4D COILS LIMITED

Heat Transfer Specialists

ADIABATIC SYSTEMS

- SPRAY
- HYBRID
- PAD

FOR DRY COOLERS

4D_ADBS_03/20

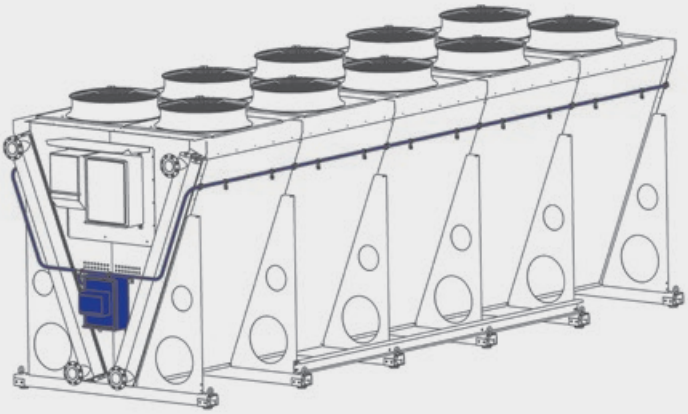
SPRAY ADIABATIC SYSTEM

HYGENIC CERTIFICATION
Compliant with VDI 2047 Part 2

RELATIVE HUMIDITY INCREASE
+30%

WATER CONSUMPTION
LOW

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.
Adiabatic saturation reduces the air temperature, increasing the efciency of the heat exchanger. The system does not recirculate the water and meets the requirements of Standard VDI 2047-2 certied for health and safety by the Johannes Gutenberg University of Magonza



AVAILABLE FOR THE FOLLOWING PRODUCT RANGE


SUPERJUMBO


COMBO


TOWER


WALL


HV

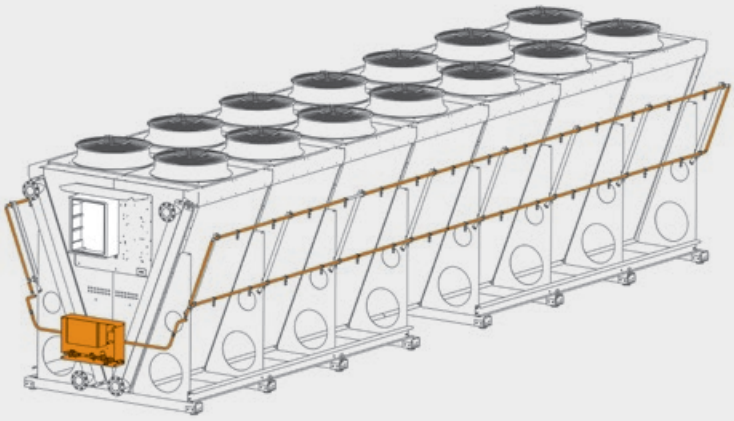
HYBRID SPRAY SYSTEM (H.S.S.) - OPEN CIRCUIT

HYGENIC CERTIFICATION
Under approval

RELATIVE HUMIDITY INCREASE
Up to 100%

WATER CONSUMPTION
MEDIUM

Cooling system of the heat exchange surface of the equipment through a direct water atomisation. Special water diffusing nozzles atomise the water humidifying and cooling the inlet air; the finned-pack heat exchanger releases its sensible heat to the atomized water increasing the thermal heat exchange of the unit even further.



AVAILABLE FOR THE FOLLOWING PRODUCT RANGE


SUPERJUMBO


COMBO


TOWER


WALL


HV

OPTIONAL:
WATER RECIRCULATION SKID (CLOSE CIRCUIT)

WATER CONSUMPTION
VERY LOW

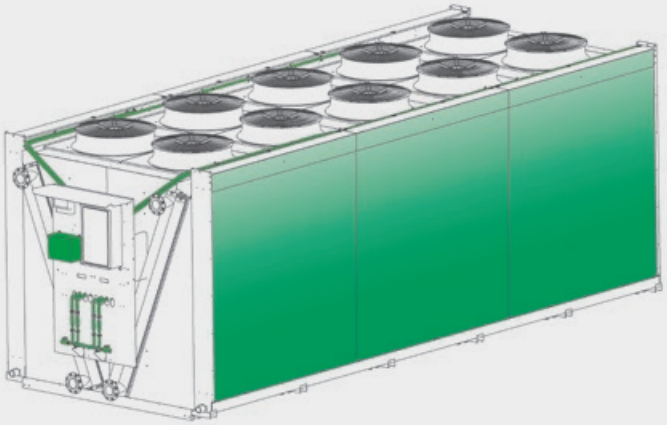
INDUSTRIAL ADIABATIC SYSTEM (PADS) - OPEN CIRCUIT

HYGENIC CERTIFICATION
Compliant with VDI 2047 Part 2

RELATIVE HUMIDITY INCREASE
+60% (max 99%)

WATER CONSUMPTION
HIGH

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.
The system does not recirculate the water and meets the requirements of Standard VDI 2047-2 certied for health and safety by the Johannes Gutenberg University of Magonza.
Standard shipment (optimized for common means of ground transportation): the evaporator modules are supplied separately from the air-cooled equipment (only "Combo" and "Superjumbo" models). The industrial adiabatic system is supplied fully installed, wired and ready-to-use.



AVAILABLE FOR THE FOLLOWING PRODUCT RANGE

SUPERJUMBO

COMBO

TOWER

WALL

OPTIONAL:
WATER RECIRCULATION SKID (CLOSE CIRCUIT)

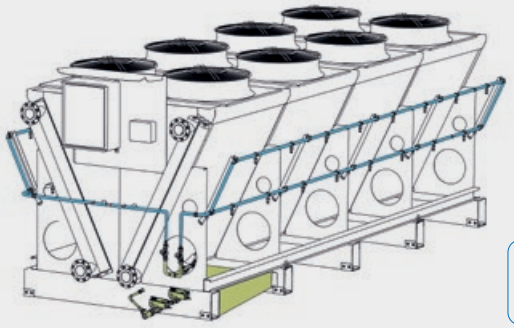
WATER CONSUMPTION
VERY LOW

WATER RECIRCULATION SKID

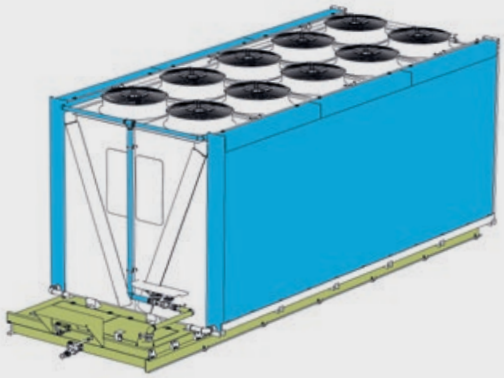
Designed to minimise water consumption in a closed circuit adiabatic system.

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.



H.S.S.



PADS

COMPARISON CHART

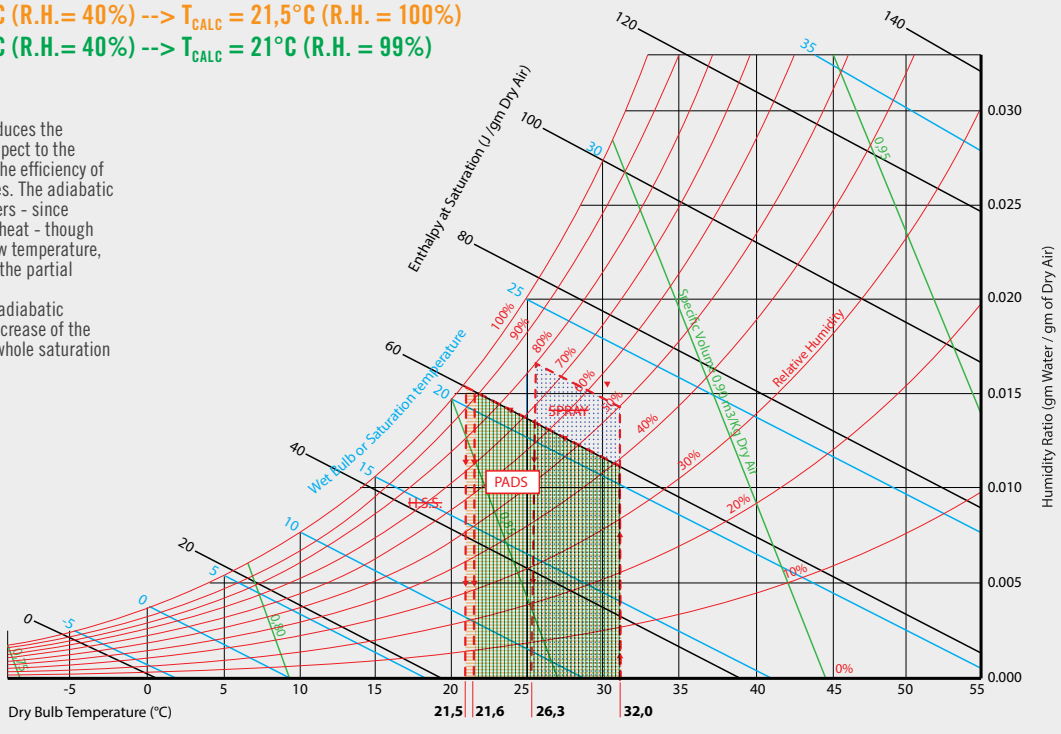
	ADIABATIC SYSTEMS		
	SPRAY	H.S.S.	PADS
SATURATION	80%	100%	99%
INCREASING R.H.	30%	100%	60%
AIR TEMP. REDUCTION	-5 K	-10 K	-8 K
VENTILATION ENERGY SAVING	2/10	5/10	4/10
DIRECT ENERGY CONSUMPTION	1/10	1/10	1/10
WATER CONSUMPTION	4/10	5/10 OPEN CIRC. 3/10 CLOSE CIRC.	9/10 OPEN CIRC. 3/10 CLOSE CIRC.
INVESTMENT	2/10	3/10 OPEN CIRC. 5/10 CLOSE CIRC.	6/10 OPEN CIRC. 5/10 CLOSE CIRC.
WATER QUALITY	6/10	8/10	3/10
HIGIENIC CERTIFICATION	OK	UNDER APPROVAL	OK

THEORY

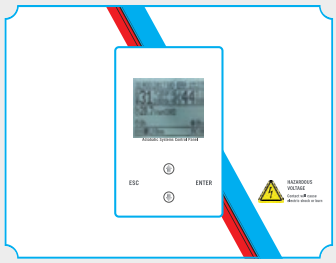
EXAMPLE:

SPRAY: T_{AMB} 32,0°C (R.H.= 50%) --> T_{CALC} = 26,3°C (R.H. = 80%)
H.S.S.: T_{AMB} 32,0°C (R.H.= 40%) --> T_{CALC} = 21,5°C (R.H. = 100%)
PADS: T_{AMB} 32,0°C (R.H.= 40%) --> T_{CALC} = 21°C (R.H. = 99%)

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 our systems, the adiabatic saturation guarantees an increase of the relative humidity up to the whole saturation of the air (R.H.=100%).



ADIABATIC SYSTEM MANAGER



Standard
Modbus®

A unique controller for the control and diagnostics of all types of adiabatic systems and related on-board equipment (pressure, temperature and humidity sensors, UV lamps, actuation valves).

Overview:
- Enclosure in UV resistant plastic, protection rating IP54 (IEC Standard 60529).
- Operating temperature -25°C +50°C
- Multifunction LCD Display (resolution 128x64), remote control distance 600m
- 4 control buttons
- Multilanguage menu **Features:**
- Non-volatile memory to retain parameters and event logs
- RTC (Time/Date) with battery backup
- Humidity/temperature sensor
- Input: remote start/stop (clean contact or Modbus)
- Output: operating state (clean contact)
- Output: alarm state (clean contact)
- Output: room thermostat state (clean contact)
- 2 password levels: user/manufacturer

Connectivity:
- RS485 Modbus RTU Slave communication interface

Technical data:
- Single-phase supply, voltage 100-240V, 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 European Directive 2014/30/EU EMC
- Complies with European Directive 2014/35/EU LVD

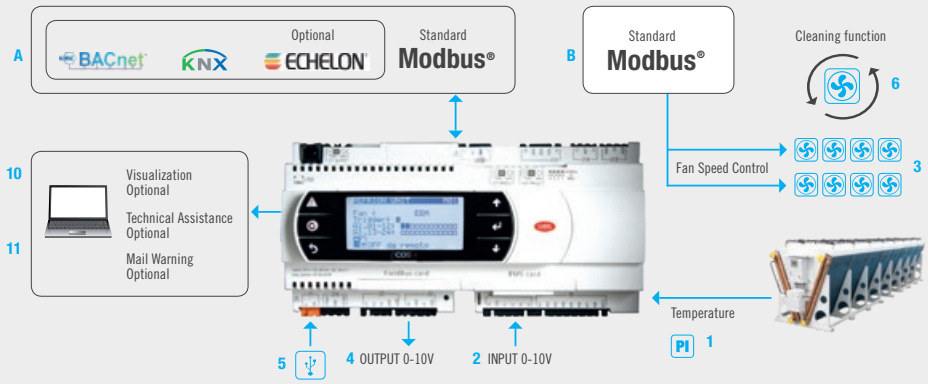
DIGITAL INTELLIBOARD (OPTION)

Designed to continuously and homogeneously regulate the speed of EC motors using MODBUS RS485 serial communication protocol, as well as control and run diagnostics on on-board systems (adiabatic systems, pressure, temperature and humidity sensors, UV lamps).
With the technology used on Electronic Commutation (EC) fans, operation is versatile and optimal with the consequent energy savings and noise reduction.
Any faults/anomalies are univocally identi ed in a detailed way.
The control panel is supplied installed, wired, programmed and ready-to-use.

- CAREL 4.3" colour touchscreen with screen protector.
- CAREL (PLC) programmable logic controller.
- Lockable hatch.
- Lockable yellow/red main switch.
- Operating/maintenance lockable selector: isolates the fan power lines.
- ON/OFF button with green status indicator.
- Red fault indicator.
- Multipole quick- t (FLEXI) connectors on panel.
- Temperature or pressure sensors installed and wired.
- 3-phase input, nominal voltage 400V (±10%), frequency 50Hz.
- 24V auxiliary circuit input, frequency 50Hz.
- Power line protected from overcurrent by automatic magneto-thermal circuit breaker (for each group of fans).
- Built-in fan overload protection (in the case of a fault, only the faulty fan will stop).
- "By-pass" function: in the case of a communication BUS malfunction, to prevent plant shutdowns, the fans automatically start running at the max. set speed.
- Volt-free contacts for controlling PLC remotely.
- Volt-free contacts for fan malfunction alarm signals.
- Programmable volt-free contacts.
- UL certi cation, CSA certi cation available on request.

Connectivity

Full remote control (over 900 parameters available) through eld BUS (standard: MODBUS RS485; on request: LonWorks®, BACnetTM, SNMP, Konnex®).



Functions

- Proportional-Integral-Derivative heat regulation.
- For remote control (reference: speed or temperature/pressure setpoint) with 0-10V signal or eld BUS.
- Limits fan rotation speed (ex. to limit noise levels during the night).
- Enables anticlockwise fan running to clean nned heat exchangers.
- Sends an analog 0-10V signal proportional to fan speed (0-100%).
- Update software with USB stick, without using a PC.
- Optional: for regulating 2 independent fan banks separately and independently (ex. different rotation speeds).
- Optional: Ethernet connection (ex. control parameters on a web page, remote assistance from the works, software update, etc.).
- Optional: sends an e-mail to max. 10 users for each alarm event (if the e-mail addresses have been registered in the PLC memory and the system is connected to Ethernet).

WATER RECIRCULATION SKID (OPTION)

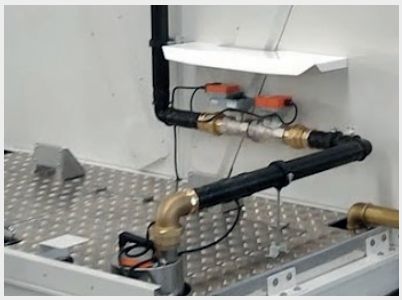
Designed to minimise water consumption in a closed circuit adiabatic system. The water used to allow the adiabatic saturation of the air is directed into the basin and redirected into the circuit through the recirculation pump. Water consumption is thus limited to the quantity evaporated during the adiabatic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

- Submersible centrifugal pumps in stainless steel material. Enclosure class: IP 68.

(Dual pump available on request).

The dimensioning of the pump size is optimized for the maximum water flow required by the adiabatic system.

- Flow rate gauge with piezoelectric sensor.
- Tank water level transducer.
- Water conductivity meter available on request.



ULTRAVIOLET LAMP (OPTION)

The UV lamp sterilizes the water in the adiabatic system (UV-C rays = 254 nm) emitting UV rays lethal to pathogens (including Legionella), providing an alternative effective solution to chemical biocides.
Unlike chemical treatments, UV sterilization does not use any harmful substances or add any toxic-noxious component to the water.
The intense biostructural disorder induced by this radiation interferes with the development and the reproductive capacity of every kind of micro-organism, making them inoffensive.

NOTE: the dimensioning of the lamp size is optimized for the maximum water flow required by the adiabatic system.

Additional recommended water quality requirements:
- Fe < 0.3 ppm
- Hardness <12 °f = 6.7°dH = Max. 120 ppm of CaCO3.
- S.A.C. (Spectral Absorption Coef cient) > 20 1/m S.A.C. (Spectral Absorption Coef cient) > 20 1/m

VIBRATION DAMPERS (OPTION)

A Simple leaning on the floor

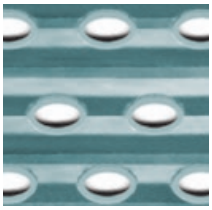
- Loading up between 50 daN and 1500 daN each A.V. Mountings.
- Low height.
- Aluminium cap to shelter the elastomer.
- Rubber components: Vibro stop elastomer.
- Metal components: aluminium alloy.
- Fixing between machine and A.V. mounting.
- Simple leaning to the floor.

F Fixing to the mounting plate

- Load range between 50 to 600 daN.
- Low heigh.
- Cap to shelter elastomer.
- Rubber components: rubber NR.
- Metal components: plated steel.
- Fixing between machinery and A.V. mounting.
- Fixing to the floor.

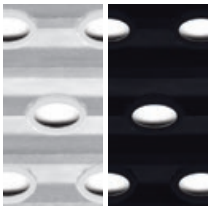
PROTECTION COATINGS

HEAT EXCHANGER PROTECTION TREATMENT OPTIONS



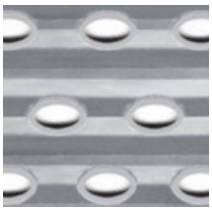
PRE-PAINTED HYDROPHILIC COATING

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



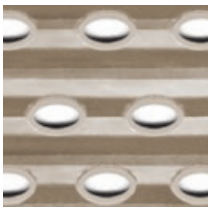
PRE-PAINTED HYDROPHOBIC COATING

- It gives the drops of water wetting the n a spheroid shape (contact angle>50°) for easier draining.
- Corrosion resistance (ASTM B117): *single layer **1000 hours** (colour grey), double layer **1500 hours** (colour black).*



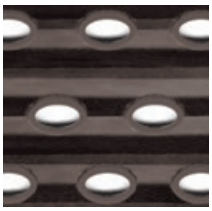
THERMOGUARD®

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



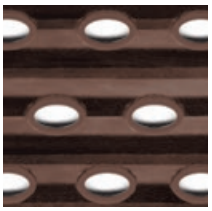
BLYGOLD®

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



ELECTROFIN®

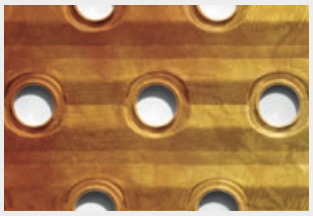
- Water-based, flexible cationic epoxy polymer using an electro-coat process.
- It guarantees complete heat exchanger coverage.
- Corrosion resistance (ASTM B117): 6000 hours.
- C5M & C5I High Durability (ISO 12944).



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.

HEAT EXCHANGER WITH COPPER FINS



SPECIAL COLOURS

Frame special colours

All RAL chart available on request.

USAGE LIMITATIONS

		LIMIT OF USE [HOURS/YEAR]						
	SPRAY ADIABATIC SYSTEM HYBRID SPRAY SYSTEM	**PRE-PAINTED HYDROPHILIC (single layer)**	**PRE-PAINTED HYDROPHOBIC (single layer)**	**PRE-PAINTED HYDROPHOBIC (double layer)**	**THERMOGUARD®**	**BLYGOLD®**	**HERESITE®**	**ELECTROFIN®**
WATER QUALITY	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 $CaCO_3$	150	300	400	800	1000	1500	1500
WATER QUALITY	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 $CaCO_3$	300	1000	1200	2400	3000	4000	4000
	INDUSTRIAL ADIABATIC SYSTEM							
WATER QUALITY	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 $CaCO_3$	/	MANDATORY FOR CLOSE CIRCUIT (ZP)	OPTION	OPTION	OPTION	OPTION	OPTION

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