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Chillers with natural refrigerant R744 (CO₂)

CDA

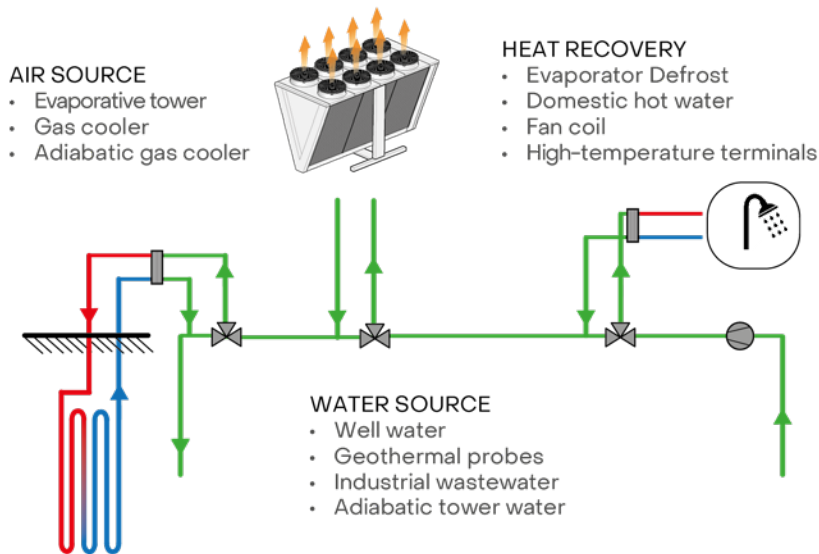
air condensed with modulating compressors

Range: 96-492 kW



CDA is the new range of water chillers designed by HiRef for applications that require energy efficiency and environment-friendliness. Low environmental impact is guaranteed by the use of CO₂ as a refrigerant fluid (R744) which is characterised by a unit GWP (Global Warming Potential) value equal to 1. High efficiency/footprint ratios are achieved thanks to the use of inverter-driven compressors and finned pack exchangers with a large exchange surface installed in a “V” configuration. The adiabatic saturation technology also allows the highest efficiency rates to be reached both at partial and at nominal loads, thanks to the lower temperature of the air entering the coils.

Main advantages



Very high temperature and multi-source heat recovery

In CDA units, the transcritical nature of the CO₂ refrigeration cycle makes it possible to interpose more heat exchangers in series on the dissipation side. A common configuration could consist of:

- a heat exchanger for partial or total recovery of dissipation heat, allowing to produce very high temperature water (over 90°C) without altering the unit's operating conditions in any significant way. The refrigerant does not change phases so this makes large instant temperature differences possible on the water side (for example 10°C / - 80°C) with very high efficiency levels; a common application is domestic hot water production;
- a heat exchanger with air heat sink, preferably adiabatic;
- a heat exchanger with water heat sink, with use of well water or geothermal probes. This allows the CO₂ to be chilled even more, guaranteeing greater cooling performance and efficiency during the most critical times in operation.

The compressors and the pumping kit are placed in a box lined with sound-absorbing material.

Adiabatic saturation system

The adiabatic saturation system consists of a set of humidification panels placed in front of the finned pack heat exchangers and equipped with a system of nozzles that evenly wet the coils. The air flowing through these panels causes partial evaporation of the contained water and cools down as a result. This ensures higher efficiency of the thermodynamic cycle and increased refrigeration capacity.

Natural refrigerant

The refrigerant R744 is a natural gas, largely available in nature and without limitations of use. In addition, it is inert, non-toxic and, more importantly, non-flammable, all of which contributes to reducing costs and the difficulties associated with installing the systems safely. This refrigerant can be widely used in the field of commercial refrigeration; among other things, it offers good thermodynamic performance due to its inherently favourable chemical and physical properties.

Higher efficiency potential

Ejector technology (available as an option) makes it possible to flood the evaporator and increase the unit's performance by 8%.



Modular and efficient

A configuration with very deep modular 'V' coils provides an extensive heat exchange surface area and therefore excellent thermal efficiency levels in relation to the unit footprint. Another special feature is the material of the coil tubes (alloy of copper and steel) which ensures mechanical strength to high pressures (up to 130 bar) and heat transfer coefficients greater than those of stainless steel-only tubes. By connecting in parallel each CDA unit via special kits (on request) a modular configuration can be obtained capable of meeting high cooling capacity requirements and guaranteeing high redundancy, with full system management via the on-board electronics.

Maximum efficiency at partial loads

The choice of adopting a single refrigerant circuit configuration with an inverter-driven compressor, the use of EC electronic switching fans (supplied as standard) and management of the variable flow rate through circulation pumps: these main features maximize the efficiency of the CDA range at partial loads.

Componenti tecnologici



Refrigerant R744 (CO₂)

On some units it is possible to use, as an alternative to the traditional refrigerants, R744, commonly known as CO₂, a natural gas, widely available in nature, non-toxic and above all non-flammable (GWP = 1). In the field of commercial refrigeration it is an already widely used refrigerant, also thanks to its excellent thermodynamic efficiency which makes it suitable for the production of water at temperatures above 80°C.



Adiabatic Cooling

The air is humidified by passing through a series of wet panels placed before the dissipation coils and decreasing its temperature. An increase in the efficiency of the thermodynamic cycle and in the cooling capacity is therefore obtained.



Multi-protocol communication interface

HiRef units can be integrated with the customer's external supervision Building Management System (BMS), using the most popular communication protocols, including Modbus RTU, Modbus/IP, BacNet, LonWorks, SNMP.



Piston compressors

Piston compressors are suitable for applications characterised by high pressure ratios (e.g. water heat pumps for the production of high temperature water, or uses with carbon dioxide as a refrigerant). They can work with different types of refrigerant, both low density (R515B, R1234ze) and high density (CO₂).



Class A

Internal high-tech components suitably chosen and sized allow the units to operate with outstanding levels of efficiency.



Fast restart

The fast restart function (on request) allows the unit to restart quickly after a mains power outage. This optional feature is available with dual power to minimise restart times.



Corrosion resistant material

The HiRef outdoor units are protected by a metal structure resistant to corrosion and weathering. They are also made of galvanised steel sheet, with epoxy-polyester powder coating, oven-polymerised at 180°C, to offer a C3 degree of protection. On request, it is possible to order specific paint finishing treatments or a metalwork structure built entirely in stainless steel, to obtain a higher degree of protection from high impact adverse weather events.

Available versions



COOLING ONLY



FREE-COOLING

REVERSIBLE HEAT
PUMP

Types of system



AIR/WATER

Additional benefits

- EC fans as standard (as AC option)
- Available in versions: Liquid chiller and Free-Cooling chiller
- Aisi 316L stainless steel refrigeration circuit
- Low pressure side PS: 85 bar

Technical table

CDA		095CS	190CS	285CS
USER WATER VALUES 12/7°C, 35°C OUTSIDE AIR, 40% U.R.				
COOLING CAPACITY	kW	96	192	288
TOTAL POWER INPUT	kW	29	58	87
EER	-	3.33	3.33	3.33
USER WATER VALUES 12/7°C, 10/80°C SOURCE WATER SIDE				
COOLING CAPACITY	kW	131	262	393
THERMAL POWER	kW	164	328	492
TOTAL POWER INPUT	kW	33.5	67	100.5
TOTAL COP	-	8.81	8.81	8.81
SOUND POWER LEVEL	dB	86	89	91
DIMENSIONS [LxHxD]	mm	2255x2655x1600	2255x2655x3200	2255x2655x4800

Also available with 60 Hz power supply

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