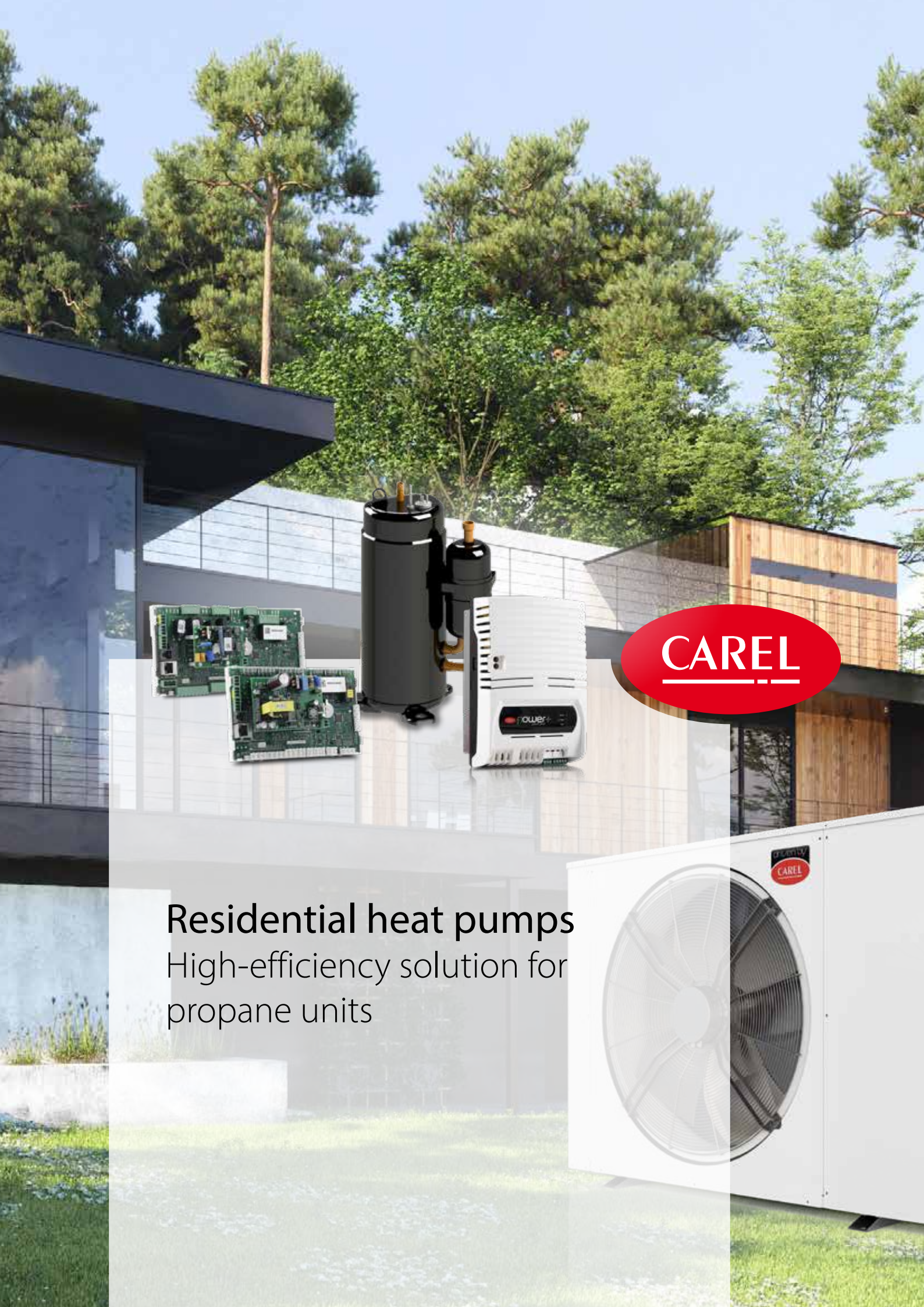


Residential heat pumps

High-efficiency solution for propane units

Complete solution for the management of heat pumps in residential application

System developed to obtain the highest results in terms of energy efficiency and promote environmental sustainability by using devices compatible with low GWP natural refrigerants.

- Integrated management of BLDC compressors and electronic expansion valves;
- High flexibility and modularity for different needs;
- Basic software as starting point for the development of custom solutions;
- Compatibility with the use of natural refrigerants and HFOs (A3 Ready).

Due to the greater availability of energy from renewable sources and the need for the rapid decarbonisation oh heating systems, there has been an exponential grouth in the heat pump market.

Increasing attention to environmental protection is driving the use of low GWP natural refrigerants, however these are often highly flammable.

CAREL's products are suitable for use with the latest A3-classified flammable refrigerants. This means being able to speed up the final certification process of the machine and produce the high number of units required by the air-water and water-water markets.

Compatibility with the latest refrigerants

Compatibility with HFOs and flammable natural refrigerants to meet the needs of unit manufacturers in terms of regulations such as F-Gas.

High efficiency and low power consumption

Combined use of EEV technology and BLDC compressors to ensure higher efficiency and lower power consumption (high SCOP).

Compressor + inverter system qualification

Functional safety across the entire operating range of the compressor. Tested and certified solution

Software and tools for developing your ideas

CAREL offers "DC Residential HP", a software application for managing heat pumps and controlling high-efficiency devices (inverters, valves, etc.) while guaranteeing system protection (evaporator defrost functions, frost protection, etc.).

The software can be used during initial configuration or adapted in simple steps to the layout of the customer's unit using the STone development environment.

SW Design
- Code generation
- Code optimisation
- HMI translation

STone manages the application software development, testing and validation stages and is the pivot around which the entire life cycle of the HVAC/R unit revolves. The software and function system created around STone are used to meet the customers' needs at every step of the machine's life, from design to spare part management in the field.

DEVELOPMENT PROCESS

SPARKLY
Integration with third party production tools

STone Simula
Stand-alone simulator for training / testing

STone Virtual Loop
Digital twin technology to test and validate software developed with STone

DEVELOPMENT PROCESS

APPLICA
APPLICA DESKTOP
Commissioning and maintenance

STone Gate
Remote advanced maintenance and debug

STone Digital Signature
Original spare parts

Main software functions

Refrigeration circuit management

- Primary water (heating/cooling) and domestic hot water (DHW)
- High-efficiency device management: power+ inverter and DC compressor, EEVs
- Modulated control of external devices (fans, pumps)
- Intelligent control of operating limits and optimised low-load compressor management
- Defrost, antifreeze, anti-legionella and other specific functions for the residential market
- Compatible with pGD*, pLDPRO, pGDx user interfaces
- Fast commissioning and correct operation monitoring using the "Applica" app installed locally on smartphones
- Alarms with integrated troubleshooting

Indoor environment hydronic management

- Circulation pump activation for controlling up to three zones
- SG ready
- Screed drying
- Climate curve management

System components

The ready-to-use CAREL solution for managing the cooling circuit of air-water and water-water heat pumps, consisting of reliable, safe and highly-efficient devices.

1

Programmable controller (µPC3*)

- High configurability of the I/O mix for high flexibility;
- Up to 2 built-in driver for the management of electronic expansion valves (EEV);
- RS485 and Ethernet ports for high field connectivity and BMS;
- Compatibility with traditional and natural refrigerants (A3 ready).

2

Pressure transducers (SPKT* / SPKS*)

- High EMC immunity for precise measurement;
- Can be installed directly on the pipe, eliminating the need for fittings and joints;
- Available in screw-on and weld-on versions;
- ATEX certification, compatibility with traditional and natural refrigerants (A3 ready).

4

Electronic expansion valve (E²V-F)

- Suitable for use with refrigerants reaching condensation temperatures of up to 100°C;
- High-precision bidirectional valve, independent of fluid direction;
- Compatibility with traditional and natural refrigerants (A3 ready).

5

Power+ inverter (PS2*)

- Designed specifically for driving BLDC compressors and equipped with active and passive filters for harmonic reduction;
- Compressor protection in the event of a fault, ensured by class B certified FW and the dedicated STO safety input;
- Wide temperature range with the guaranteed maximum output power (-20T60);
- Compatible with traditional and natural refrigerants (A3 ready).

3

HMI user interface

- 6-button semi-graphic terminal with monochromatic display (pGDn);
- Touch screen graphic terminal with 65K or 16M colour display, depending on the model (pGDx);
- Available for indoor and outdoor applications;
- Compatibility with traditional refrigerants and specific versions for natural refrigerants (A3 ready).

- Seven-segment display with integrated Bluetooth connectivity;
- Suitable for use with the Applica app installed on smartphones;
- Quick system configuration wizard;
- Dedicated synoptic for unit display.

6

AVIC rotary compressor

- Twin rotary technology combined with BLDC electric motor;
- Wide operating range, with evaporating temperatures down to -30°C and condensing temperatures up to +82°C;
- Range suitable for residential heat pump applications;
- Available for both traditional gases, such as R410A or R32, as well as for R290.

AVIC rotary compressor for R290

CAREL's offering includes an exclusive range of rotary compressors: environmentally **friendly** because it uses R290, **efficient** thanks to BLDC technology, with **specific** capacities suitable for residential applications, and **flexible** to adapt to multiple climatic conditions.

- **Qualification**: free with CAREL inverter
- **Availability**: stock at CAREL
- **Exclusivity**: Europe

沈阳中航机电三洋制冷设备有限公司
AVIC ELECTROMECHANICAL (SHENYANG) SANYO REFRIGERATION EQUIPMENT CO., LTD.

The CAREL proposal has been further extended and completed with the addition of the AVIC rotary compressor.

The partnership with AVIC allows CAREL to offer an efficient, tested and certified solution in terms of compressor-inverter combination.

AVIC EM SANYO manufactures more than 6 million rotary compressors a year. The company was founded in 1990, with solid roots in Sanyo, still a valuable partner in the areas of design, production and quality.

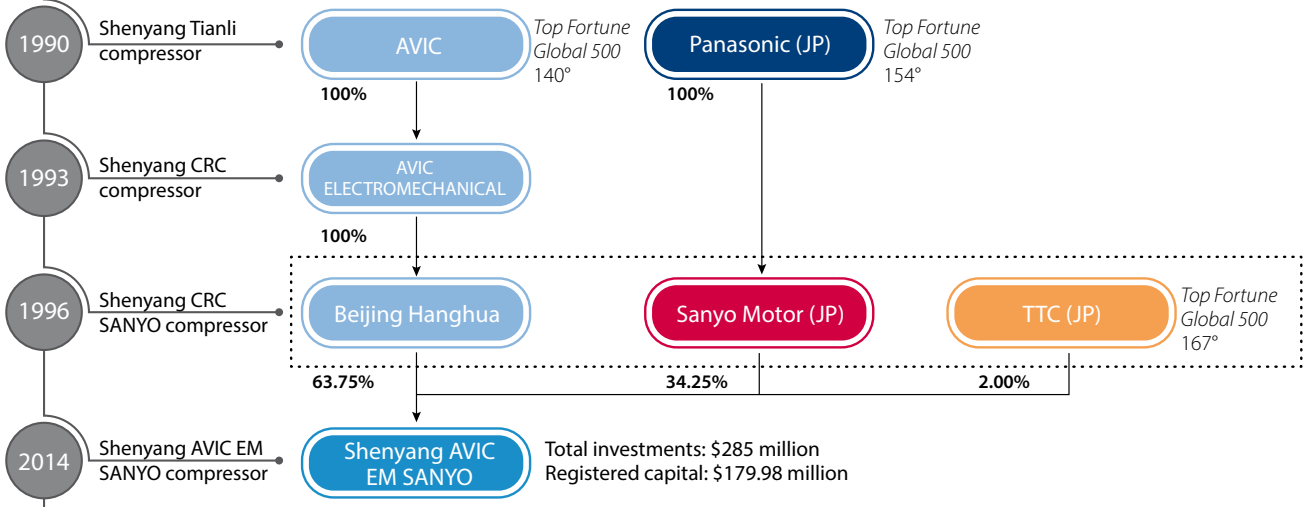
Indeed, the company can boast almost 60 years of experience in the field of rotary compressors for HVAC applications. In the mid 1980s it was the first company to launch a twin solution combined with permanent magnet electric motors.

Today, the natural evolution of this experience is the new R290 range, which CAREL has approached with the desire to offer the market a tested, high-performance inverter-compressor solution.

History

- 1990 — Shenyang Tianli compressor
- 1993 — Shenyang CRC compressor
- 1996 — Shenyang CRC SANYO compressor
- 2014 — Shenyang AVIC EM SANYO compressor

Shareholding structure



some other numbers...

1990

Year of foundation

>2,200

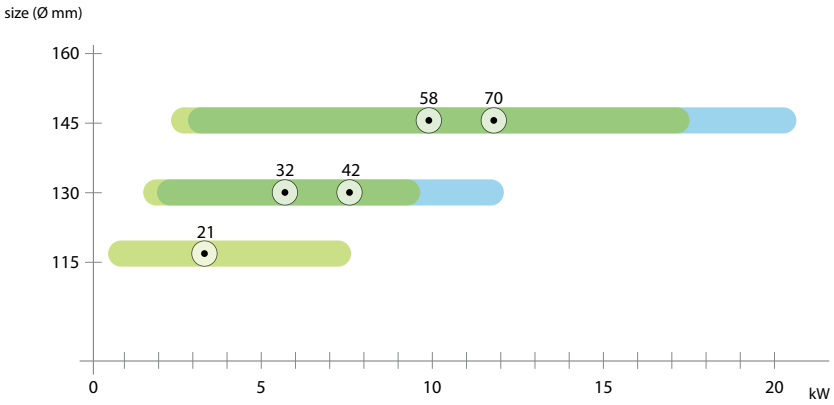
Exployees

142,000

m^2

Total indoor area

Capacity range - heat pump mode

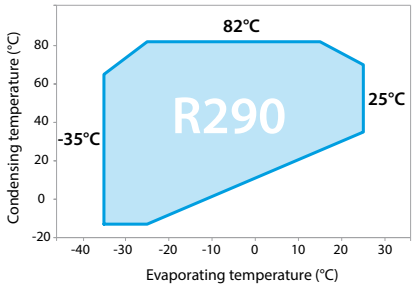


0/75 °C= evaporation temperature/condensing temperature
10/5 K= superheat/subcooling
⊙= capacity values at 60 rps

Main technical specifications

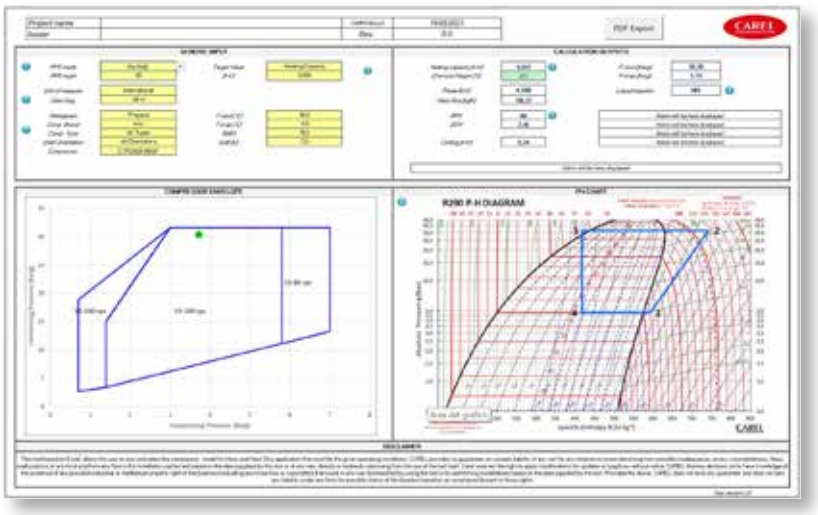
Model	210	320	420	580	700
Size (mm)	115	130	130	145	145
Displacement (cm³/rev)	21	32	42	58	70
Vmin - Vmax (rps)	8 - 120	15 - 100	15 - 100	15 - 100	15 - 100
Single-phase power supply - 230 V	●	●	●		
Three-phase power supply - 400 V		●	●	●	●
PED class	I	II	II	II	II

R290 compressor verification software



Compressor verification software

CAREL provides software for verifying compressor performance.
Easy, intuitive and highly useful.



Operating range

Evaporation temperature: -35T25 °C
Condensing temperature: -13T82 °C

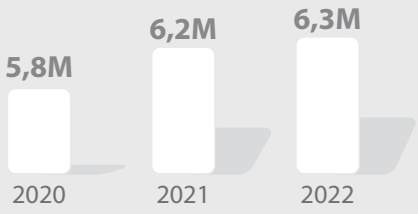
Tests conducted in the laboratory

- Calorimeter
- Test bench for electric motors
- Anechoic chamber
- Vibration analysis
- Accelerated life cycle tests

Research and development

- Two Research and Development centres:
  - Shenyang, PRC since 1990;
  - Gunma, JP since 1968
- over 200 technical staff

Units manufactured



over 10 million - annual production capacity
Fully automated production lines

Headquarters

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Authorized distributor

+3000239EN - 1.2 - 24.09.2024

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