



ALCHEMIST Series

Adiabatic subcooler for CO₂

TORRAVAL
cooling



THE NEW ALCHEMIST SERIES



Alchemist is a simple and compact **PATENTED** product, designed to **increase chillers' power and seasonal energy efficiency**, specifically for retrofitting. Alchemist has been developed by TORRAVAL cooling technologies for commercial refrigeration (food-storage), a particular and demanding sector, focused on efficiency and reliability.

The adiabatic subcooler designed by TORRAVAL increases the efficiency in the commercial refrigeration, without alteration to general plant configuration: it's **ONLY** necessary to intercept fluid

coming from condensers and to design Alchemist electrical and water connections.

When installing the adiabatic subcooler?

In all the cases where there is a refrigeration system for supermarkets. Available a range for Commercial Refrigeration, CO₂ plants (R744): *Refrigeration capacity from approximately 50 [kWf] to 500 [kWf], depending on the needs and the size of the shop.*



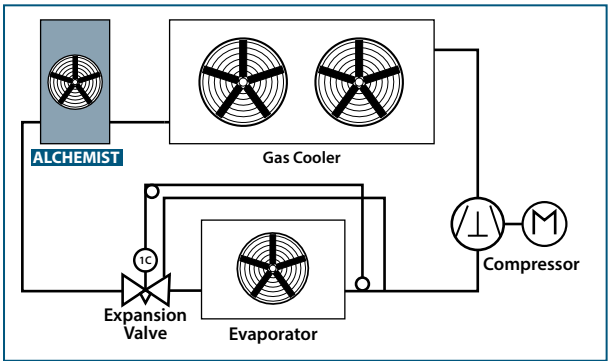
ADIABATIC SUBCOOLING

Alchemist combines the **adiabatic cooling** physical principle, together with the **refrigerant fluid subcooling**.

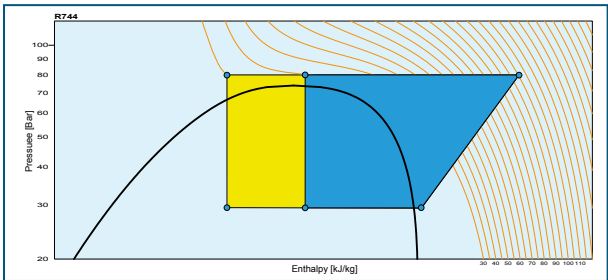
The adiabatic cooling consists in air temperature reduction through humidification. **Adiabatically treated air subcools the liquid** coming from chiller condenser circulating inside the machine's coils.

Alchemist is a plug & play product that, in comparison with other evaporative/adiabatic solutions used for increasing efficiency, **maintains the existing chiller configuration and plant layout.**

Plug & Play



*Example with refrigerant R744 (CO₂).
Frigorific circuit beneficial effect (yellow part) thanks to the Alchemist introduction (sub-cooling)*

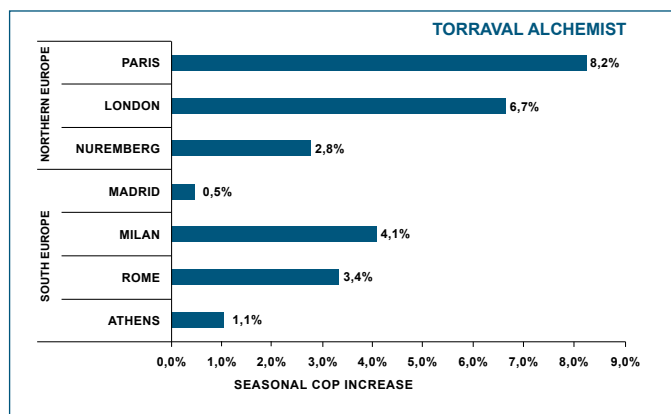
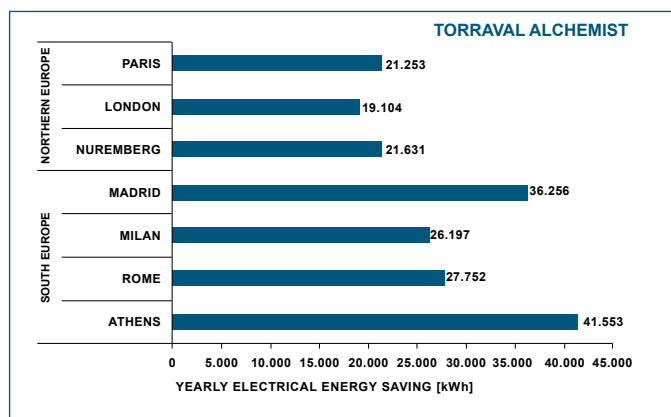


Cooling effect

MAIN ADVANTAGES

- ◆ High **savings kWh** of produced frigorific energy.
- ◆ **Plug & Play solution**, with integrated control system.
- ◆ **Easy and simple access** for maintenance.
- ◆ Compact design, **modularity** and easy installation.
- ◆ **EC Plug fan** technology.
- ◆ Available software to have **ROI & VAN**.

Simulation: Alchemist in a 160 kWf plant with parallel compression



Alchemist in a supermarket



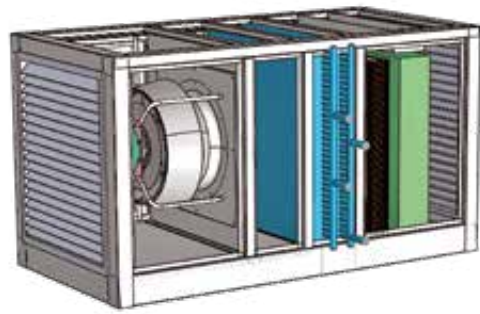
WHERE TO USE ALCHEMIST

HFC frigorific circuits retrofitting.

*In combination with **new HFC** or **HFO chillers**.*

Transcritical plants width CO_2 .

OPERATION



The **PATENTED Alchemist** Series is fully automated and managed by an operator panel integrated with the possibility of **remote management**: just set the subcooling temperature you wish to obtain and the system will self-adjust optimising energy and water consumption.

There are **two operating ways**: dry and adiabatic.

Dry operation:

external air is drawn in and conveyed onto the finned coils.

The humidification process is deactivated, no water is present and the humidifier pack is dry.

The subcooling readings by temperature probes modulate fan speed to optimise power consumption.



Adiabatic operation:

external air is drawn in and passed through the humidifier pack (protected inside the machine). The adiabatically cooled air (therefore at a lower temperature than the external air) is conveyed to the finned coils thus **increasing the frigorific fluid subcooling**.

The subcooling readings by temperature probes modulate fan speed and adiabatic cycles to **minimise power/water consumption**.



SPECIFICATIONS

- ◆ **Support structure** made of press-folded galvanized metal sheets and subsequently protected by a RAL 7016 epoxy paint cycle.
- ◆ **Heat exchange coil** arranged inside the cooler, made of copper pipes and aluminium fins. Angle between coil, diameter of pipes, thickness and pitch of fins are designed to offer the best heat exchange performance with reduced fluid and airflow pressure drops.
- ◆ **Flocked PVC humidifier pack.** The geometric configuration allows the use of untreated water. The particular flocked pack design, as opposed to other types of adiabatic packs, requires spraying only for short periods at long intervals of time: this minimizes the power and optimises water consumption. The adiabatic pack is easily accessible and removable for cleaning.

- ◆ **Temperature probes** for measuring external air, refrigerant, humidified air temperature inside the machine.
- ◆ **Aluminium air Inlet grille** (removable in an easy way), for the adiabatic section protection: avoiding direct penetration of light and water splashes during the wetting cycles.
- ◆ **EC Plug Fan.**
- ◆ **Command and control panel** of the various functions of the cooler, with the possibility of data transmission via MODBUS TCP/IP.

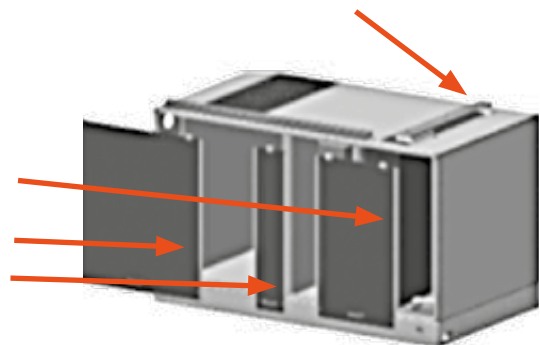
- ◆ **Wetting water collection gutters** in stainless steel AISI 304, accessible and cleanable. The machine is totally accessible in a simple, fast and safe way.



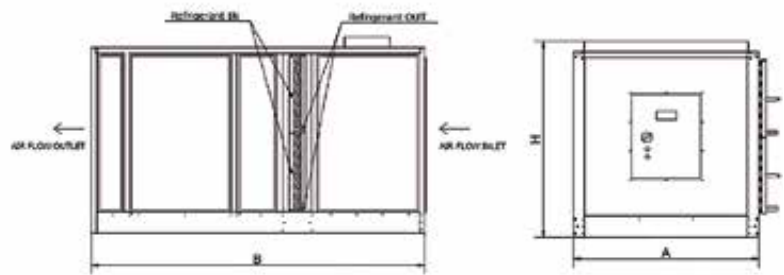
- ◆ The unit does not require special maintenance.
- ◆ System provides for the direct use of mains water. Generally, the quantity of water is minimal and limited to the summer season at a preset threshold. This topic has been given particular

attention both in the choice of components in direct contact and in the management of the water itself: no accumulations, no stagnation.

The unit is totally accessible, in a simple, fast and safe way



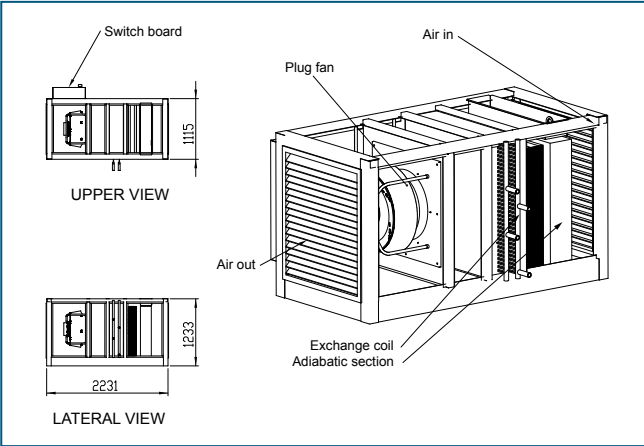
FLOW, POWER, NOISE LEVELS, CONSUMPTIONS AND DIMENSIONS



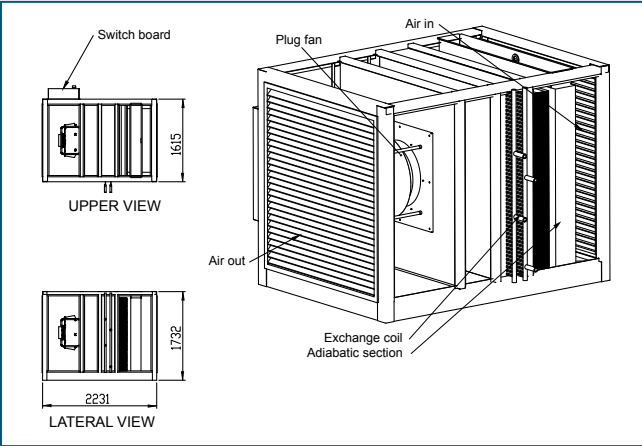
Model	CO ² Caudal (kW)	Thermal power (kW)	CO ² Pressure loss (bar)	Instant consumption (l/h)	Noise level @10m (dBA)	Electrical consumption (A)	Dimensions B / A / H (mm)
Alchemist 5000-19 S.R.	6000	32	0,6	58	483	2,80	2231 / 1615 / 1732
Alchemist 4000-19 S.R.	4500	24	0,6	51	513	2,80	2231 / 1365 / 1483
Alchemist 3000-19 S.R.	3500	18	0,6	38	533	3,65	2231 / 1265 / 1383
Alchemist 2500-19 S.R.	2500	13	0,6	13	574	3,60	2231 / 1115 / 1233

* Available also other dedicated solutions

Data valid for the following conditions:
T _{in} CO ₂ (°C) 38
P _{in} CO ₂ (bar) 94
ΔT subcool. (°C) 4
T _{amb} (°C) 35
H.R. (%) 40



Alchemist 2500-19 S.R.



Alchemist 5000-19 S.R.



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