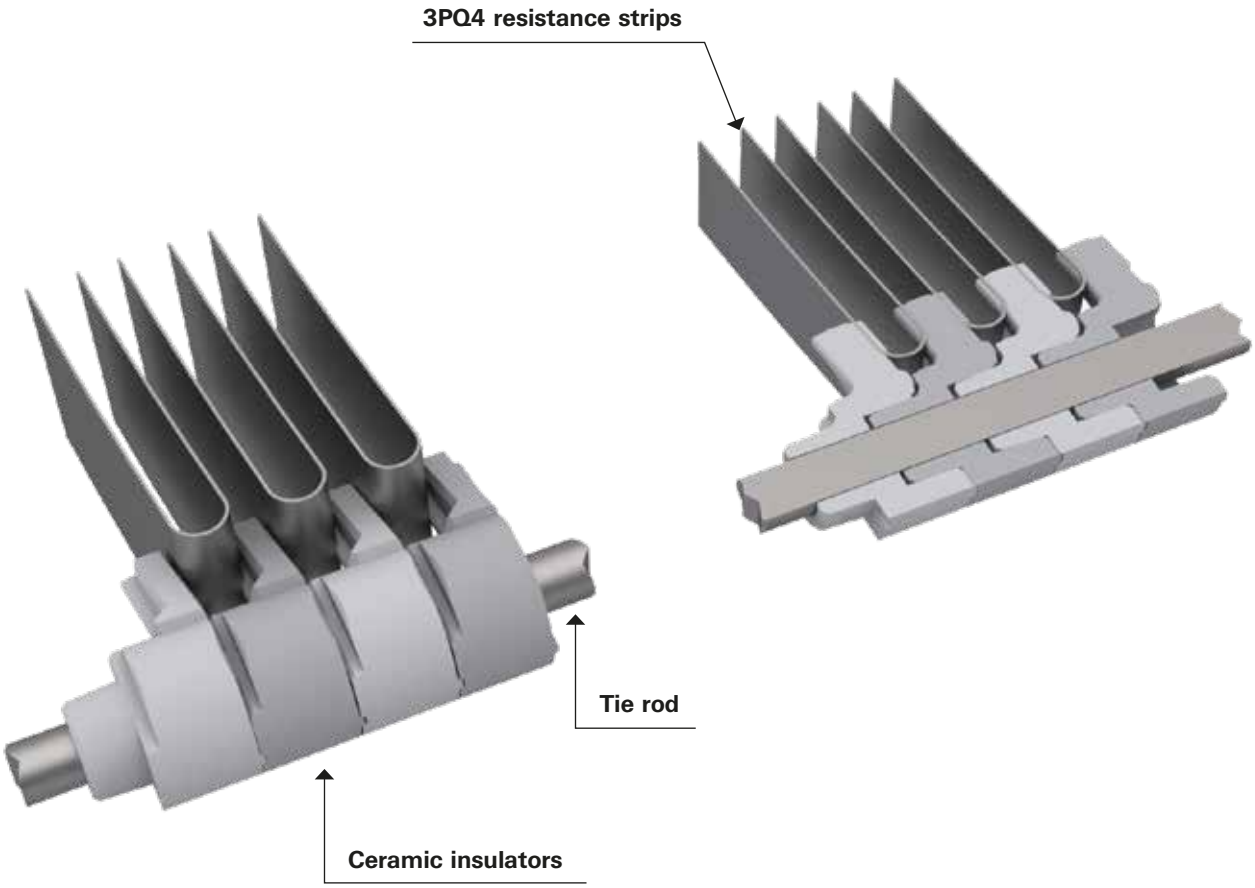
In addition to our 3PQ4 system, which has temperature reserves of up to 850 °C, offering additional safety in the event of overload, GINO AG has also further developed its own 6GN1 resistor system. This now trades under the name EN system. With the help of these two resistor systems, GINO AG is able to get the most out of the given installation space for the customerspecific application area.

Our resistance strips are made of the classic resistance materials **nickel-chromium** and **iron-chromium-aluminium**. The nickel-chromium alloys are corrosion and heat-resistant. The nickel content determines the change in resistance value when heated; the greater the nickel content, the lower the change in resistance.

EN-SYSTEM

The resistance strips joined together by spot welding are additionally provided with embossing. These are mounted on tie rods with additional insulation tubes and ceramic insulators. The EN system is wearless and low-maintenance.





3PQ4-SYSTEM

Full-length folded meandering strips are mounted between ceramic insulators lined up on tie rods. Due to the large clearance and creepage distances, additional insulation is not required in the area of the strips.

This design allows permissible strip temperatures of up to 850 °C to be achieved. Moreover, the strip is wearless and low-maintenance. The requirements for resistors in the field of mobility applications are increasing with higher driving speeds and the safety of the means of transport.

Vehicle manufacturers need competent partners even at the conceptual design stage. All regulations are applied, as well as special customer regulations in individual cases.

All units conform to the EC Low-voltage Directive and are CE marked. Highly qualified project engineers always guarantee state-of-the-art execution. We design, plan and manufacture the perfect individual solution according to your specific wishes and requirements.

EXPANDED PORTFOLIO

In addition to braking resistors, GINO AG also sells other products for the mobility sector.

CONTACTORS

Contactors are switches for high power, low voltage and heavy duty applications. They can also be used to control motors with the help of their control board. Due to their flexible design, the contactors can control any voltage class.

In mobility applications, strict guidelines according to IEC 60077 apply with regard to compliance with electrical parameters, which the contactors of the HB, T and S series fulfil.

The **HB series** is designed and tested according to IEC60077 for use in railway vehicles. It is suitable for circuit protection.

The **T series** is also designed according to the IEC60077 standard for railway vehicle applications. It can be used for a wide variety of circuits such as charging, discharging and filtering circuits.

The **S series** contactors and switch-disconnectors are the world's most complete range of devices for switching AC and DC current. With thousands of flexible configurations, they fit a wide range of applications and offer the highest performance for almost any specification.

WATER-COOLED RESISTORS

Resistors with water cooling do not generate the usual heat at the place of use.

During braking processes, the electrical drive energy is converted into thermal energy. This thermal energy is absorbed by the cooling water and can thus be made usable again. The compact, water-cooled high-performance resistors are available in modular design and can be loaded with up to 25 kW per module. Up to five modules can be connected together to form a block. The range of applications extends from passenger cars to buses and trucks.

BLOWERS

Forced cooled applications can be used as soon as particularly high heat energies have to be dissipated or the natural cooled resistors cannot be used due to a small installation space.

Depending on the installation situation, both axial and centrifugal fans as well as complete cooling systems may be used. Our systems are developed, built, tested and delivered according to the individual requirements and wishes of our customers.

AXIAL

The use of axial fans is very versatile and is mainly used in our own resistor systems. High volume flows of up to 25 m^3/s at a static pressure of up to 3000 Pa are possible. Our axial blowers can be used flexibly and offer particular advantages in a compact design with very high performance. Integrated guide blades are optimised at the operating point to achieve a high fan efficiency of close to 90%.

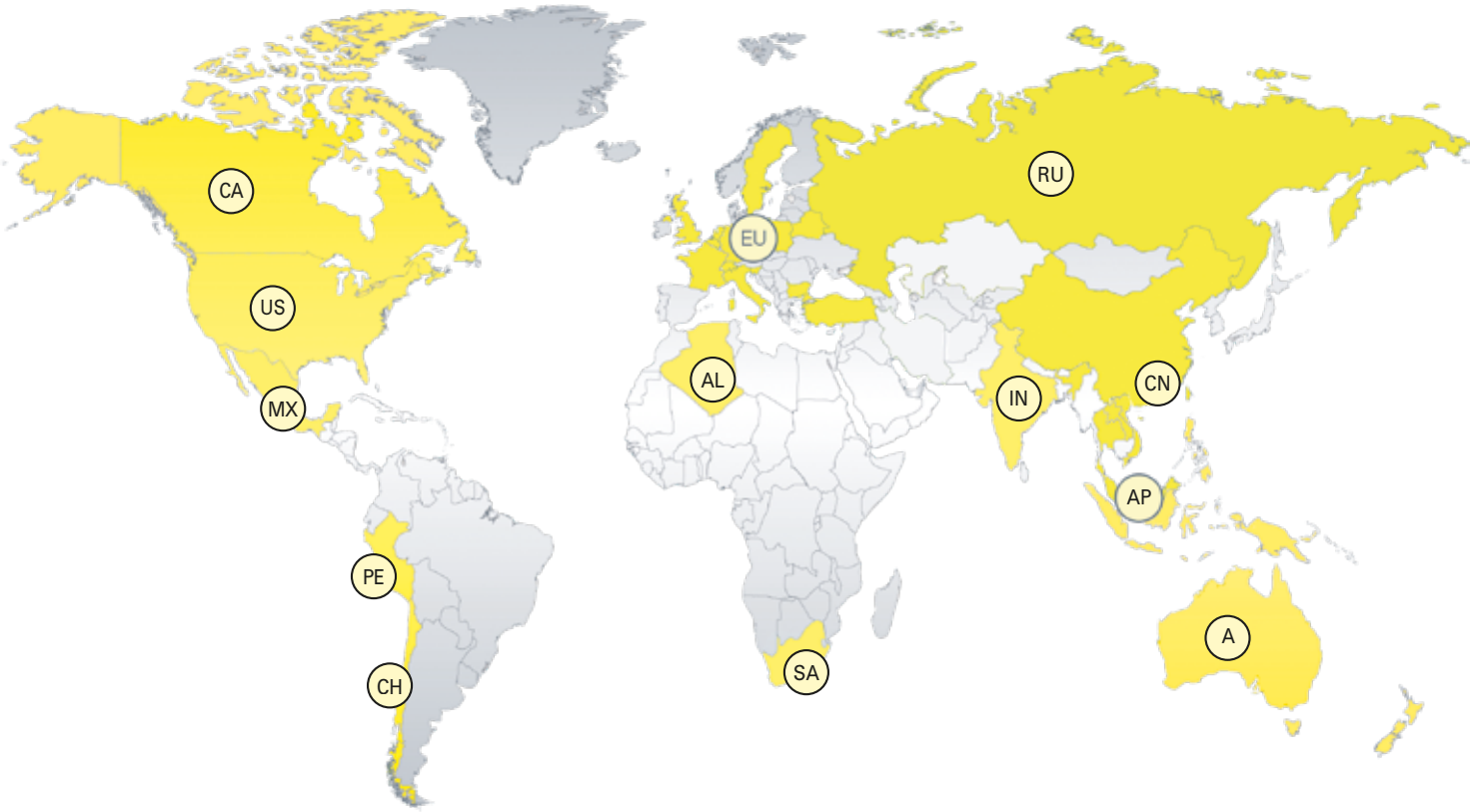
RADIAL

Radial fans are used for high air resistance. Static pressure of up to 10000 Pa is possible. Compared to the axial system, the radial valve often offers a better efficiency with a lower volume. Our centrifugal fans are easily adjustable and are developed according to the specific requirements of our customers.

COOLING SYSTEM

Based on the customer's requirements, complete „plug-and-play" systems with fans, coolers, filters, cabins and other accessories can be developed and integrated into one package so that all mechanical, aerodynamic, acoustic, thermal and filtering properties can be guaranteed. These help our customers to simplify development cycles and to better concentrate on their core competencies.

GINO AG – OUR REPRESENTATIVES



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GINO AG
Elektrotechnische Fabrik
Friedrich-Woehler-Str. 65
53117 Bonn
Germany
+49 (0) 228 98 98 6- 0

Certified to ISO 9001, ISO 14001, IRIS

info@GINO.de / www.GINO-AG.com