JACIR
Cooling for life

ZYRCO

Adiabatic Cooler

Technical Documentation

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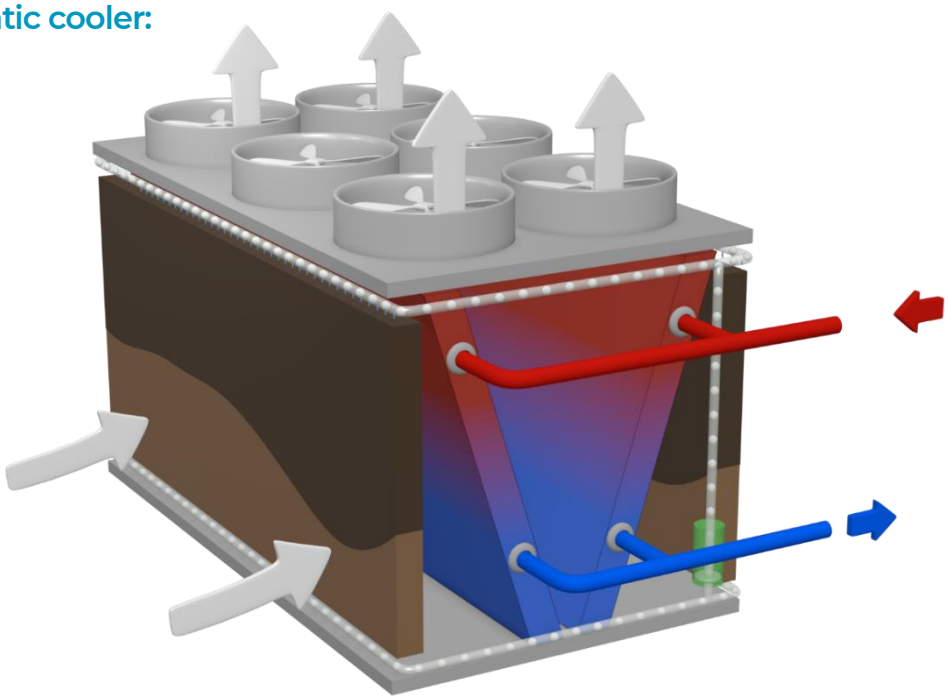
La FRENCH FAB

Principle and operation ZYRCO

The Adiabatic cooler ZYRCO is a heat exchanger. Calories are released dry to the atmosphere. As soon as the climatic conditions get warmer, this exchanger uses the evaporation of water. So, safely and without water treatment, it dissipates the calories by maintaining a cold-water temperature lower than that of ambient air.

This adiabatic cooler results from the combination of a dry air cooler and an adiabatic pre-cooling section: this pre-cooling section lowers the ambient air temperature by evaporating water on humidifying pads designed specifically for this purpose.

Operation of an adiabatic cooler:



Dry mode:

- The fluid is cooled in the dry tube coil by ambient air flow. The ambient air is drawn through the coils by fans mounted centrally on the top of the cooler; the humidifying pads located in front of the coils are dry.
- The fan speed is controlled by an inverter depending on heat load to maintain the fluid outlet temperature.
- The warm air is then evacuated upwards.

Adiabatic mode:

- When cooling in dry mode is not effective and the ambient temperature reaches a predetermined set point, the pads are saturated with water from the sump.
- The ambient air is cooled by evaporation when passing through the pads
- This precooled air then passes through the tube coils and cools the fluid.

The water which has not been evaporated on the pads is collected in a stainless-steel collector and then flows to sump. As an option, il can be recirculated with the make-up water from the sump to redistributed over the pads.

The water saving is then significant and does not require water treatment, without risk of Legionella.

General description and benefits ZYRCO

Range

The **ZYRCO** range proposes a complete series of 10 adiabatic chillers.

General description

ZYRCO adiabatic chillers are equipped with:

- Two heat exchangers with tube coils,
- A set of media humidifiers for evaporative pre-cooling,
- EC motors: electronic variation integrated into each motor,
- Units of low-noise helicoidal fans.

The water distribution system for pre-cooling of air is composed of:

- A water make-up solenoid valve,
- A motorized drain valve,
- A water recirculation pump,
- 3 level sensors (including 1 safety sensor).

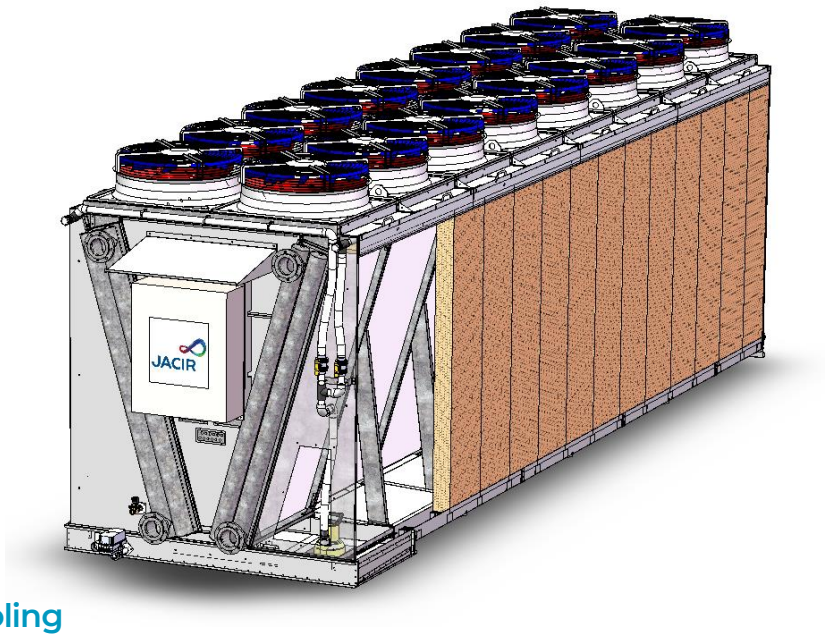
Benefits

- No drift,
- No water spray in airflow,
- Elimination of legionella risk,
- The coils have been tested (sealing and pressure according to PED), and their thermal performance have been certified Eurovent certified by Friterm, which participates to Eurovent Certita Certification COILS program (www.eurovent-certification.com),
- Garanteed thermal performance,
- No water treatment required,
- Very low water consumption,
- Access hatch maintenance,
- Low operating costs,
- Optimised electricity consumption, in accordance with Ecodesign Regulation (EU) 327/2011 on the application of Directive 2009/125/EC (ErP) for minimum efficiency thresholds after 202x,
- Transport by flat truck,
- Made in France.

Manufacturing Details ZYRCO

Tube coils

As standard, the batteries are made of copper tubes/aluminium fins with epoxy coating.
The tubes are expanded through the fins to ensure good mechanical strength and optimized thermal conduction. The thickness of copper tubes varies depending on the size of the device.
Previously certified by the manufacturer Friterm, whose participates in the Eurovent Certita Certification program for the COILS program (www.eurovent-certification.com), the batteries are tested at 20 bar as standard in accordance with the DESP.



Evaporative pre-cooling

The evaporation section is used to pre-cool the ambient inlet air. The cooling/humidifying media covers the whole air inlet section, on both sides of the unit.
The design and the choice of materials have proven to give best efficiency and long operating life, both in urban and industrial environments.

For a better integration in the architecture of the building, its colour can be adapted on request, according to the needs. The cooling/humidifying pads are made of special cellulose, chemically treated to avoid moisture and to improve water absorbing characteristics.

Selected to simplify maintenance, the symmetrical media pad can be used regardless of its direction of installation (indoor/outdoor).
The dismantling of humidifier media is extremely easy, without tools or means of handling.

Water distribution

The evaporation surface is used for the pre-cooling of the inlet air: the humidifier pads cover the entire two air inlet surfaces of the device.
The water distribution is located at the top of the device, outside the airflow.

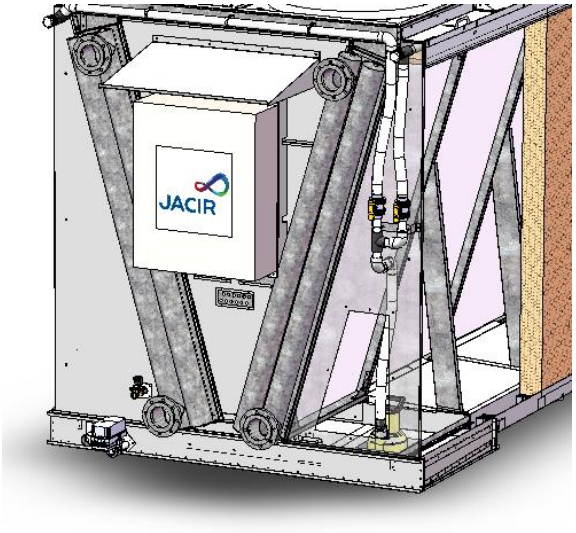
The pre-cooling circuit is activated when fluid outlet temperature is higher than the set point. This wet/dry set point is around 23°C in a continental climate, for a fluid outlet temperature of 27°C.

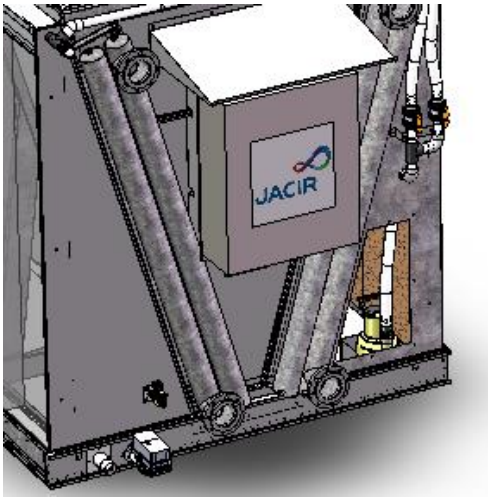
Collected water can de recirculated without any bacteriological risk (temperature is below the level for bacterial growth): the water **consumption is then divided by a factor of 3** during adiabatic mode operation.

Located outside the airflow, the water distribution is carried out by a PVC tube that distributes the water evenly and safely over the pads.
Caps at tube ends allow internal cleaning.

Aluminium water recovery channels recover non-evaporated water. This water is returned to a SILVER-STEEL covered tank, once filtered and sucked in by the recirculation pump.
The regulation of the water level is secured by three level detectors.

The maintenance of the water recirculation pump is carried out from the outside of the device via an access hatch provided for this purpose (480 x 750mm) thus it remains accessible during the operation of the ventilation.





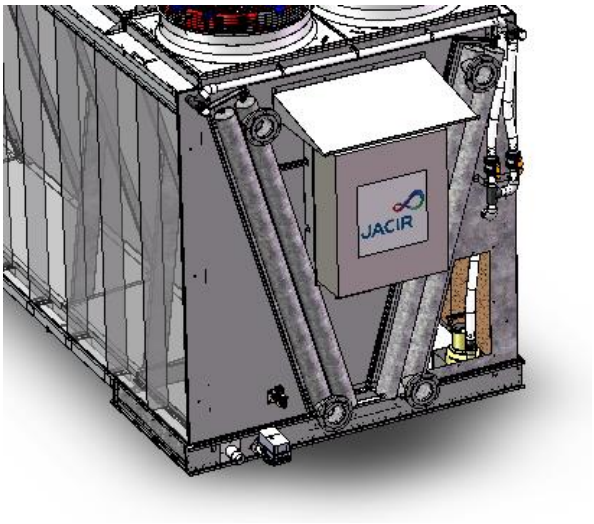
The system includes a drain valve that opens daily when the pads have been watered. This total emptying, combined with forced ventilation, automatically cleans all the elements in contact with the water.

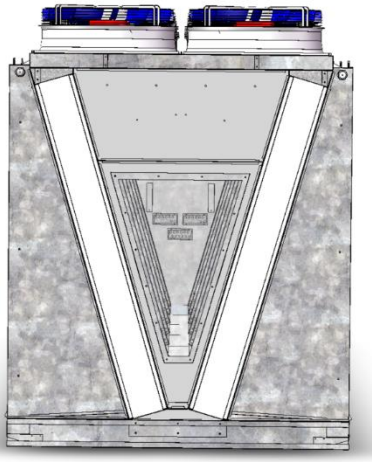
As an option, a common master-slave controlled regulation in case of serial units installed on the same hydraulic circuit is available.

Structure and Access

Of robust structure, the ZYRCO frame, roof of the device and water recovery tank are built of SILVER-STEEL, except for parts in contact with the humidifying Media which are made of aluminium for its perfect resistance to corrosion.

An access hatch (600 x 1250mm) is provided to access inside the device, as well as an access hatch to the pump and strainer effect (480 x 750mm) without having to stop the ventilation.





Motor-fan groups

The motor fan sets draw the air through the pads, then through the tube coils. Equipped with EC technology motors and directly coupled to low-rotation's speed axial fans. This combination offers both power efficiency and optimized sound level. The blades are made of Polypropylene and are directly fitted to the motor rotor. The motor fan coupling is direct and requires no maintenance.

EC motors (Electronically Commutated)

The ZYRCO adiabatic cooler is a cutting-edge technology and shows exceptional performance (efficiency higher than IE5). They are IP 55 insulation class, 380/400 V, 50/60Hz. Technology in compliance with Ecoconception (UE) 327/2011 concerning Directive 2009/125/CE application (ErP) for minimum efficiency after 202x.

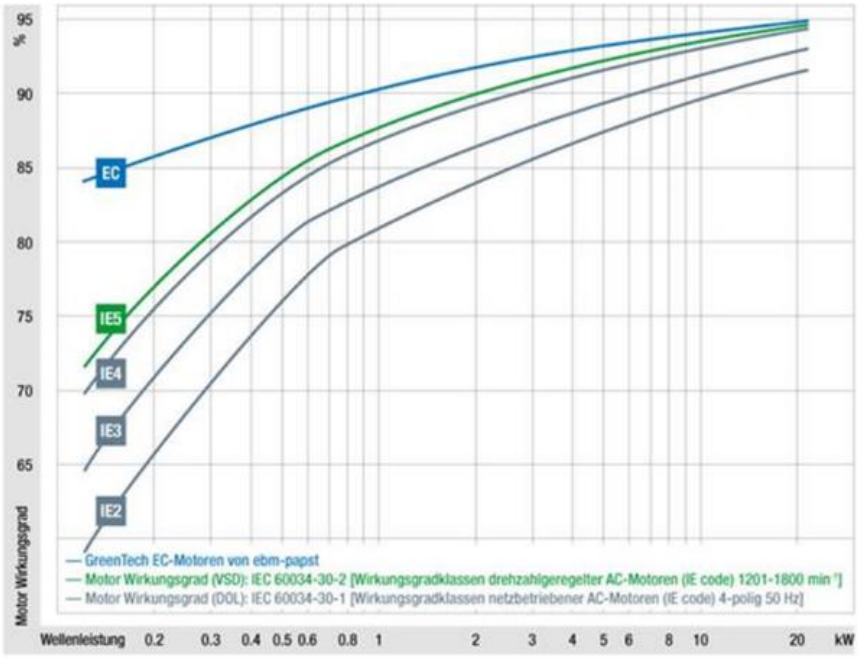
This efficiency places the ZYRCO range at the peak of energy efficiency, especially as the motors are always controlled by the inverter.

The motor runs cooler, is smaller and lighter compared to an asynchronous motor and has maintenance and handling benefits. Also, a lower temperature means long-lasting bearings (grease nipples directly on the motor), and insulation materials.

As an option, a backup mode on ventilation is also available: default activation of the fans at 50% in case of malfunction of the PLC.

These motors have a low carbon footprint → power savings.

Efficiency comparison



Speed variation

Installed as a standard across the whole range, there is one frequ

EC motor directly coupled to its helical fan and regulated by the an exceptional efficiency and cos phi, even in case of low-speed vari

Automaton

The ZYRCO range is totally “Plug and Play”: Schneider automaton equipped with HMI (Human Machine Interaction), allowing allows to control the operation of the motors and managing the pre-cooling function safely.

Here are some features of the PLC:

- Operating control including: pump, drain valve and water basin make-up valve for the pads,
- Thermal load management,
- Automatic drain control of the adiabatic system,
- Management of recirculating water levels,
- Switching to dry/wet mode
- Programming of the full draining (if coil option),
- Internal clock to optimize the management of the day and night sound levels,
- Memory backup in case of power failure,
- Multi-line liquid crystal display of main parameters and alarms,
- User interface to modify the set points water recirculation level monitoring

Communication modes are optional: Customer-user locker option: 0-10V or 04-20 mA or, Modbus,

Option to control fans in 0-10V and report defects for contact.

Master-Slave option

In the case of the setting-up of several adiabatic units on the same hydraulic network, it might be necessary to install a common regulation.
In this case, a single unit will be in charge of the regulation of the ventilation speed of the whole installation.

The wet mode trigger threshold remains specific to each unit. It can be different from one unit to another thus allowing a cascade start of the wet mode.

In case of loss of communication network, each adiabatic cooler automatically becomes autonomous again with its own probe and PID regulation system.

The water temperature probes (supplied by JACIR) will have to be placed on the water outlet collector, common to every unit.

The wired links between the devices will be customer supply.

OPTIONS

- Colour choice of the medias for a good integration in architecture site;
- POP-SCREEN: additional fixing frame to fix a protection on the medias (against insects, near forests, etc);
- Backup mode on motor fan set;
- Insulation plate in place of moto fan set during maintenance to keep the performance;
- Automaton communication gateway Ethernet, Modbus, LonWorks, or BACnet;
- Common Master-slave regulation in case of an installation of serial units on the same hydraulic circuit.
- Discharge sheathing (pit installation case)
- Sound release attenuation cladding
- Coils selection optimized for high flow rates: 4 input-outputs

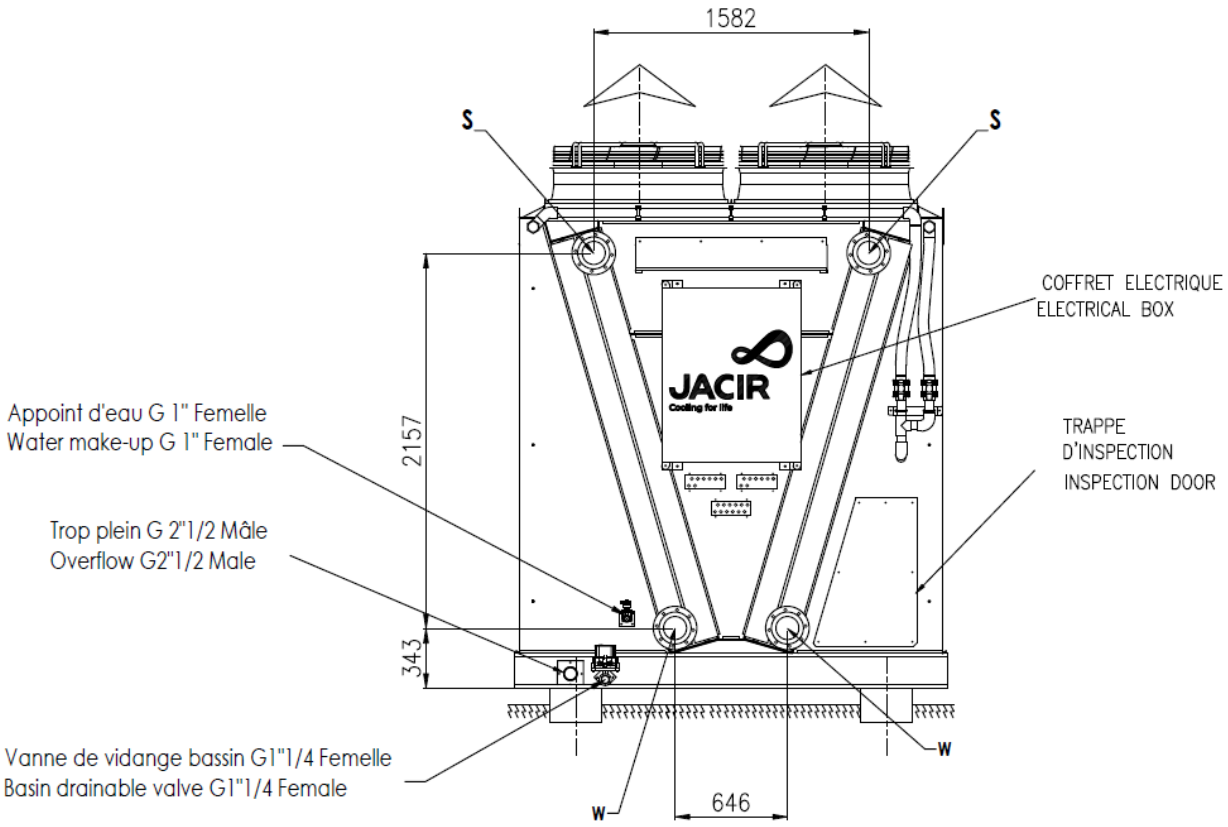
Technical characteristics ZYRCO ZH E09 D

ZYRCO		ZH2 E09 D3 2425		ZH3 E09 D3 3525		ZH4 E09 D3 4625		ZH5 E09 D3 5725	ZH6 E09 D3 6825	ZH7 E09 D3 7925	ZH8 E09 D3 9025	ZH9 E09 D3 10225	ZH10 E09 D3 11325	ZH11 E09 D3 12425
		A	B	A	B	A	B	B	B	B	B	B	B	B
Nominal capacity max [1]	kW	276	317	395	476	543	626	796	902	1 073	1 243	1 413	1 583	1 769
Motor-fan	Qty / kW	4 x 3,2		6 x 3,2		8 x 3,2		10 x 3,2	12 x 3,2	14 x 3,2	16 x 3,2	18 x 3,2	20 x 3,2	22 x 3,2
Fan diameter	mm	910												
Absorbed power per unit	kW	14,4	14,4	20,7	20,7	27	26,9	33,2	39,4	45,7	51,9	58,2	64,4	70,6
Installed power per unit	kW	14,5	14,5	20,8	20,8	27	27	33,3	39,5	45,8	52	58,3	64,5	70,8
Inlet / outlet water connections (S/W)	DN	80		100		125								
Spacing H1	mm	387.5				400								
Spacing H2	mm	2 227				2 202								
Option twice inlet / outlet - Spacing H2'	mm	949.5				937								
Spacing X1	mm	2 422.5				2 441								
Spacing X2	mm	2 147.5				2 129								
Water make-up flow (max)	m3/h	0.6		0.9		1.3		1.5	1.8	2	2.3	2.6	3	3.1
Water make up connection (male threaded)	Inches (mm)	1" (26 x 34)												
Drain connection (female threaded)	inches (mm)	1" 1/4 (33 x 42)												
Overflow connection – male (T)	inches (mm)	2" (50 x 60)							2" 1/2 (66 x 76)					
Empty weight	kg	1 305	1 440	1 890	2 070	2 430	2 700	3 330	3 960	4 545	5 175	5 805	6 435	7 065
Operating weight	kg	2 025	2 205	2 700	2 970	3 375	3 735	5 545	5 310	6 075	6 885	7 650	8 460	9 225
Overall Length (L1)	mm	2 390	2 390	3 500	3 500	4 610	4 610	5 720	6 830	7 940	9 050	10 160	11 270	12 380
Overall width	mm	2 490												
Overall height	mm	3 140												
Sound level [2]	dBA	63		64		66		66	67	68	68	68	69	69

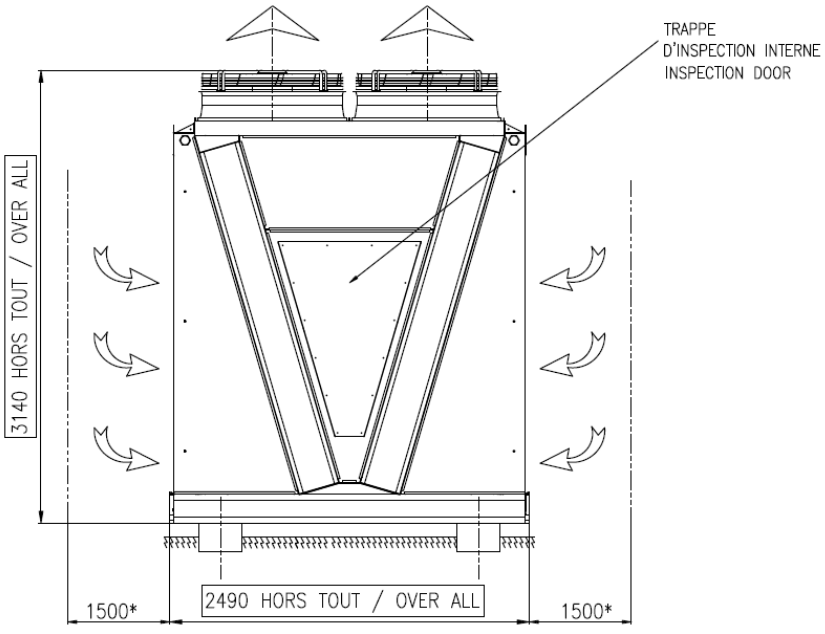
(1) : Based on a water inlet/outlet regime at 35°C / 30°C and ambient air at 35°C / 22°C (dry / wet temperature).
(2) : Sound level Lp at 15 meters in free field in the 5 directions at 100% of the ventilation (+/- 2 dBA).

Drawings and Dimensions ZYRCO ZH E09 D

VUE FACE AVANT
FRONT VIEW



VUE ARRIERE
BACK VIEW



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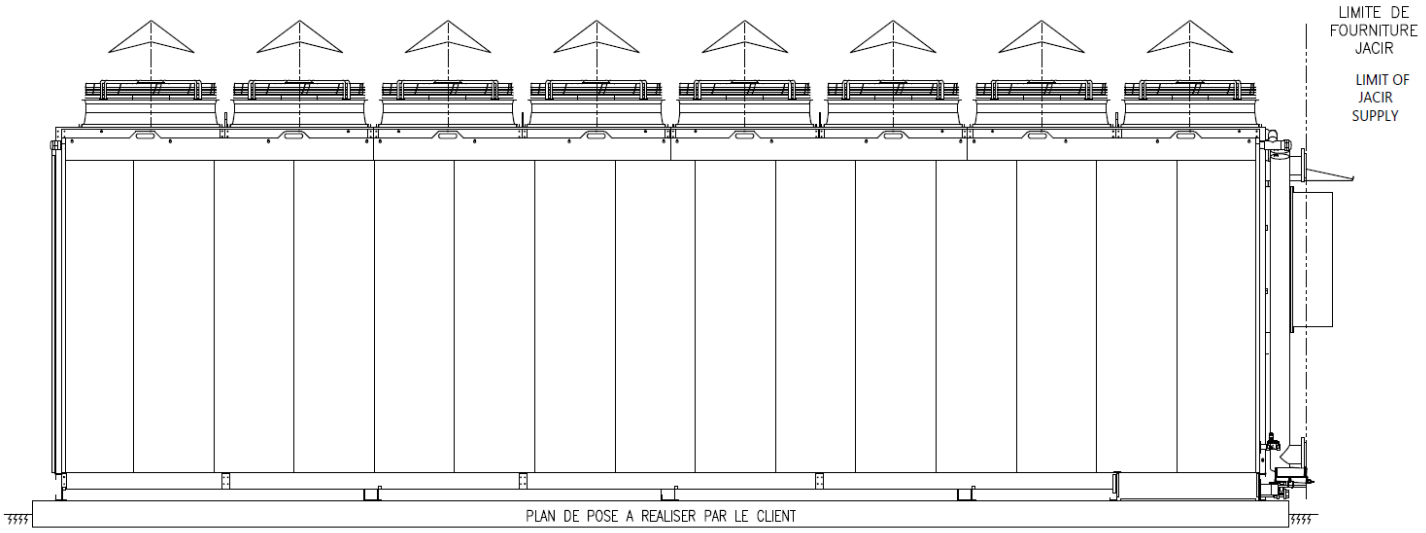
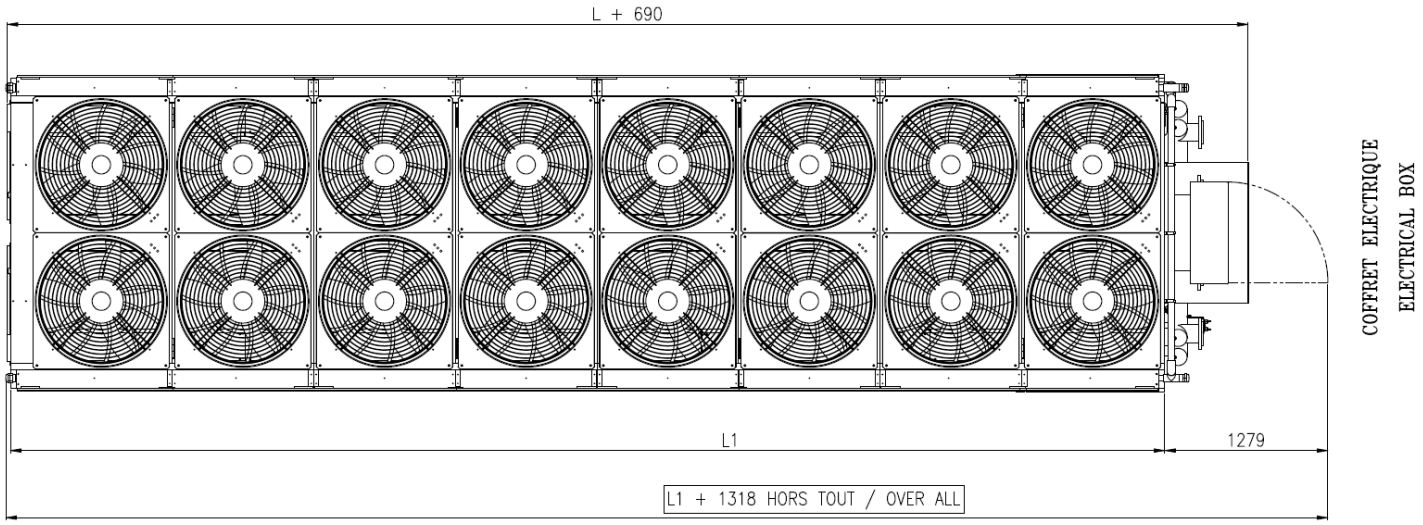




On site layout ZYRCO

In order to achieve optimum thermal performance, the ZYRCO adiabatic cooler must be installed according to the following criteria: the choice of location in relation to surrounding obstacles must met the following instructions (for any special set-up please contact JACIR):

A- There must be sufficient open space along the two sides of the unit where air intakes are located.
B- The prevailing winds direction and near obstacles must be considered to limit risks of cooling air reinjected (this is particularly important when there are several ZYRCO working on the same site).
C- Air outputs must be cleared of any obstructions.

Minimum distances required:

A = minimum given by the graphic (unit are supposed to lay on the ground with no air movement under the unit).

A= minimum 0.9 m from T4

A= minimum 1.2 m from T4 to T7

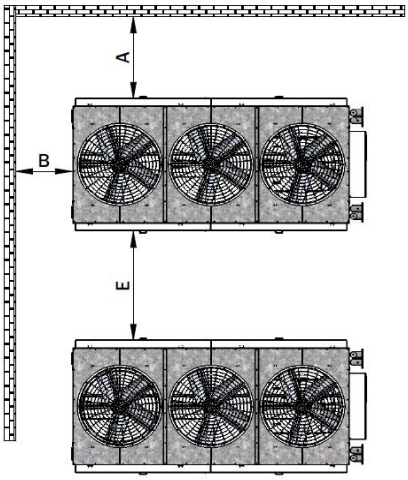
A= minimum 1.3 m from T8 to T11

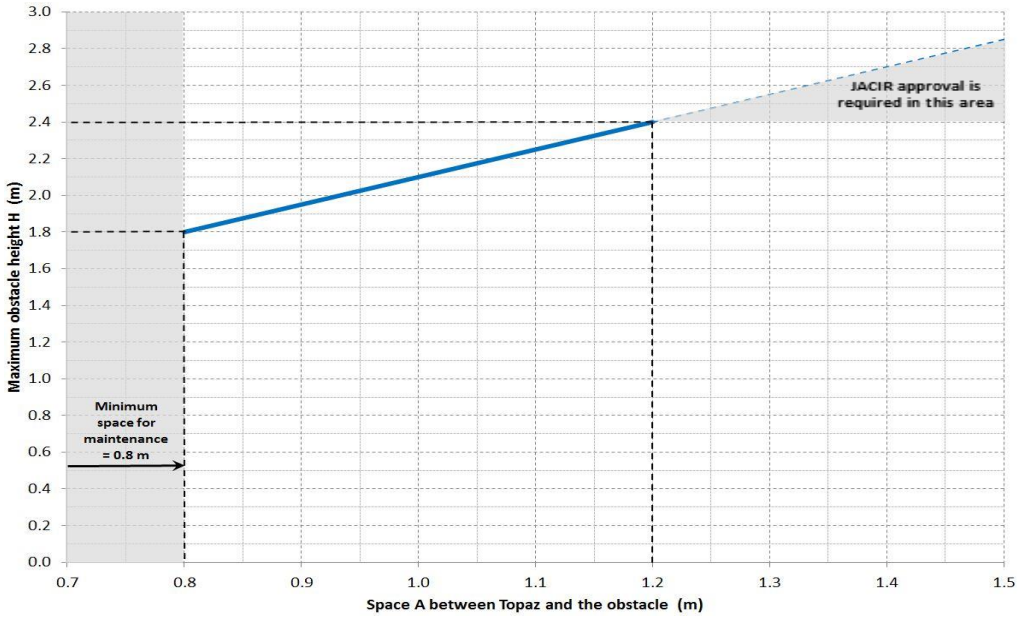
B = minimum 1 m

E = minimum 1,8 m (from T4 fans)

E = minimum 2.4 m (from T4 to T7 fans)

E = minimum 2.6 m (from T8 to T11 fans)





When the equipment is located near a building or a fence, top of the fan(s) must be higher than, or equal to, any adjacent wall or building. Special attention must be paid to avoid any hot and humid air being recycled into the equipment. All units must be positioned to prevent hot air being returned towards air intakes. This criterion must be taken into account should any extensions be made. Given dimensions are minimum general recommendations

Adiabatic cooler will be selected according the following data:

∞ Power to be dissipated: .....
∞ Water temperatures: water + glycol MEG at 30% cooled from.....
∞ Ambient air temperature of ..... °C, and a wet bulb temperature of .....
∞ The sound pressure level will not be greater than ..... db(A) at 10 metres, average in 5 directions.

Adiabatic cooler data JACIR brand ZYRCO ZH type .....

Chillers supplied with the following certificates:

∞ EUROVENT certified coils,
∞ Certificate of non-vesicular training controlled and validated by INERIS,
∞ ErP 202x compliant.

Tube coils

∞ The coils will be positioned in V with access hatch to the device's centre, to the inner faces of the coils and mechanics, without intermediate partition,
∞ The batteries will be made of copper tubes/aluminium fins with epoxy coating,
∞ The minimum thickness of the tubes will be provided according to the size of the device,
∞ The coils, certified performance by Eurovent, will be tested at 20 bar as standard pressure,
∞ Copper tubes will be seamless and expanded through the fins to secure a mechanical resistance and optimized thermal conductivity,
∞ The headers will be placed on a single side only in order to allow free access inside the opposite device.

Humidifier Media

∞ It will be made of cellulose fibres, chemically impregnated to prevent mould and to improve its absorbent qualities
∞ The waves of the Media will be symmetrical, allowing the reversible pose,
∞ The dismantling of the Media humidifiers will be extremely easy, without tools or need of handling equipment.

Water distribution

∞ The distribution pipes will be made of PVC, openable at each end for easy cleaning,
∞ The water distribution will be located outside the airflow and accessible by lifting the cover (without need of tools),
∞ In order to further reduce water consumption in adiabatic mode, the water collection channel under the medias made of aluminium will recover the non-evaporated water which will then be directed to a SILVER STEEL covered tank. The water regulation level will be secured by three level sensors, and a self-priming pump,
∞ The system will include a drain valve that will open daily automatically,
∞ This total emptying, combined with forced ventilation, will automatically dry all the elements in contact with water.

Motor – fan groups

- The motor-fan sets will be aligned in a double row at the top of the unit. They will draw the air through the pads and tube coils. They will be composed of one motor per fan,
- EC technology motors (Electronically Commutated) will be IP 55 insulation class, 380/400 V, 50/60 Hz, direct coupling requiring no maintenance, especially selected for a continuous running operation, with efficiency higher than IE5,
- Each motor will include its frequency drive automaton driven,

Control panel with automaton

- Schneider automaton will control EC motor fan and will activate the pre-cooling mode,
- The ZYRCO cooler will be delivered totally "Plug and Play", will be equipped with HMI (Human Machine Interface), placed on the front of the cabinet,
- As standard, the following information will be available: general defect, wet mode activation, drain valve status, water make-up solenoid valve status, % load on drives,
- An optional communication mode with different communication languages will be offered for remote control/command of the PLC.

Structure and Access

- The unit's frame, roof and water recovery tank will be made of SILVER-STEEL,
- All the parts in contact with the MEDIA (adiabatic pre-cooling section) will be in aluminium for its perfect resistance to corrosion,
- An access hatch (600 x 1250mm) will be provided for inside unt's inspection and maintenance,
- An access hatch (480 x 750mm) will allow access to pump and strainer without stopping ventilation.

Options

- Colour choice of the medias for a good integration on architecture site,
- POP-SCREEN: additional fixing frame to fix a protection on the medias (against insects, near forests, etc),
- Backup mode on the motor fan set,
- Insulation plate in place of motor fan set during its maintenance to keep safe the performance,
- Automaton communication gateway Ethernet, Modbus, LonWorks, or BACnet,
- Master-slave regulation in case of an installation of several units on the same hydraulic grid.
- Discharge sheathing (pit installation case)
- Sound release attenuation cladding
- Coils selection optimized for high flow rates: 4 inlets-outlets