Small and medium-sized process chillers

High-efficiency solutions for industrial process applications

Solutions for the control of small and medium-sized process chillers for the industrial market

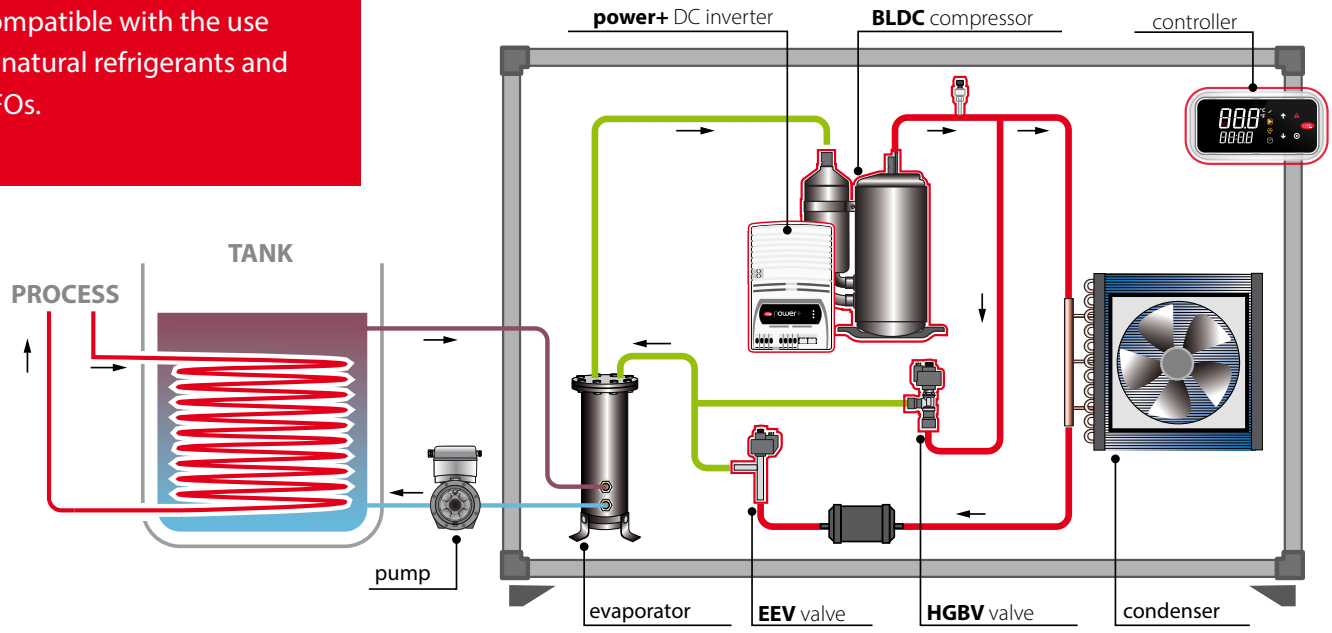
Optimum management of all configurations, with effective control of high-efficiency devices; compatibility with natural refrigerants for a lower environmental impact; advanced connectivity for easy integration into digital solutions;

- Optimum management of traditional and high-efficiency units;
- Two-row LED display for more immediate information and/or latest generation graphic HMI;
- Dedicated app for installers and maintenance technicians;
- Log management for alarms;
- Compatible with the use of natural refrigerants and HFOs.

It is widely-recognised that industry accounts for nearly 40% of current global energy consumption, the majority of which is still produced from fossil fuels.

Industry is also second largest emitter of pollutants into the atmosphere after electricity generation; in the future it will however need to depend more and more on electricity, gradually replacing fossil fuels. it is clear that industrial processes can benefit greatly from highly-efficient systems, using technologies that can help markets achieve several social, economic and environmental objectives.

CAREL's proposal, through its products that are certified for use with natural refrigerants, are ideal for supporting this quick and necessary transition, making it possible to develop extremely efficient, environmentally-friendly units.



Compatibility with the latest refrigerants

In addition to traditional refrigerants, compatibility with HFOs and natural refrigerants, including flammable gases.

High efficiency and low power consumption

Combined use of ExV technology and BLDC compressors to ensure higher efficiency and lower power consumption. Optimum control of the hot gas bypass valve for ON/OFF systems and autotuning of auxiliary loops.

Compressor + inverter system qualification

Functional safety across the entire operating range of the compressor.
Tested and certified solution for high-efficiency systems using BLDC compressors.

Chiller control system components

Solutions for industrial processes aimed at maximising efficiency and guaranteeing service continuity, while ensuring the highest level of safety and respecting the environment.

Parametric and programmable controllers

Latest-generation controllers, extremely compact yet with complete features. Versatile management possibilities based on system complexity: small and compact process units require a parametric solution such as µChiller Process, while more sophisticated and medium-large units require a programmable controller such as c.pCOmini.

Power+ inverter

- Designed specifically to drive BLDC compressors.
- High quality certification (CE, UL, safety, EMC)...
- Selection of compressors tested to work with natural refrigerants (A3 ready).

Compressors

- BLDC management (scroll, rotary, twin rotary).
- Over 350 compressors from 18 different manufacturers.
- Solid partnerships with the leading compressor manufacturers.

Unipolar electronic expansion valve

- Extremely precise control and wide range of sizes for scalable applications.
- Compatible with the use of conventional and natural refrigerants (ATEX stator available).
- Hermetic versions with welded fittings to reduce refrigerant leaks (E2V-F).
- Versions for high temperature applications (E2V-K).

pGDX

- 4.3" 65k colour graphic display.
- Run-time display or browser display.
- Micro-USB port and dual Ethernet port
- Optional T/H sensors and built-in WiFi gateway.

pGD1/pGDn

- 132x64 pixel backlit display and 6-button keypad.
- Easy programmability.
- A3 ready.

Pressure transducers

- Compatible with the most-widely used refrigerants on the market.
- Precise measurement and high EMC immunity.
- Available in screw-on and welded versions.
- Now also available with ATEX certification.

Management of compact single-circuit, traditional and high-efficiency process chillers

Controller for complete management with extended connectivity, able to drive the latest-generation unit components to achieve new ratings based on part load operation and high seasonal efficiency.

µChiller Process is CAREL's solution for the complete management of air/water and water/water process chillers, with on-off and variable-speed BLDC compressors, plus additional innovative connectivity functions.

The controller can also manage hot gas bypass and high-efficiency units.
The largest configuration includes two compressors in a single circuit.

µChiller process includes two auxiliary PID control loops with autotuning, for external control functions.

Another distinctive feature is wireless connectivity via NFC and, on dedicated models, Bluetooth, allowing interacting with mobile devices using the CAREL "APPLICA" app. This makes parameter configuration and unit commissioning in the field much simpler.

NFC
CAREL
APPLICA

Quickly download configurations and send data logs on alarm situations via CAREL app.
Save alarm logs.

Two independent control loops and PID with autotuning (3-way mixing valve, modulating pump for constant pressure, etc.).

Hot gas bypass control via solenoid valve (ON-OFF or modulating via SSR) or ExV. Second valve management with EVD mini or external EVD EVO.

Storage management via auxiliary sensors (minimum level control, preheating, heating, etc.).

ExV closed even in the event of a power failure, thanks to the Ultracap module (to avoid flooding the evaporator).

Lightweight and compact user interface, featuring backlit buttons and NFC (Bluetooth optional) for optimum usability via app.

Compressor envelope control to ensure reliability and service continuity.

Management of medium-high capacity process chillers, with extensive flexibility

Solutions based on programmable controllers for managing advanced units with multiple circuits, numerous devices and custom control.

Compact programmable controller, just 4 DIN modules, with extensive connectivity options.

Available for DIN rail (with or without LCD) and panel mounting, both in three versions (Basic, Enhanced and High-End) that differ in terms of connectivity and the number of I/Os.

The main benefits are:

- Built-in high-efficiency ExV, energy saving algorithms and smart device guide;
- Semi-graphic LCD with icons, customisable user interface and easy wiring;
- System interoperability with third-party devices via standard protocols;
- Universal inputs for maximum I/O flexibility.

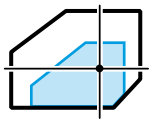
c.pCOe is an I/O expansion board that increases the flexibility of the input and output configuration. A specific model with built-in driver supports a CAREL unipolar ExV.

ExV management for the highest energy efficiency, thanks to precise control in different load and outside temperature conditions.

Wide range of human-machine interfaces for intuitive programming and maintenance, including font support in the most common languages.

c.suite

Programming suite with a complete library of functions to easily develop dedicated control solutions.



High reliability of the functions, verified through thermodynamic testing (in particular for compressor control).

AVIC rotary compressor

CAREL's proposal includes an exclusive range of rotary compressors: **suitable** for operation with multiple refrigerants: R410A, R32, R290; **efficient** being BLDC technology; **flexible** by covering multiple application conditions

- **Qualification**: free with CAREL inverters
- **Availability**: in stock at CAREL
- **Exclusive** dealer in Europe
- **ON-OFF:** dedicated solutions available for traditional refrigerants

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 close collaboration with its partner AVIC allows CAREL to offer a highly-reliable and high-performance rotary compressor. Furthermore, in the BLDC version, the combination with CAREL inverters is tested and certified.
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' experience in the field of rotary compressors for HVAC applications, and was the first to launch the "twin" solution combined with permanent magnet electric motors, in 1985.
Today the natural evolution of this experience is the new R290 range, which completes the more traditional R410A and R32 ranges and is also available in the BLDC version. The latter maximises efficiency and ensures adaptive modulating operation, limiting and virtually eliminating abrupt and repeated ON-OFF cycles and limit conditions that lead to alarms/unit shutdowns.

History

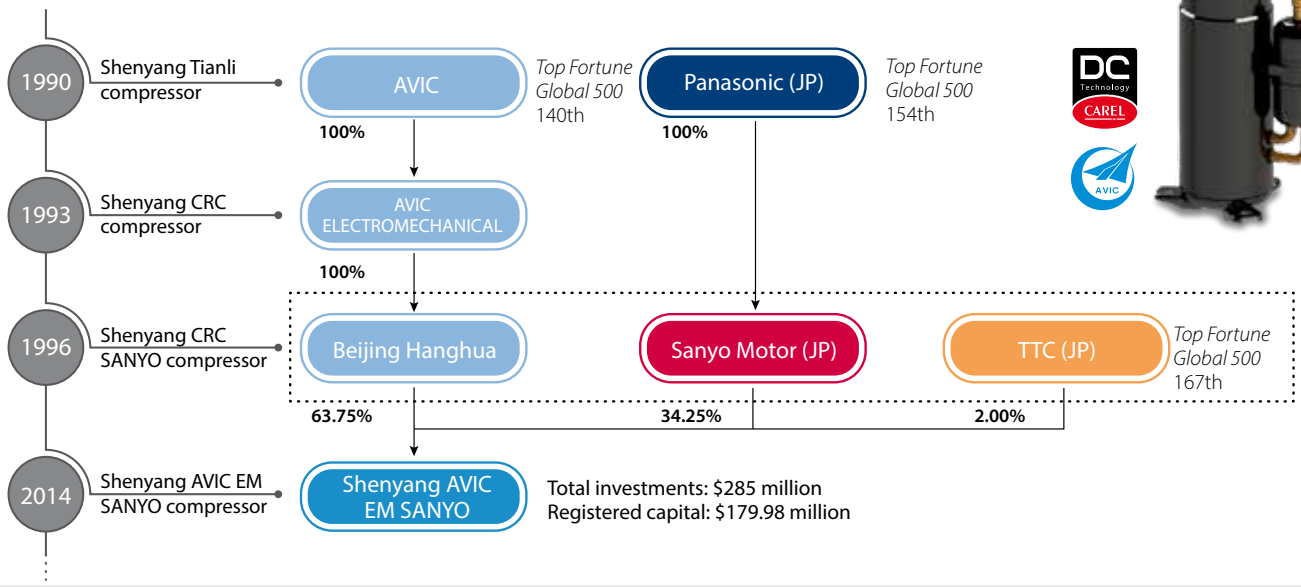
1990 Shenyang Tianli compressor

1993 Shenyang CRC compressor

1996 Shenyang CRC SANYO compressor

2014 Shenyang AVIC EM SANYO compressor

Shareholding structure



some other numbers...

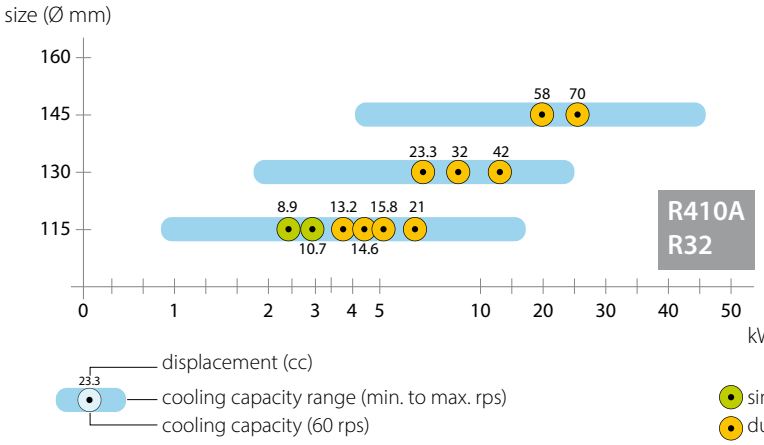
1990
Year founded

2,200+
Exployees

142,000 m²
Total indoor area

Capacity range* - cooling mode

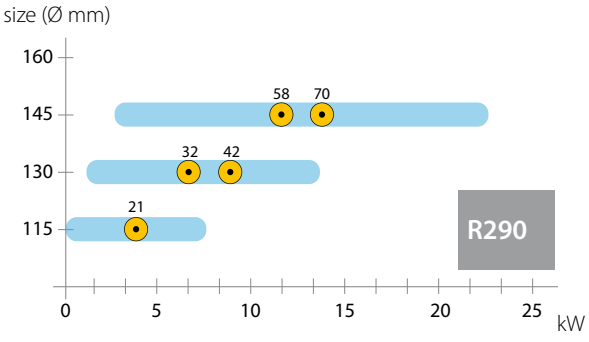
7.2/43.5 °C= evaporation temperature/condensing temperature
* the R410A/R32 summary graph is a purely indicative representation



single rotary
dual rotary

Capacity range - heat pump mode

0/75 °C= evaporation temperature/condensing temperature
10/5 K= superheat/subcooling



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

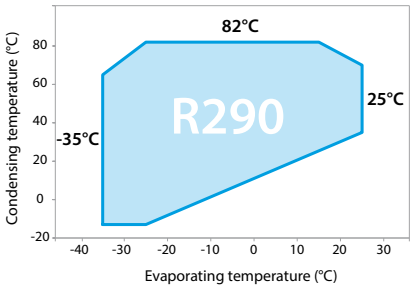
Main technical specifications

Model	210	320	420	580	700
R290					
Size (mm)	115	130	130	160	160
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

Model	146	158	21	233	320	420	580	700
R32								
Size (mm)	115	115	115	130	130	130	160	160
Displacement (cm³/rev)	14.6	15.8	21	23.3	32	42	58	70
Vmin - Vmax (rps)	8 - 150	8 - 130	8 - 120	15 - 120	15 - 100	15 - 120	15 - 100	15 - 100
Single-phase power supply - 230 V	●	●	●	●	●	●		
Three-phase power supply - 400 V					●	●	●	●
PED class	I	I	I	II	II	II	II	II

Model	089	107	132	146	158	210	233	320	420	580	700
R410A											
Size (mm)	115	115	115	115	115	115	130	130	130	160	160
Displacement (cm³/rev)	8.9	10.7	13.2	14.6	15.8	21	23.3	32	42	58	70
Vmin - Vmax (rps)	10 - 130	10 - 130	8 - 130	8 - 150	8 - 130	8 - 120	15 - 120	15 - 100	15 - 120	15 - 100	15 - 100
Single-phase power supply - 230 V	●	●	●	●	●	●	●	●	●		
Three-phase power supply - 400 V								●	●	●	●
PED class	I	I	I	I	I	I	I	I	I	I	I

R290 compressor verification software



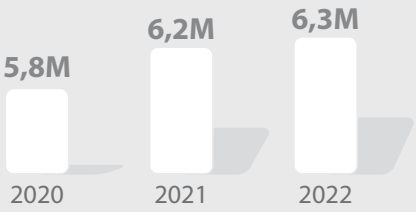
Tests conducted in the laboratory

- 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

Pezzi prodotti



over 10 million - annual production capacity
Fully automated production lines

Headquarters

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