

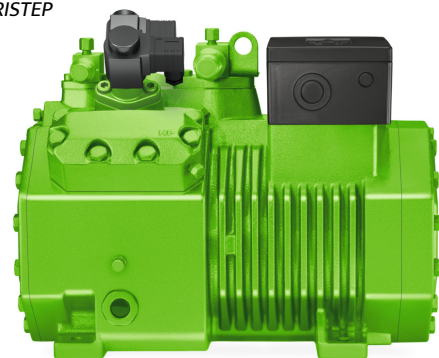
BITZER

Air Conditioning in Rail Vehicles: Increased Comfort, Higher Energy Efficiency and Lower Operating Costs

BITZER's VARISTEP Solution

Energy-efficient operation of rail vehicles reduces operating costs, which also applies to its components. BITZER, has always developed and optimised its products with a focus on energy efficiency. To further reduce energy costs, BITZER ECOLINE compressors can be equipped with mechanical capacity regulators, called VARISTEP, to improve the overall system efficiency. The VARISTEP capacity control is suitable for use with a variety of refrigerants, including HFC and HFO refrigerants and natural refrigerant such as R290 (propane) and R744 (CO₂).

ECOLINE with VARISTEP

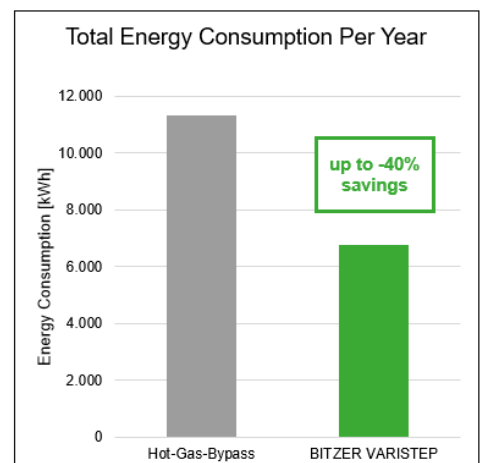
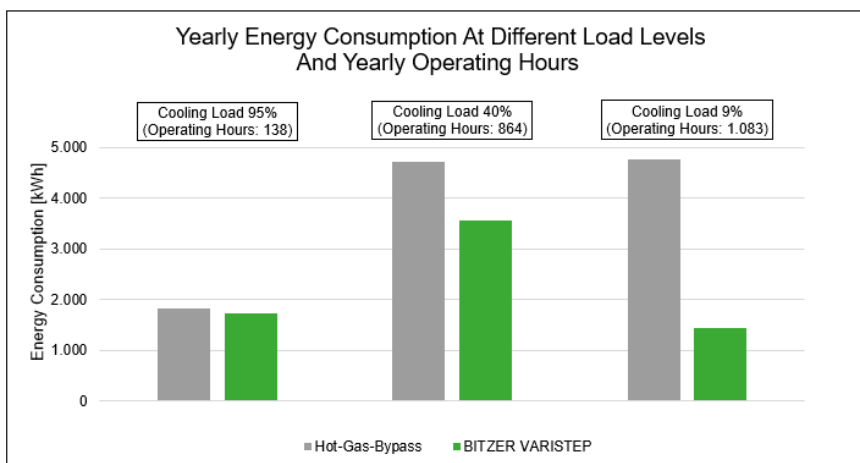


air conditioning systems are much lower than with conventional systems featuring hot gas bypass control.

Capacity Control for Increased Energy Savings

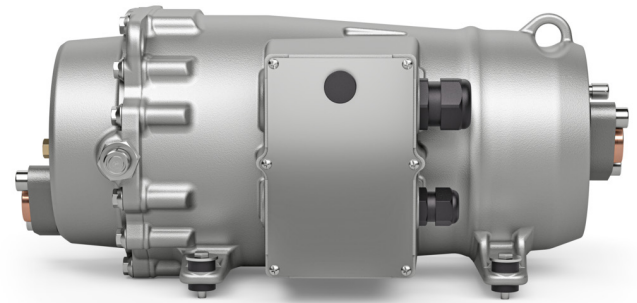
VARISTEP mechanical capacity control enables fine capacity adjustment for reciprocating compressors to effortlessly accommodate changing operating conditions. The extensive control range of around 25 to 100 per cent allows for outstanding full and part load efficiency and thus improves the efficiency of the entire air conditioning system. As a result, the annual operating costs associated with railway cooling and

The following diagrams reveal significant seasonal energy savings, calculated on the basis of a typical air conditioning system in operation on a suburban train in Central Europe. The diagram compares two identical refrigerating circuits operated with R290 – one with VARISTEP and the other with hot gas bypass. Different cooling loads and operating hours were observed over a period of twelve months. Where part load operation is frequent, energy savings can be as high as 40 per cent for compressor operation alone.



BITZER SPEEDLITE ELV52

Air conditioning components for rail vehicles for local and long-distance public transport must fulfil a unique set of demands. Space and weight constraints, efficiency and working life have a direct impact on investment and running costs as well as future compatibility. A decisive factor in this is also the choice of a future-proof refrigerant such as the hydrocarbon propane (R290). The new, ultra-light BITZER SPEEDLITE ELV52 scroll compressor is designed to address all these specific requirements, ensuring a high level of passenger comfort at all times.



The new SPEEDLITE ELV52 scroll compressor from BITZER is optimally designed for railway-specific requirements

Ready for the Future of Rail Transport

As industrial countries worldwide are implementing ever stricter regulations on refrigerants with the EU F-Gas Regulation 2024/573 leading the way, substances with high global warming potential (GWP) are being phased down, becoming scarce and expensive. Furthermore, proposed restrictions on per- and polyfluoroalkyl substances (PFAS) are being drafted through the EU's REACH chemical regulation. The specialist for refrigeration, air conditioning and heat pump technology BITZER has many years of experience in the field of natural refrigerants, offering a comprehensive portfolio of suitable components. Therefore, the compact, low-noise scroll compressor SPEEDLITE ELV52 for mobile applications was also developed for use with various refrigerants, including low-GWP refrigerants as well as the natural refrigerant propane (R290). As the world continues moving towards more sustainable solutions, the highly flammable hydrocarbon propane is proving to have a promising future in the railway sector. Increasingly more transport companies, for instance, already explicitly require the use of natural refrigerants for the vehicles in their urban areas. Propane is an attractive option due to its excellent thermodynamic properties and low environmental impact. Large temperature strokes are easily possible when compressing with this substance.

BITZER SPEEDLITE ELV52: An Efficient and Lightweight Compressor

The BITZER SPEEDLITE ELV52 is a highly efficient compressor that offers an optimal cooling capacity to weight ratio. With its aluminium design, it weighs only 35kg, making it around 50% lighter than conventional compressors. This lightweight design reduces the roof

load and power consumption of vehicles, making it an excellent choice for air conditioning systems in railway vehicles. The SPEEDLITE ELV52 features a suction gas-cooled permanent magnet motor and offers a cooling capacity of 34kW (R290 @to 5°C; tc 50°C; Superheat 10K; Subcooling 0K).

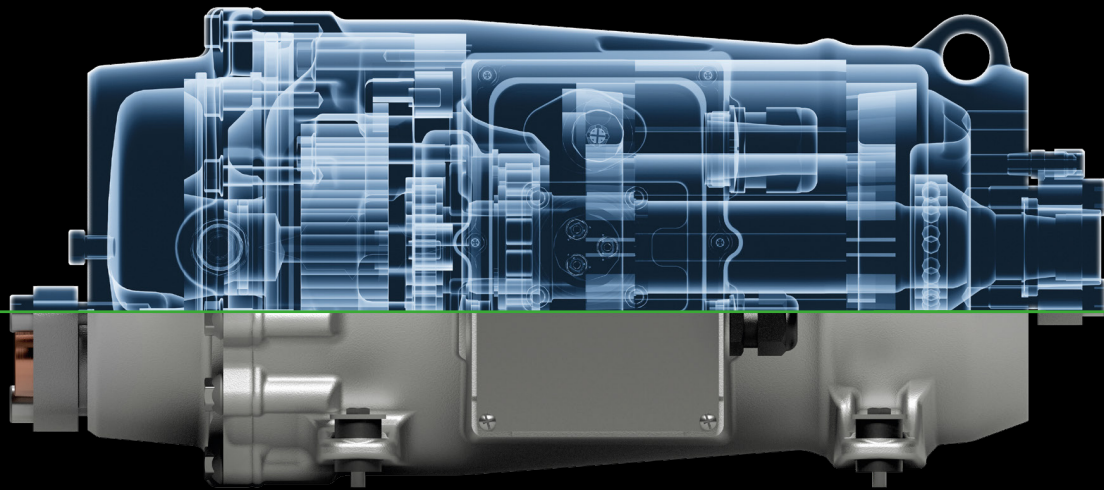
Even under drastically changing operating conditions, the compressor demonstrates its efficiency due to its wide control range. Furthermore, a separate speed control adjusts its cooling capacity to the current cooling and heating load. This increases not only the efficiency of the SPEEDLITE ELV52, but also of the whole system, ensuring a stable temperature regulation inside the train – for maximum passenger comfort. Moreover, an integrated Economiser technology expands the application limits of the compressor significantly. The increase in efficiency thanks to the Economiser technology is particularly advantageous in heat pump operation, which is also possible with the SPEEDLITE ELV52. Compared to electric heating systems, heat pumps achieve much higher efficiency, further reduce operating costs and help to meet the requirements of global environmental regulations. Therefore, they will also be at home in the modern rail vehicles of the future.

For more information visit www.bitzer.de/gb/en





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COMPACT AND LIGHTWEIGHT. STRONG AND EFFICIENT.

The BITZER SPEEDLITE ELV52 scroll compressor for buses and trains is not only compact, lightweight and quiet, but also offers a wide speed range for outstanding performance and high efficiency in heating and cooling regardless of the conditions. Learn more at bitzer.de/speedlite_en

-  AIR
CONDITIONING
-  HEAT
PUMPS
-  BUS
-  RAILWAY
-  PROPANE