

ADIABATIC SYSTEM



REFRION
COOL GENERATION

REFRION

COOL
GENERATION

Refrion is a **European market leader** in the **industrial refrigeration sector, data centres and the ventilated equipment sector**. Founded in 2002, the group employs over **100 professionals** in the manufacture of **Dry Coolers, condensers and heat exchangers**.

We have chosen to be a future-proof company, conducting our business in a way that **fully respects natural resources**. That's because we believe that caring for the planet isn't just common sense - it's a necessity.

We have opted for **progress that fully** respects the environment in which we live. That's why we were the first to introduce **an innovation that has revolutionised** the industrial refrigeration and data centre sectors: the **adiabatic system**. Adopting this **intelligent solution** allows water savings of up to 95% and a net reduction of **energy** consumption and **CO² emissions**.

That's why Refrion is the First for Adiabatics.
That's why Refrion is part of the COOL GENERATION.

WHY REFRION ADIABATIC SYSTEM

ADIABATIC SATURATION THEORY

The adiabatic saturation reduces the suction air temperature (respect to the ambient air) and therefore the efficiency of the heat exchanger increases. The adiabatic saturation temperature lowers - since evaporating water removes heat - though it is still higher than the dew temperature, as evaporation itself raises the partial pressure of water vapour. Thanks to Refrion's systems, the adiabatic saturation guarantees an increase of the relative humidity up to the whole saturation of the air (R.H.=100%).



SMARTBOARD



A UNIQUE CONTROLLER FOR:

- the continuous EC fan speed regulation;
- the control and diagnostics of all Refrion adiabatic systems and related on-board equipment (pressure, temperature and humidity sensors, UV lamps, actuation valves, pumps).

Smartboard modulates a 0-10V or a modbus signal on the basis of the input coming from the sensor and the settings. The signal is reprocessed by the electronics on-board the EC fans that adjust the rotation speed. Smartboard module using EC fan technology guarantees substantial energy savings and reduces the noise level of the fans being regulated therefore it is ideal for environments with extremely restrictive noise limits.

OVERVIEW:

- Enclosure in UV resistant plastic, protection rating IP54 (IEC Standard 60529).
- Operating temperature: -20°C ÷ +50°C
- Storage temperature: -25°C ÷ +70°C
- Multifunction LCD Display (resolution 128x64)
- 4 control buttons
- Multilanguage menu

FEATURES:

- Non-volatile memory to retain parameters and event logs
- RTC (Time/Date) with battery backup

- Humidity/temperature sensor
- 5 analog inputs (0-10V, 0-20mA, PTC temperature sensor, pressure transducer).
- 4 analog outputs (0-10V).
- 6 digital inputs.
- 4 digital outputs: alarm signal, external unit control

CONNECTIVITY:

- RS485 Modbus RTU Slave communication interface
- RS485 Modbus RTU Master communication interface
- Ethernet (Modbus TCP/IP)
- WIFI

TECHNICAL DATA:

- Single-phase supply, voltage 230V (-15% ÷ +10%), frequency 50/60Hz.
- Power supply overcurrent protection using fuse
- USB Host Interface allows flash drive connection to upgrade software and download data logs
- RS485 interface
- Signal buzzer
- Electromagnetic system for reducing limescale build-up
- Complies with Electromagnetic compatibility EN 61000-6-3 EN61000-6-2
- Complies with European Directive 2014/35/EU LVD

INDUSTRIAL ADIABATIC SYSTEM (PADS)

OPEN CIRCUIT



VDI 2047-2
Compliant



ICPE 2921
EXCLUDED



The guideline VDI 2047 Part 2 specifies the requirements for the hygienic operation of evaporative cooling systems, where water is trickled or sprayed or otherwise in contact with the atmosphere.

With the aim to minimize any hygienic risk, considerable relevance is given not only to the water cycle but also to the materials used and the mode of operation.

The design, the construction and the operation of all Refrion adiabatic coolers comply with VDI 2047 -2 guidelines.

Inlet air humidification system by means of special adiabatic panels. The panels, placed in front of the heat exchangers on the air inlet side, are homogeneously soaked through a distribution system with no water recirculation. The air, by passing through the panels, increases its humidity and gets colder depending on the different working conditions.

**WATER CONSUMPTION
HIGH**

**RELATIVE HUMIDITY INCREASE
UP TO 60%**

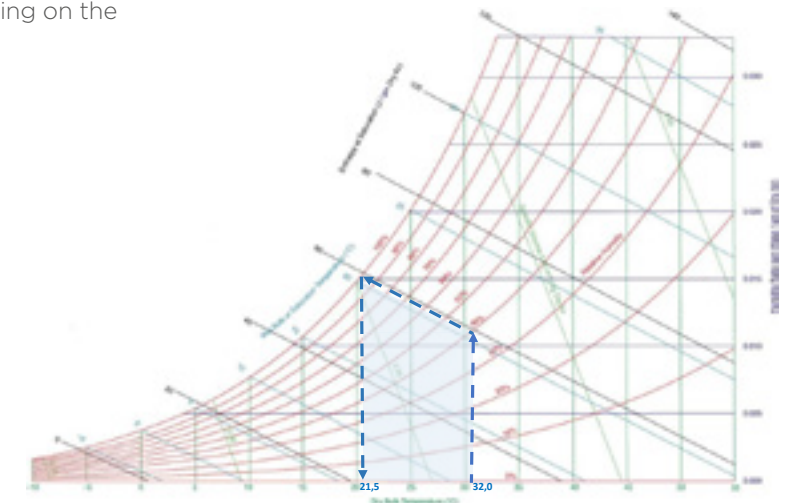
T.AMB = 32,0 °C (R.H.=39%)

T.CALC=21,5 °C (R.H.=99%)

OPTIONAL:

Water recirculation skid
(CLOSE CIRCUIT)

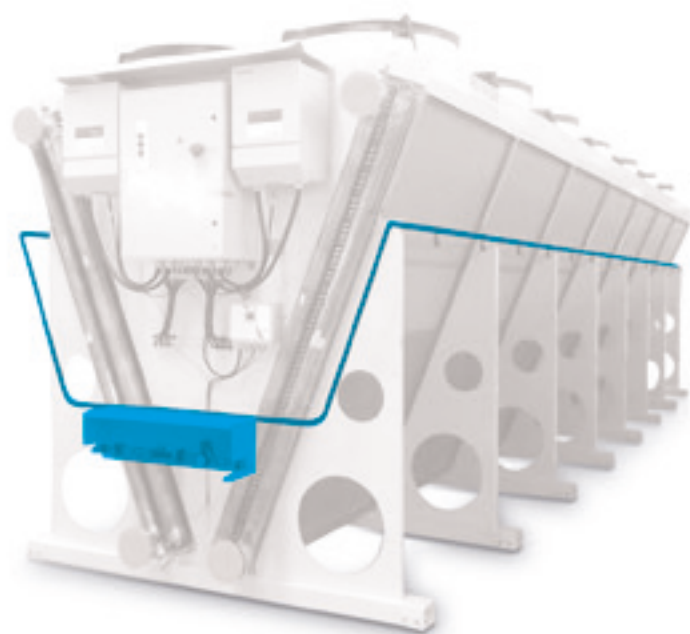
**WATER CONSUMPTION
VERY LOW**



Available for the following product range: Superjumbo ► Combo ► Tower ► Wall



SPRAY ADIABATIC SYSTEM



The guideline VDI 2047 Part 2 specifies the requirements for the hygienic operation of evaporative cooling systems, where water is trickled or sprayed or otherwise in contact with the atmosphere.

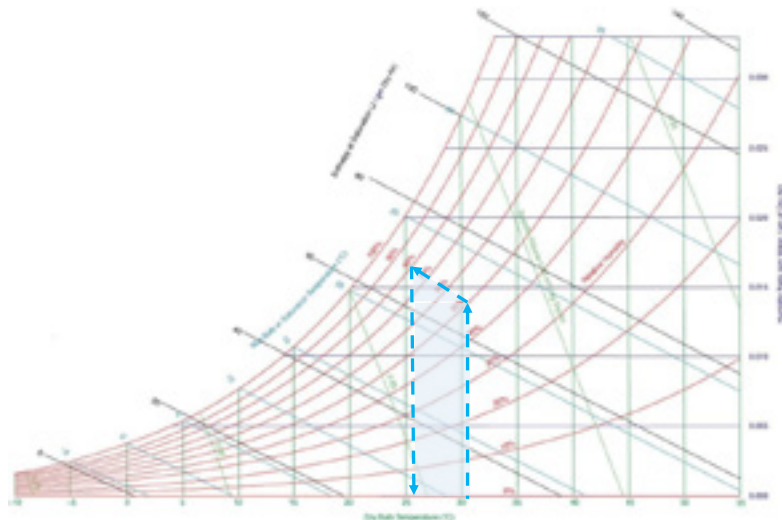
With the aim to minimize any hygienic risk, considerable relevance is given not only to the water cycle but also to the materials used and the mode of operation.

The design, the construction and the operation of all Refrion adiabatic coolers comply with VDI 2047 -2 guidelines.

Inlet air humidification system through water atomisation. A very thin water mist generated by specific nozzles fills and humidifies the inlet air, thus making it colder, depending on the different working conditions.

WATER CONSUMPTION LOW
RELATIVE HUMIDITY INCREASE +30%

T.AMB = 32,0 °C (R.H.=50%)
 T.CALC=26,3 °C (R.H.=80%)

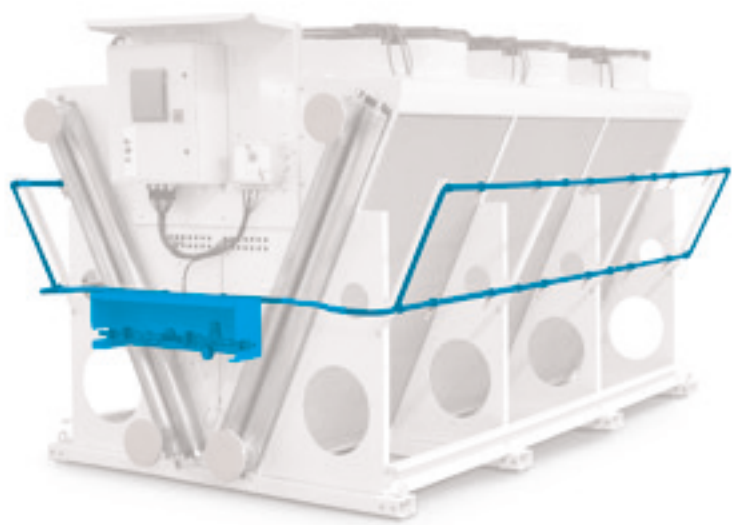


Available for the following product range: Superjumbo ▶ Combo ▶ Tower ▶ Wall ▶ HV



HYBRID SPRAY SYSTEM (H.S.S.)

OPEN CIRCUIT



The guideline VDI 2047 Part 2 specifies the requirements for the hygienic operation of evaporative cooling systems, where water is trickled or sprayed or otherwise in contact with the atmosphere.

With the aim to minimize any hygienic risk, considerable relevance is given not only to the water cycle but also to the materials used and the mode of operation.

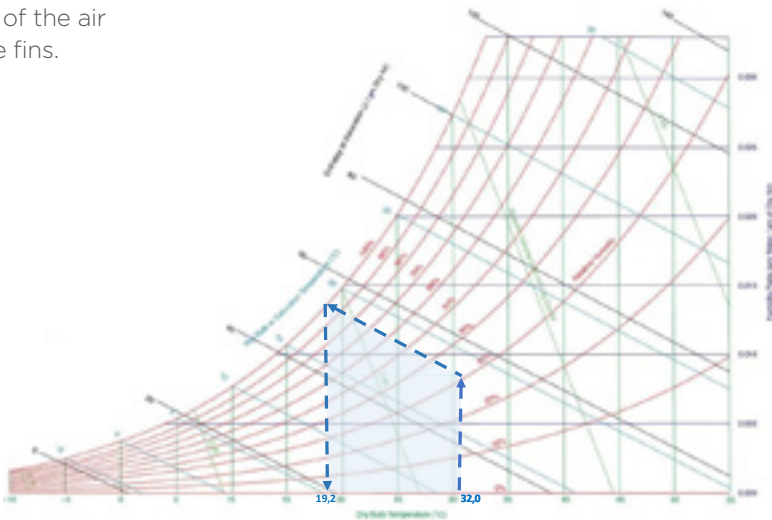
The design, the construction and the operation of all Refrion adiabatic coolers comply with VDI 2047 -2 guidelines.

Water atomisation system available for the liquid coolers and the air cooled condensers. Special diffusing nozzles spread a very thin water mist throughout the inlet air and the finned surface of the heat exchanger. The cooling capacity of the unit is considerably enhanced by the combined effect of the adiabatic saturation of the air and the evaporation of the drops onto the fins.

WATER CONSUMPTION MEDIUM
RELATIVE HUMIDITY INCREASE UP TO 100%

T.AMB = 32,0 °C (R.H.=30%)
 T.CALC = 19,2 °C (R.H.=100%)

OPTIONAL:
 Water recirculation skid (CLOSE CIRCUIT)
WATER CONSUMPTION VERY LOW



Available for the following product range: Superjumbo ▶ Combo ▶ Tower ▶ Wall ▶ HV



REFRION HIGHLIGHTS

WATER RECIRCULATION SKID

Designed to minimise water consumption in a closed circuit adiabatic system. The water used to allow the adiabatic saturation of the air is directed into the basin and redirected into the circuit through the recirculation pump. Water consumption is thus limited to the quantity evaporated during the adiabatic process.



COMPARISON CHART

	PADS	SPRAY	H.S.S.
SATURATION	<div><div></div></div> 99%	<div><div></div></div> 80%	<div><div></div></div> 100%
INCREASING R.H.	<div><div></div></div> 60%	<div><div></div></div> 30%	<div><div></div></div> 100%
AIR TEMP. REDUCTION	<div><div></div></div> -8 K	<div><div></div></div> -5 K	<div><div></div></div> -10 K
VENTILATION ENERGY SAVING	<div><div></div></div> 4/10	<div><div></div></div> 2/10	<div><div></div></div> 5/10
DIRECT ENERGY CONSUMPTION	<div><div></div></div> 1/10 OPEN CIRC. <div><div></div></div> 3/10 CLOSE CIRC.	<div><div></div></div> 1/10	<div><div></div></div> 1/10 OPEN CIRC. <div><div></div></div> 3/10 CLOSE CIRC.
WATER CONSUMPTION	<div><div></div></div> 9/10 OPEN CIRC. <div><div></div></div> 3/10 CLOSE CIRC.	<div><div></div></div> 4/10	<div><div></div></div> 5/10 OPEN CIRC. <div><div></div></div> 3/10 CLOSE CIRC.
INVESTMENT	<div><div></div></div> 6/10 OPEN CIRC. <div><div></div></div> 5/10 CLOSE CIRC.	<div><div></div></div> 2/10	<div><div></div></div> 3/10 OPEN CIRC. <div><div></div></div> 5/10 CLOSE CIRC.
WATER QUALITY	<div><div></div></div> 3/10	<div><div></div></div> 6/10	<div><div></div></div> 8/10
HYGIENIC NORMS COMPLIANCE • VDI 2047-2 • RUBRIQUE 2921	OK EXCLUDED	OK EXCLUDED	OK INCLUDED

PROTECTION COATINGS



Pre-painted hydrophilic coating

- High surface tension: it gives the drops of water wetting the fin a flattened shape (contact angle >15°).
- It favours circulation and the adiabatic saturation of the air.
- Corrosion resistance (ASTM B117): 250 hours.



Single layer pre-painted hydrophobic coating

- It gives the drops of water wetting the fin a spheroid shape (contact angle >50°) for easier draining.
- Corrosion resistance (ASTM B117): 1000 hours.
- Colour grey



Thermoguard*

- Polyurethane based coating.
- High flexible properties.
- Heat conduction and UV resistant properties.
- Prevents chemical and galvanic corrosion.
- Corrosion resistance (ASTM B117): 3000 hours.



Heresite*

- Suitable for marine and salt air environments.
- Withstand exposure to an extensive variety of corrosive and chemical fumes.
- Corrosion resistance (ASTM B117): 6000 hours.



Pre-painted Hydrafins™

- Brand-new coating that enhances the performance of the adiabatic spray systems.
- It exploits the benefits of the latent heat of evaporation even when the water spray system is turned off.
- Corrosion resistance (ASTM B117): 1500 hours.



Duble layer pre-painted hydrophobic coating

- It gives the drops of water wetting the fin a spheroid shape (contact angle >50°) for easier draining.
- Corrosion resistance (ASTM B117): 1500 hours.
- Colour black



BlyGold*

- Heat conductive pigmentation.
- Very high chemical resistance at a low layer thickness.
- Corrosion resistance (ASTM B117): 4000 hours.



ElectroFin*

- Water-based, flexible cationic epoxy polymer using an electro-coat process.
- It guarantees complete heat exchanger coverage.
- Corrosion resistance (ASTM B117): 6000 hours.
- C5M & C5I High Durability (ISO 12944).

USAGE LIMITATIONS

		LIMIT OF USE [HOURS/YEAR]							
WATER QUALITY	SPRAY ADIABATIC SYSTEM HYBRID SPRAY SYSTEM	PRE-PAINTED HYDROPHILIC (single layer)	PRE-PAINTED HYDROPHOBIC (single layer)	PRE-PAINTED HYDROPHOBIC (double layer)	HYDRAFINS™	THERMOGUARD™	BLYGOLD™	HERESITE™	ELECTROFIN™
	To prevent corrosion: • 6 < pH < 8 • Conductivity <1500 µS/cm • Chlorides < 100 ppm To prevent formation of scale: • Hardness 2-4 °f = Max. 1.1-2.2 °dH = Max. 20-40 ppm of CaCO3	150	300	400	400	800	1000	1500	1500
	To prevent corrosion: • 6 < pH < 8 • Conductivity <500 µS/cm • Chlorides < 50 ppm • Sulphate < 50 ppm To prevent formation of scale: • Hardness 2-4 °f = Max. 1.1-2.2 °dH = Max. 20-40 ppm of CaCO3	300	1000	1200	1200	2400	3000	4000	4000
WATER QUALITY	INDUSTRIAL ADIABATIC SYSTEM								
	To prevent corrosion: • 6 < pH < 8 • Conductivity <1500 µS/cm • Chlorides < 200 ppm To prevent formation of scale: • Hardness <25 °f = 14 °dH = Max. 250 ppm of CaCO3	/	MANDATORY FOR CLOSE CIRCUIT (ZP)	OPTION	OPTION	OPTION	OPTION	OPTION	OPTION

REFRION CLIMATIC CHAMBER

THE FIRST LABORATORY IN EUROPE SPECIALISING IN PERFORMANCE TESTING OF EVEN THE LARGEST AND MORE POWERFUL LIQUID COOLERS.

The climatic chamber has been built on the site of the Talmassons (UD) headquarters and will be able to reproduce both the operating (temperatures, flow rates and pressure loss of refrigerant fluids) and the environmentawl conditions (temperature and relative air humidity) defined by our customers in the scale design phase of the unit. The intake and outflow temperatures and pressures of the operating fluids and their flow rate, the temperature, relative humidity and air flow inside the chamber are measured directly, as well as the electrical power and current consumed. Therefore, it is possible to accurately calculate the thermal exchange capacity and the energy efficiency coefficient. It is also possible to perform measurements of the noise level of the units through a sound intensity sensor (ISO 9614-1).

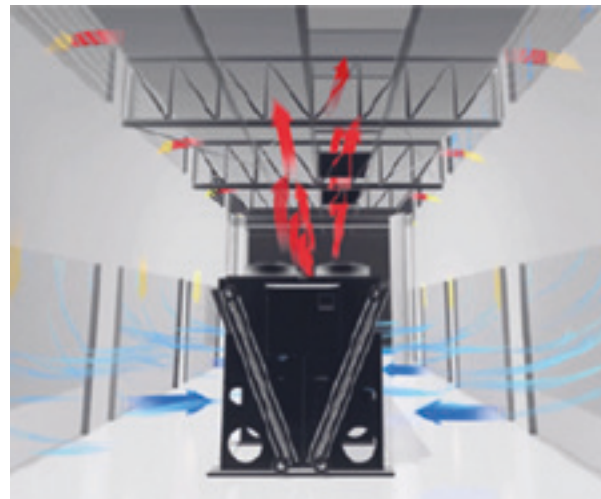
MAX SIZE OF TESTABLE UNITS

LENGTH: 14 m
HEIGHT: 3,5 m
WIDTH: 3,0 m

CHAMBER DIMENSIONS

LENGTH: 19,6 m
HEIGHT: 8,5 m
WIDTH: 12,3 m

SCAN HERE
AND WATCH MORE



PERFORMANCE TESTING AND ASSESSMENT

- Thermal exchange capacity according to Eurovent standards (EN 1048)
- Thermal exchange capacity under customer-defined conditions
- Thermal exchange capacity under free cooling conditions
- Thermal exchange capacity under high-temperature conditions
- Electrical power / current consumption
- Liquid side pressure drop
- Sound levels (ISO 9614-1)

OPERATING RANGE (*)

- Air temperature: 0°C to +45°C (**)
- Relative air humidity: 40% to 70%
- Max intake liquid temperature: 50°C (with capacity up to 400m3/hr), 100°C (with capacity up to 30 m3/hr)
- Maximum measurable exchange capacity: 2.2 MW
- Maximum air flow processed: 700.000 m3/hr

(*) The test conditions must be validated by the Refrion technical office.

(**) A maximum variation in temperature of 25K on the same test day is tolerated.



SELECTION TOOL IS THE NEW REFRION CONFIGURATOR

Selection Tool is the new **Refrion configurator** – designed and developed entirely by our **R&D** department. The software allows prospective clients to choose the **dry coolers** and **ventilated units** that best meet their needs, by calculating their performance under the actual working conditions to which the units will be subjected.

The **Selection Tool** is based on the results obtained from the tests performed in the Refrion Climatic Chamber, where we certify the performance of our **dry coolers** and **condensers** under standard test conditions (EN 1048) and the exact operating conditions defined by the client. The **Refrion Climatic Chamber** is one of the biggest dry cooler-dedicated performance testing laboratories in Europe.

The **Selection Tool** guarantees:

- a more reliable thermodynamic calculation;
- constant updates;
- a quicker calculation time.

Unlike the “Web Selector” – its predecessor – the new Selection Tool with its extremely powerful calculation engine, proves to be a versatile solution as it checks the performance of the selected unit under the exact working conditions, in an even faster and more precise manner.

Furthermore, the energy analysis is more reliable, due to the updated climatic condition database.

With the **Selection Tool**, prospective clients can also save the calculation results to return to the quote at a later stage; a feature that makes the design phase even easier and more convenient.

We also took our clients’ design requirements into account when creating the Selection Tool; in fact, the new interface is completely user friendly and ultra-intuitive to help guide the user through the calculation operations and allow them to easily compare the units in the Refrion range.

In addition to the latest innovations concerning first and foremost, the new distribution systems and reduced water consumption for the Refrion **adiabatic systems**, the Selection Tool will be regularly updated to include all the new Refrion products. The latest additions to the dry cooler and condenser range have already been added, such as the new Wall Super Jumbo and the new **Ecooler** that’s compact enough for container shipping.

ACCESS THE
SELECTION TOOL



REFRION SERVICE

SERVICE, MAINTENANCE, TRAINING AND WARRANTIES.

Refrion provides a range of professional after-sales training and support services to assist its customers throughout the entire lifecycle of their products.

In particular:

- System start-up service
- Scheduled and unscheduled maintenance service
- Technical support service
- Technical training for the installation and maintenance of the units.

Refrion offers a range of Scheduled Maintenance Contracts on new or existing systems, allowing you to outsource some or all service operations to our authorised technical personnel, and extend our standard 2-years warranty.



FOR MORE
INFORMATION:



EUROVENT CERTIFICATION PROGRAMMES

Refrion participates at the Eurovent Certification Programmes “Heat exchangers for refrigeration” For Dry Coolers and Air Cooled Condensers.* The purpose of Eurovent Certification Programmes is to create a common set of criteria for the rating of products. Through specification of certified products, the engineer’s tasks become easier, since there is no need to carry out detailed comparison and performance qualification testing.

Comparison of product performance by third party testing based on well-defined procedures ensures a healthy and solid competition on a market open to all manufacturers. Consultants, specifiers and users can select products with the assurance that the catalogue data are accurate.

* Refrion adiabatic systems are not covered by Eurovent certification.



Check ongoing
validity of certificate:
www.eurovent-certification.com

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