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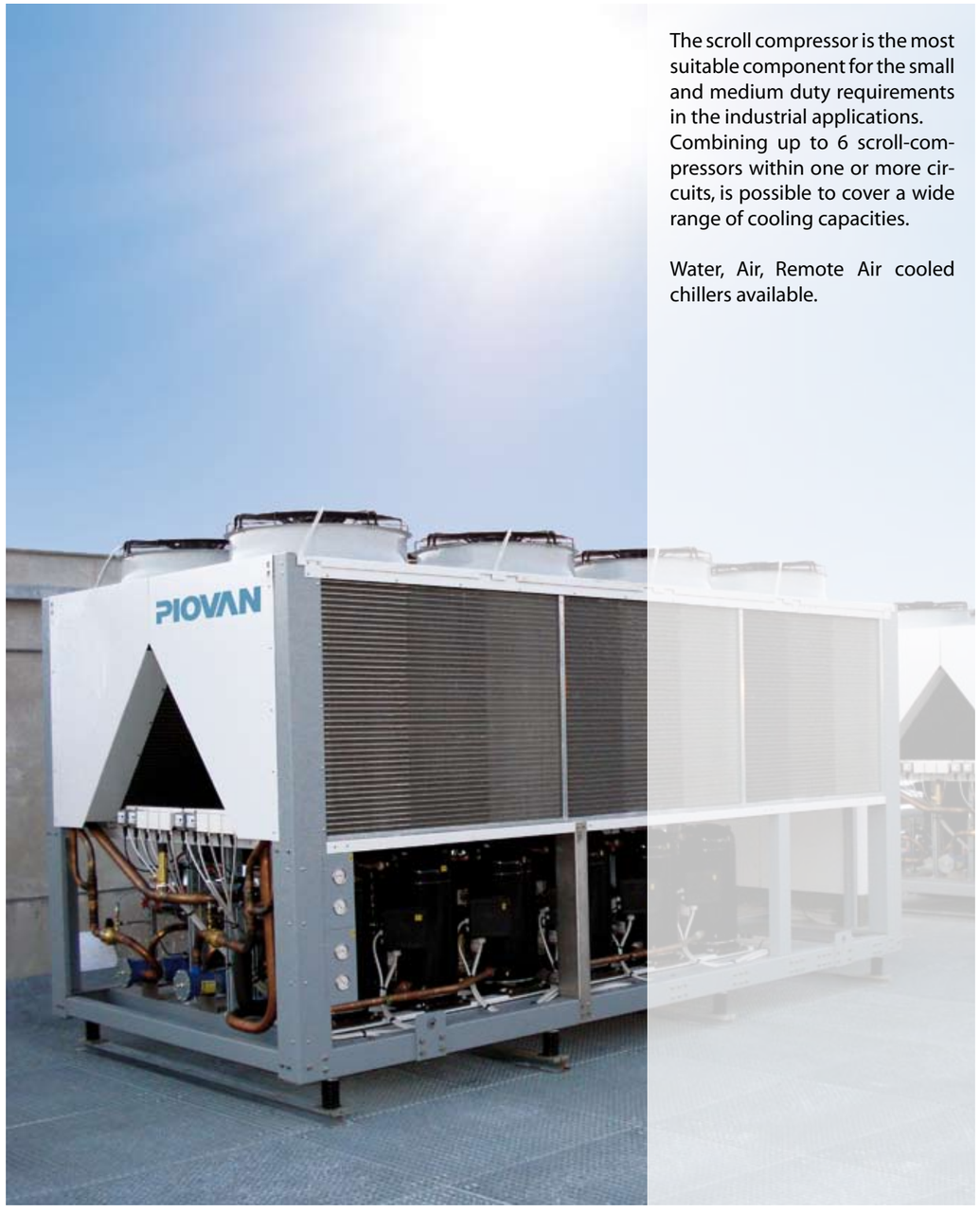
PIOVAN

Customers. The core of our innovation

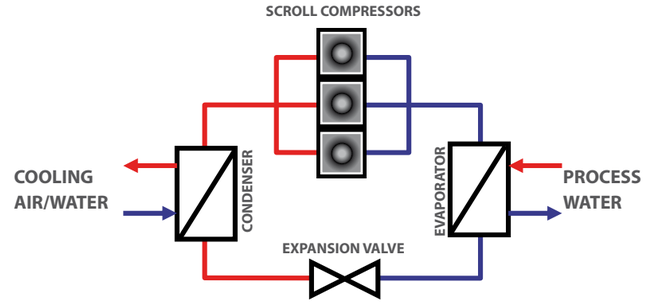
Feeding&Conveying
Drying
Dosing
Temperature Control
Refrigeration
Granulation

Refrigeration Technologies:
scroll-compressor chillers



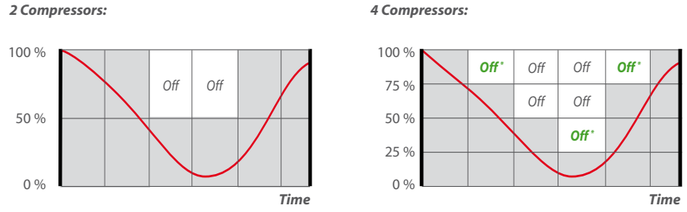
The scroll compressor is the most suitable component for the small and medium duty requirements in the industrial applications.
Combining up to 6 scroll-compressors within one or more circuits, is possible to cover a wide range of cooling capacities.

Water, Air, Remote Air cooled chillers available.



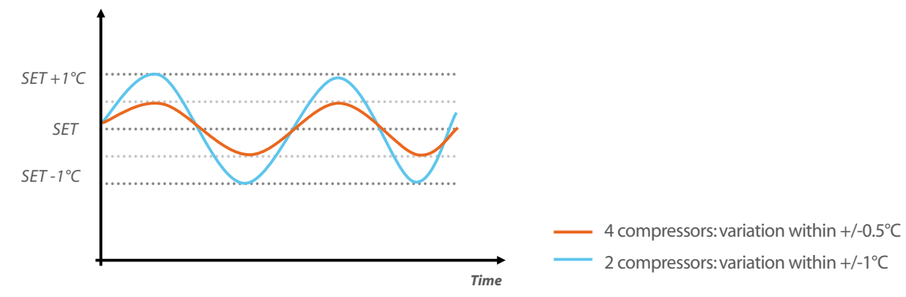
Working principle
This hermetic unit is mainly composed by a compression chamber, one fix scroll plus one orbiting scroll, the electrical motor and the shaft connected to the lubrication pump.

Variation of Thermal Load with 2 or 4 scroll compressors



*Energy saved using 4 compressors instead of 2.

Temperature Stability with 2 or 4 scroll compressors



***Benefits** of Piovan multi-scroll chillers*

- **Reliability**
  The easy and robust design lead this technology to be among the most reliable today available in the market.
  Low sensitiveness to liquid hammer.
- **Efficiency**
  Reduced energy utilization: up to 3 compressors within one refrigerant circuit.
  Stable water temperature during partial loads (most part of working time): the Piovan multi-scroll range is composed by solution with 1 to 6 compressors in the same unit assuring high adaptability to the working conditions.
- **Flexibility**
  Optimized for partial-load functioning: multi-scroll or close control function.
  Suitable for a wide range of refrigerants.
  Wide applications range (process water or ambient temperature).

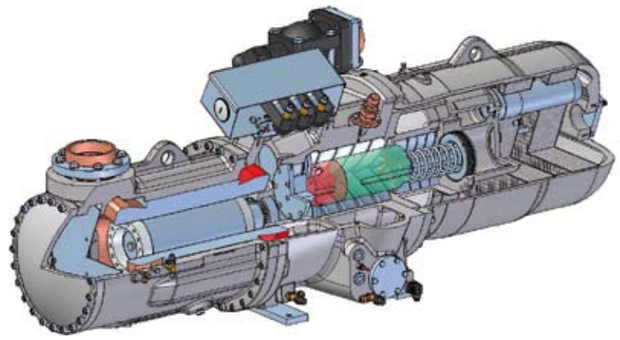
Refrigeration Technologies:
screw-compressor chillers

The screw-compressor chillers allow to cover the medium and high duty requirements in the industrial applications.
Water, Air, Remote Air cooled chillers available.

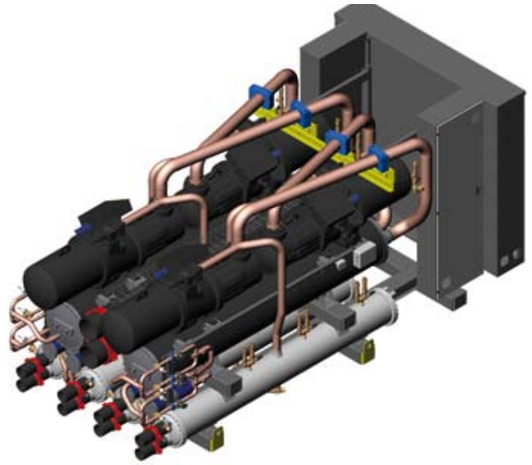
Working principle

Rotary screw compressors utilize two helical screws to compress the refrigerant. Lubricating oil fulfil the space between the screws, both providing a hydraulic seal and transferring mechanical energy between the driving and driven rotor.

Gas enters at the suction side and moves through the threads as the screws rotate. Clearances between the threads decrease and compress the gas. The gas exits at the end of the screws.



(a) ***Screw compressor***



(b) ***Screw compressor chiller by Piovan.***
Unit with cooling capacity of 2.8MW and COP 5.3
(Eurovent conditions)

Benefits *of Piovan screw-compressor chillers*

- **Reliability:** up to 4 independent refrigerant circuits guarantee a continuous functioning.
  The semi-hermetic case allows internal maintenance to the compressor.
- **Efficiency:** Reduced energy utilization: innovative design of the screws.
  High efficiency shell-and-tube evaporator.
  Temperature stability and energy usage optimization: standard electronic expansion valve.
  Developed for optimal functioning with green refrigerant R134a.
- **Flexibility:** Stepless regulation of the cooling capacity from 25% to 100%.

Refrigeration Technologies:
inverter driven chillers

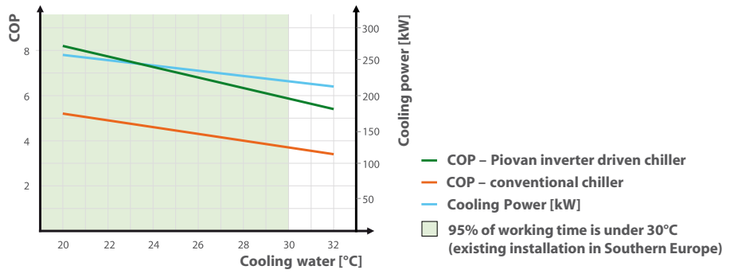
This range of chillers adopts state-of-the-art cooling devices to reach the highest performance in terms of efficiency, accuracy and reliability.

Water, Air, Remote Air cooled chillers available.

Working principle

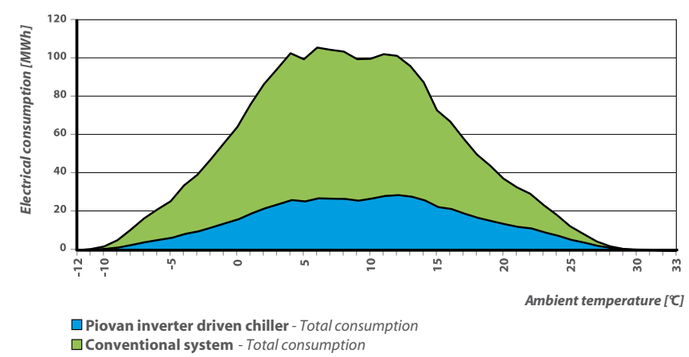
INVERTER TECHNOLOGY works on the principle of variable compressor motor speed; an electrical signal is given to the compressor motor to adjust the screw speed according to the thermal load.
If the thermal load is high the compressor runs faster developing a higher refrigerant flow rate and accordingly increasing the cooling power; on the contrary, the inverter reduces the refrigerant flow rate reducing the cooling power supplied consequently.

Ambient effect on COP and cooling power
Piovan inverter driven chiller Vs conventional unit



working conditions: *12/7°C chilled water*
50 Hz frequency

Total annual energy consumption
Piovan inverter driven chiller Vs conventional system



Required cooling capacity: 400 kW
existing installation in Southern Europe

Benefits *of Piovan inverter driven chillers*

1-Reliability and efficiency in temperature control: highest COP with any ambient conditions.
- Fans managed by frequency converter ensure high efficiency and low noise level.
- Sub cooler increases refrigeration capacity and efficiency.
- EEV electronic expansion valve, for the accurate control of the lamination phase of the refrigerant gas. Lowest water temperature fluctuation: +/- 0.3°C at evaporator outlet.
- Oil flow switch to assure compressor is running in safe conditions.

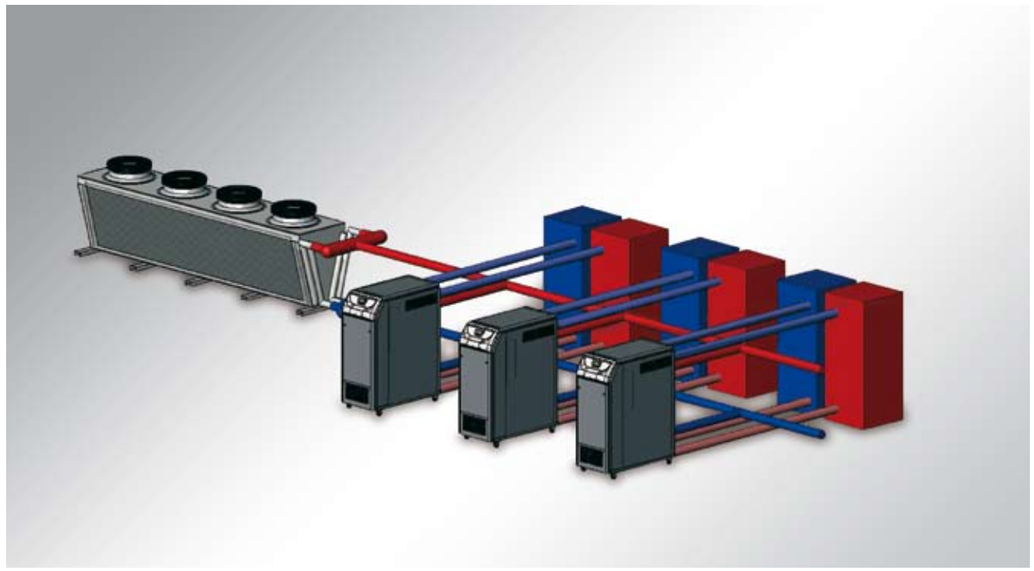
2-Easy to install and to maintain.

3-Compact and suitable also for outdoor installation (no room required inside the production plant).

4-Designed to operate at low condensation pressure to increase the efficiency, especially at partial loads.

5-Extended compressor life and reduced energy utilization: screw compressor is managed by frequency converter.

Refrigeration Technologies:
thermorefrigerators

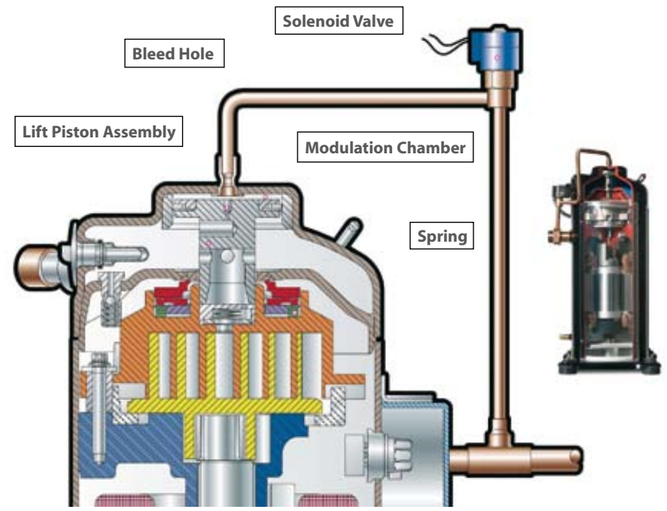


The new Piovan Thermorefrigerators have the function to heat and cool the process circuit of injection and blow moulding machines.
This technology ensures the highest quality of the production process, providing water to every single circuit at specific temperature, pressure and water flow.

All models are equipped with digital scroll compressors which have the feature of working continuously, thanks to the possibility to modulate their functioning from 10 to 100% step by step.

Working principle

The Digital Scroll compressors operate with the principle of engaging the compressor mechanism (scrolls) at intervals, while the motor runs constantly.
The variable capacity is so obtained.



Benefits *of Piovan thermorefrigerators*

- **Significant reduction of energy consumption**. The combination of compressors with digital technology and the electronic expansion valve ensures the greatest energy efficiency. Moreover, the exclusive Piovan solution which does not require an internal recirculating pump further increases energy savings.
- **Maximum operational flexibility** of the working cell. Ideal solution whenever it is necessary to manage the demands of different temperatures of every single processing machine, with no waste.
- **Reduced running costs**, thanks to the possibility to use the free-cooling system which permits to provide water coming from the dry cooler or the cooling tower.
- **Reliability** and long life of the unit: the possibility of power modulation from 10 to 100% allows the compressor to function continuously, thus eliminating the risk of breakdowns and ensuring long duration of the motor.
- **Ultra-compact design**: small floor dimension, reduced height.
- **Complete respect** of the environmental concerns, with the choice of the R410a gas, according to the EU legislation.

Refrigeration Technologies:
Free Cooling systems

Free cooling is a method of using low external air temperatures to assist in ch
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drops to a set temperature, a modulating valve allows all or part of the

optimal utilization of energy, allowing to save all costs for refrigeration
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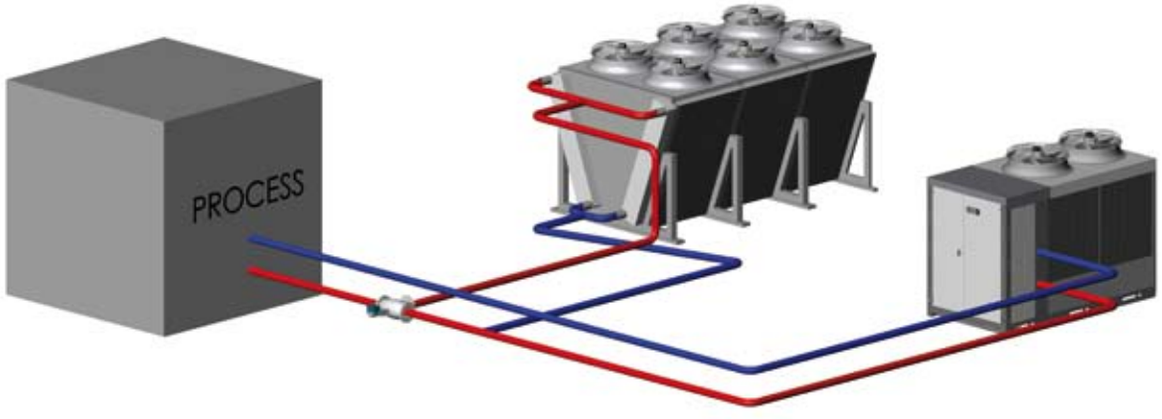
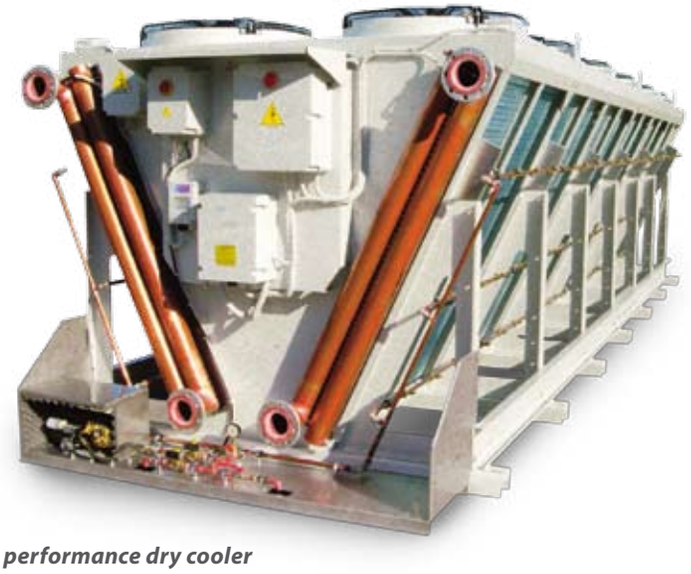


Piovan free-cooling technologies

1. ***Dry cooler***
Water Temperature =
Ambient Temperature + 5°C

2. ***Dry cooler with sprinklers***
Water Temperature =
Ambient Temperature + 2°C

3. ***High performance dry cooler***
Water Temperature =
Ambient Temperature - 5°C



3. ***High performance dry cooler***

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